

# Typologies of Family Functioning and 24-Hour Movement Behaviors

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## Research

**Keywords:** family environment, physical activity, screen time, sleep

**Posted Date:** July 28th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-48988/v1>

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**Version of Record:** A version of this preprint was published at International Journal of Environmental Research and Public Health on January 15th, 2021. See the published version at <https://doi.org/10.3390/ijerph18020699>.

# Abstract

**Objective:** The purpose of the current study was to use latent profile analysis to identify family typologies characterized by parental acceptance, parental monitoring, and family conflict, and to examine whether such typologies were associated with the number of movement behavior recommendations (i.e., physical activity, screen time, and sleep) met by children.

**Methods:** Data for this cross-sectional observational study were part of the baseline data from the Adolescent Brain Cognitive Development (ABCD) study. Data were collected from September 1, 2016 to September 15, 2018, across 21 study sites in the United States. Participants included 11,875 children aged 9 and 10 years.

**Results:** Results from latent profile analysis showed that children were meaningfully classified into one of five family typologies, ranging from *ideal* (high acceptance, high monitoring, and low conflict) to *poor* (medium acceptance, low monitoring, and high conflict) functioning. Children from *good* (OR= 0.54; 95% CI, 0.39-0.76), *average* (OR=0.28; 95% CI, 0.20, 0.40), *fair* (OR=0.24; 95% CI, 0.16, 0.36), and *poor* (OR=0.19; 95% CI, 0.12-0.29) functioning families were less likely to meet all three movement behavior recommendations compared to children from *ideal* functioning families. The odds of meeting all recommendations progressively decreased as family functioning worsened. Similar findings and pattern of results were found for meeting  $\geq 2$  recommendations and  $\geq 1$  recommendation.

**Conclusions:** These findings highlight the importance of the family environment for promoting healthy movement behaviors among children.

## Introduction

The *Canadian 24-hour Movement Guidelines* recommend that children and youth (5–13 years) accumulate a minimum of 60 minutes of moderate-to-vigorous physical activity per day, engage in no more than 2 hours of screen time per day, and obtain 9–11 hours of sleep per night.(1) Meeting these recommendations have been linked to favorable body composition,(2) lower cardiometabolic risk scores,(3) favorable psychological well-being,(4) higher global cognition scores,(5) and lower impulsivity scores.(6) Many factors are implicated in the development and maintenance of these movement behaviors. One factor that plays a powerful role in shaping children’s health behaviors is the family environment,(7, 8) which comprises various behaviors within the family, including parental practices (i.e., parental acceptance and monitoring) and family conflict.

Parenting practices generally refer to the specific acts of parents when attempting to socialize their children, and can include parental acceptance (e.g., affection, approval, warmth, support)(9) and monitoring (knowing where and with whom the child spends her time). Numerous studies have shown positive associations between parental encouragement/support and children’s levels of physical activity.(8, 10) The relationship between parental acceptance and screen time remains largely unknown, though it is likely complex given the research on parenting styles and screen time; authoritarian (low acceptance, high demand) and permissive (high acceptance, low demand) parenting styles are linked with greater screen time among 5-10-year-olds.(11) Moreover, parental monitoring of children’s sleep, physical activity, and media use is associated with longer sleep duration,(12) greater physical activity,(13) and less screen viewing among children,(14) respectively.

In contrast to protective family factors, family conflict is considered a risk factor that may hinder children's ability to meet the 24-hour movement behaviors. Family conflict refers to openly expressed anger, aggression, and disagreement among family members,(15) and is believed to interfere with parenting ability.(16) Empirical evidence supports the notion that parents in high-conflict families may be unable to monitor their children's physical activity, media use, and sleep habits. Family conflict has been frequently linked with sleep disruptions and poor sleep quality in children.(17) In fact, family conflict during childhood (7–15 years) predicted insomnia later in life.(18) Marital conflict, in particular, has been shown to negatively impact children's sleep as characterized by sleep onset latency, frequent awakenings, reduced sleep duration, and increased nightmares. (19, 20) Furthermore, associations between family conflict and media use suggest that higher family tension is linked with greater television viewing among children,(21) and that children from high-conflict families (vs. those in less conflictual families) watch more violent electronic media.(22) Finally, greater family conflict has also been linked with less physical activity in children with Type 1 diabetes.(23)

Research on the importance of family environment on children's health behaviors is ubiquitous. Yet critical gaps exist within the literature and should be addressed. Many of the previous studies have generally focused on only one family characteristic or factor and its relationship with different health outcomes. Where multiple family characteristics are examined, researchers have often adopted "variable-centered" approaches, which assume that participants are drawn from a single homogenous population. Alternatively, "person-centered" approaches – like latent profile analysis (LPA) – allow researchers to identify homogenous groups, typologies, or profiles of participants characterized by differences on variables of interest (e.g., family environment). To date no studies have examined different family environment characteristics and how they relate to children's movement behaviors. Therefore, the purpose of the current study was to use LPA to identify typologies of families characterized by parental acceptance, parental monitoring, and family conflict, and to examine whether such family typologies were associated with the number of movement behavior recommendations met by children.

## Methods

### Study Design

These data ( $N= 11,875$ ) are part of the baseline dataset from the Adolescent Brain Cognitive Development (ABCD) study, a broadly representative sample of 9 to 10-year-old children recruited from 21 research sites across the United States. A broad aim of the ABCD study is to track brain development of children for 10 years to understand how different factors (e.g., environmental, behavioral, biological) impact or alter developmental trajectories, making it the largest long-term study of brain development and child health in the United States. Participants with missing data were removed from the data set. The final sample size was 10,712 participants. Ethics approval was obtained from all relevant institutional research ethics boards. Signed informed consent and assent were obtained from parents/guardians and participating children, respectively.

### Exposures

Parental acceptance, parental monitoring, and family conflict were used in the LPA analyses to create family profiles/typologies. Children's perceptions of parental warmth, acceptance, and responsiveness were assessed using the acceptance subscale (5 items) of the Child Report of Behavior Inventory.(24) Items assess the extent

to which children perceive their caregiver as warm or accepting (e.g., “Makes me feel better after talking over my worries with him/her”; “Smiles at me very often”). Items are rated on a three-point scale, ranging from 1 (*not like him/her*) to 3 (*a lot like him/her*). Children reported on their primary caregiver (usually the mother), who is also participating in the ABCD study. Parental monitoring was assessed using a scale (five items) developed by the ACBD leadership group that assesses children’s perceptions of how often their parents know where they are (“How often do your parents know where you are?”), who they are with (e.g., “How often do your parents know who you are with when you are not at home and away from home?”), communicate with them (“If you are at home and your parents or guardians are not, how often do you know how to get in touch with them?”), know of their upcoming plans, and family dinner frequency. Family conflict was assessed using the conflict subscale (nine items) of the Moos Family Environment Scale.(15) Items assess the amount of openly expressed anger and conflict among family members, and are assessed using a true or false response scale. For each measure, items were summed, whereby higher scores reflect more acceptance, higher conflict, and greater parental monitoring.

## Outcomes

The movement behaviors served as the outcome variables. Physical activity was assessed using one item from the Youth Risk Behavior Survey,(25) wherein children reported the number of days per week they were physically active for at least 60 minutes. Screen time was assessed using the child-reported Youth Screen Time Survey (12 items), which was developed by Barch et al.(26) and based on the work of Sharif et al.(27) Items assess how much time children spend on different types of media (e.g., watching shows or movies, texting) on both a typical weekday and weekend day. Daily recreational screen time was calculated by taking a weighted average of the weekday and weekend screen time items: (sum of weekday screen time in decimal hours x 5) + (sum of weekend day screen time in decimal hours x 2)/7. Sleep was assessed using one item from the Sleep Disturbance Scale for Children.(28) Parents reported the number of hours of sleep their child obtained on most nights. For each movement behavior, children were coded as either 1 (meeting the guideline) or 0 (not meeting the guideline) and were then used to create three separate dichotomous variables: (1) 0 recommendations vs. met  $\geq 1$  recommendation met; (2) 0 recommendations met vs.  $\geq 2$  recommendations met; (3) 0 recommendations met vs. 3 recommendations met.

## Statistical Analyses

Statistical analyses were conducted using a multi-phase approach. First, we used LPA to determine whether participants could be classified into meaningful profiles based on the three dimensions of family environment (i.e., acceptance, monitoring, and conflict). Scores on acceptance, monitoring, and conflict were standardized and used in the LPA, which was conducted in R using the `mclust` package.(29) We used an iterative process to identify the optimal number of profiles whereby we started with a 2-profile solution and sequentially added profiles. Various criteria were used to identify the best fitting model, including Bayesian Information Criterion (BIC), Consistent Akaike’s Information Criterion (CAIC), the Sample-Adjusted Bayesian Information Criterion (SABIC), and Bootstrap Likelihood Ratio Test (BLRT). Lower BIC, CAIC, and SABIC values indicate better model fit, whereas the *p*-value generated for the BLRT indicates whether the solution with more classes or less classes fits better. Classification accuracy was evaluated using entropy, whereby values close to 1 indicate improved classification precision. Once the best-fitting profile was identified, multilevel logistic regressions

were used to examine the association between family profiles and meeting the 24-hour guidelines. All models were adjusted for age, sex, ethnicity, and family income and included study site as the random intercept.

## Results

### Latent Profiles

Latent profile models comprising 1 through 5 profiles were fit to the data. Model fit indices for each profile are shown in Table 1. The 5-profile solution was selected as the best model as it had the lowest BIC, CAIC, and SABIC values, a significant BLRT  $p$ -value, and the highest entropy value. Means and standard deviations for the 5-solution profile are displayed in Table 2. Profile names were selected based on means of each variable between profiles and defining differences between profiles. Consequently, families in our sample were labelled as: *ideal functioning* ( $n = 1,465$ ; 12%); *good functioning* ( $n = 3,095$ , 26%); *average functioning* ( $n = 3,357$ , 28%); *fair functioning* ( $n = 1,895$ , 16%); and *poor functioning* ( $n = 2,020$ , 17%). Figure 1 displays a plot of the scaled means for each of the five latent profiles.

Table 1  
Model Fit Indices from Latent Profile Analyses

Solutions	BIC	CAIC	SABIC	BLRT $p$ -value	Entropy
2-Profile	88876.42	88684.48	88613.46	0.001	0.745
3-Profile	84506.42	84223.61	84119.16	0.001	0.820
4-Profile	82260.52	81886.51	81748.64	0.001	0.737
5-Profile	79541.60	79076.78	78905.48	0.001	0.843

*Note.* BIC = Bayesian Information Criterion; CAIC = Consistent Akaike's Information Criterion; SABIC = Sample-Adjusted Bayesian Information Criterion; BLRT = Bootstrap Likelihood Ratio Test.

Table 2  
Descriptive Statistics for Parental Acceptance, Family Conflict, and Parental Monitoring for the 5-Profile Solution

Profile	Acceptance		Monitoring		Conflict	
	$M$	$SD$	$M$	$SD$	$M$	$SD$
Ideal functioning ( $n = 1462$ )	15.00	0.00	24.07	0.80	0.00	0.00
Good functioning ( $n = 3095$ )	15.00	0.00	22.87	1.67	1.33	0.87
Average functioning ( $n = 3357$ )	14.34	0.47	22.17	1.93	2.90	2.07
Fair functioning ( $n = 1895$ )	11.45	1.62	20.44	2.98	1.72	1.73
Poor functioning ( $n = 2020$ )	13.02	1.10	19.89	2.98	3.50	2.01

*Note.* Ranges (minimum and maximum) for Acceptance, Monitoring, and Conflict were 9–15, 5–25, and 0–9, respectively.

# Association of Family Profiles with Number of Movement Behaviors Met

Table 3 shows the odds ratios for associations between family typologies and number of movement behaviors met. Results showed that children from families with *good*, *average*, *fair*, and *poor functioning* were at lower odds for meeting all 3 movement behaviors (respective odd ratios [ORs] = 0.54, 0.28, 0.24, and 0.19) compared to children from *ideal functioning* families (the referent group). Similar results were found for the remaining recommendation categories; children from families with less-than-ideal functioning (i.e., *good*, *average*, *fair*, and *poor*) were at lower odds for meeting  $\geq 2$  recommendations and  $\geq 1$  recommendation compared to children from families with *ideal functioning*. Notably, the results showed that the odds of meeting a movement behaviour category progressively decreased as family functioning worsened. For instance, the ORs for meeting  $\geq 2$  recommendations were 0.77, 0.49, 0.42, and 0.28 for children from families with *good*, *average*, *fair*, and *poor functioning*, respectively. Furthermore, within a given family typology, as the number of recommendations met increased, the odds ratios decreased (see Fig. 2). For example, the odds of meeting  $\geq 1$  recommendation,  $\geq 2$  recommendations, and 3 recommendations for children from a poor functioning family were 0.54, 0.35, and 0.19, respectively.

Table 3  
Associations Between Predictors and Number of Movement Behavior Recommendations Met

Predictors	≥ 1 recommendation			≥ 2 recommendations			3 recommendations		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
(Intercept)	70.73	30.20, 165.67	< 0.001	40.96	13.58, 123.51	< 0.001	1.58	0.18, 13.76	0.677
Age (decimal years)	0.71	0.66, 0.77	< 0.001	0.63	0.57, 0.69	< 0.001	0.66	0.55, 0.79	< 0.001
Sex (ref: girls)	1.20	1.10, 1.31	< 0.001	1.43	1.27, 1.61	< 0.001	1.18	0.94, 1.49	0.148
Ethnicity: African Americans (ref: Asians)	0.27	0.18, 0.41	< 0.001	0.17	0.10, 0.27	< 0.001	0.19	0.06, 0.58	0.004
Ethnicity: Caucasians (ref: Asians)	0.65	0.44, 0.96	0.032	0.72	0.46, 1.12	0.145	1.40	0.55, 3.55	0.477
Ethnicity: Hispanics (ref: Asians)	0.36	0.24, 0.54	< 0.001	0.31	0.20, 0.50	< 0.001	0.29	0.10, 0.79	0.015
Ethnicity: Multiracial (ref: Asians)	0.43	0.29, 0.64	< 0.001	0.43	0.27, 0.69	< 0.001	0.61	0.23, 1.61	0.318
Family income (1–10 scale)	1.14	1.12, 1.16	< 0.001	1.28	1.24, 1.32	< 0.001	1.41	1.31, 1.53	< 0.001
Family typology: good (ref: ideal)	0.81	0.69, 0.95	0.012	0.77	0.63, 0.94	0.012	0.54	0.39, 0.76	< 0.001
Family typology: average (ref: ideal)	0.62	0.53, 0.73	< 0.001	0.49	0.40, 0.59	< 0.001	0.28	0.20, 0.40	< 0.001
Family typology: fair (ref: ideal)	0.54	0.45, 0.64	< 0.001	0.42	0.33, 0.52	< 0.001	0.24	0.16, 0.36	< 0.001

	$\geq 1$ recommendation			$\geq 2$ recommendations			3 recommendations		
Family typology: poor (ref: ideal)	0.54	0.45, 0.64	< 0.001	0.35	0.28, 0.44	< 0.001	0.19	0.12, 0.29	< 0.001

## Discussion

The purpose of this study was to identify typologies of families characterized by parental acceptance, parental monitoring, and family conflict, and to examine whether these family typologies were associated with the number of movement behavior recommendations met. Using LPA, we found that children from families in our sample could be meaningfully classified into one of five family typologies, ranging from *ideal functioning* (high acceptance, high monitoring, and low conflict) to *good functioning* (high acceptance, high monitoring, medium conflict) to *average functioning* (medium acceptance, medium monitoring, high conflict) to *fair functioning* (low acceptance, medium monitoring, and medium conflict) to *poor functioning* (medium acceptance, low monitoring, and high conflict). Using these family typologies, results from logistic regression analyses revealed that children from less-than-ideal functioning families (i.e., *good, average, fair, and poor functioning*) were at progressively lower odds of meeting all three movement behaviors compared to children from *ideal functioning* families.

These findings generally align with previous research demonstrating that families with certain qualities can either positively or negatively influence children's health behaviors. Family qualities that have been linked with adverse health indicators among children include: family conflict; repeated episodes of anger and aggression; a lack of parental availability for, involvement in, and supervision of child activities; and relationships that are cold, unsupportive, and neglectful.(30) In most scenarios, family characteristics are examined individually, using variable-centered approaches. Our study extends previous research by using a person-centered approach to show how key family characteristics (acceptance, monitoring, and conflict) cluster together to generate homogenous family typologies. Results of our study also highlight that as the number of movement behavior recommendations increased, the odds of meeting each recommendation category (i.e.,  $\geq 1$  recommendation,  $\geq 2$  recommendations, and 3 recommendations) progressively decreased within any given family typology.

Our findings should be interpreted while considering some limitations. The movement behaviors were measured using subjective assessments, which can increase measurement error and bias. More rigorous methods (e.g., objective assessments) are needed to further our understanding of the antecedents and outcomes of children's movement behaviors. Finding ways to objectively measure screen time, in particular, should be a focus of future research. While examining total time spent on screens is important, information regarding time spent on specific platforms (e.g., Twitter, Instagram) would provide a more nuanced insight into the health impacts of screen media use among young people. Furthermore, the relationship between family factors and children's ability to meet the movement behavior recommendations is undoubtedly complex and therefore intervening variables (moderators and mediators) should be incorporated in future analytical models. Child temperament, which represents individual differences in reactivity and self-regulation,(31) plays an important role in children's social and psychological development. Considering child temperament when

examining family typologies and the movement behaviors may help to identify individual differences among children that make them more or less likely to meet the guidelines.

Despite its limitations, our study has several strengths and makes important contributions to both the movement behavior and family health literatures. First, a methodological strength of our study was the use of LPA; classifying individuals, rather than variables, into profiles revealed that families in our sample varied on acceptance, monitoring, and conflict. Second, this study, to our knowledge, is the first to examine family typologies and their relationship with the 24-hour movement behaviors, and thus improves upon and extends current knowledge on this topic. Findings from this study could be used to help inform future family-targeted interventions aiming to improve movement behavior adherence in children. Third, the family typologies generated in our study (via LPA) can be used in future studies to determine whether similar homogenous profiles emerge across more diverse samples. If similar profiles are identified, a theoretically meaningful taxonomy of family typologies could be developed.

That children from *ideal functioning* families were more likely to meet all three movement behaviors than children from less-than-ideal functioning families should be of interest to health researchers and practitioners. Parents/caregivers should be focus on instilling healthy habits in the early years of their children's lives as this may be harder as children age. Some emerging research suggests that parents of children (6–13 years) may be hesitant to impose rules restricting children's screen time because it could potentially lead to more conflict between the dyad as well as between siblings.(32, 33) Parents have also expressed that curtailing children's screen time would require significant energy as they would be responsible finding and creating alternative activities for their children.(33) Some parents have admitted that their children's digital media use makes their lives a bit easier by keeping their children occupied, allowing parents to do other activities (e.g., household chores, work-related tasks).(33) Therefore, exposing children to different non-screen based activities at a young age might help to reduce parental concerns and consequences related to implementing household screen time rules.

Another important implication of our study is that coupled with high acceptance and low conflict, high parental monitoring was favorably related to children's physical activity, screen time use, and sleep duration. This should not be confused with the notion "helicopter parenting", which is a term used to describe parents who are potentially over-involved in the lives of their child and who micromanage their child's life by being overly protective and unwilling to let go,(34) which is inherently different than knowing your child's whereabouts (i.e., parental monitoring). Parents should be reminded of this difference and aim to strike a balance when supervising their child's whereabouts. The notion that excessive monitoring can develop into helicopter parenting has been supported by empirical research whereby higher parental monitoring was associated with higher perceived helicopter parenting.(35)

To our knowledge, our study is the first to examine the associations between family typologies and movement behavior recommendations among children. Results showed that children in our sample were from one of five family typologies, ranging from *ideal* functioning to *poor* functioning. Children from less-than-ideal functioning families (i.e., good, average, fair, and poor functioning) were less likely to meet all three movement behavior recommendations compared to children from *ideal functioning* families. Results showed that the odds of meeting a particular movement behavior recommendation category progressively decreased as family

functioning worsened. Additionally, results showed that the odds of meeting the movement behavior recommendation categories decreased as the number of recommendations met increased. These findings highlight the importance of the family environment when promoting healthy movement behaviors among children.

## **Declarations**

### **Ethics approval and consent to participate:**

Ethics approval was sought from the Adolescent Brain Cognitive Development (ABCD) study. Ethics approval was obtained from all relevant institutional research ethics boards as well as signed informed consent from parents/guardians and assent from participating children.

### **Consent for publication:**

Not applicable.

### **Availability of data and materials:**

The data that support the findings of this study are available from the ABCD Study but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the ABCD Study.

### **Competing Interests:**

The authors declare that they have no competing interests.

### **Funding:**

The ABCD Study is funded by the National Institute of Health.

### **Author Contributions:**

MG and LPR conceptualized the study and analytical design. MG and JB analyzed and interpreted the data. MG prepared the first draft of the manuscript. MT provided comments related to the presentation of the findings. JB, MT, and LPR critically reviewed the manuscript. All authors read and approved the final manuscript.

### **Acknowledgements:**

Data used in the preparation of this article were obtained from the Adolescent Brain Cognitive Development (ABCD) Study (<https://abcdstudy.org>), held in the NIMH Data Archive (NDA). This is a multisite, longitudinal study designed to recruit more than 10,000 children aged 9-10 years and follow them over 10 years into early adulthood. The ABCD Study is supported by the National Institutes of Health and additional federal partners under award numbers U01DA041022, U01DA041028, U01DA041048, U01DA041089, U01DA041106, U01DA041117, U01DA041120, U01DA041134, U01DA041148, U01DA041156, U01DA041174, U24DA041123, and U24DA041147. A full list of supporters is available at <https://abcdstudy.org/nih-collaborators>. A listing of participating sites and a complete listing of the study investigators can be found at <https://abcdstudy.org/principal-investigators.html>. ABCD consortium investigators designed and implemented the study and/or provided data but did not necessarily participate in analysis or writing of this report. This manuscript reflects the views of the authors and may not reflect the opinions or views of the NIH or ABCD consortium investigators. The ABCD data repository grows and changes over time. The ABCD data used in this report came from NIMH Data DOI: 10-15154/1412097.

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## Figures

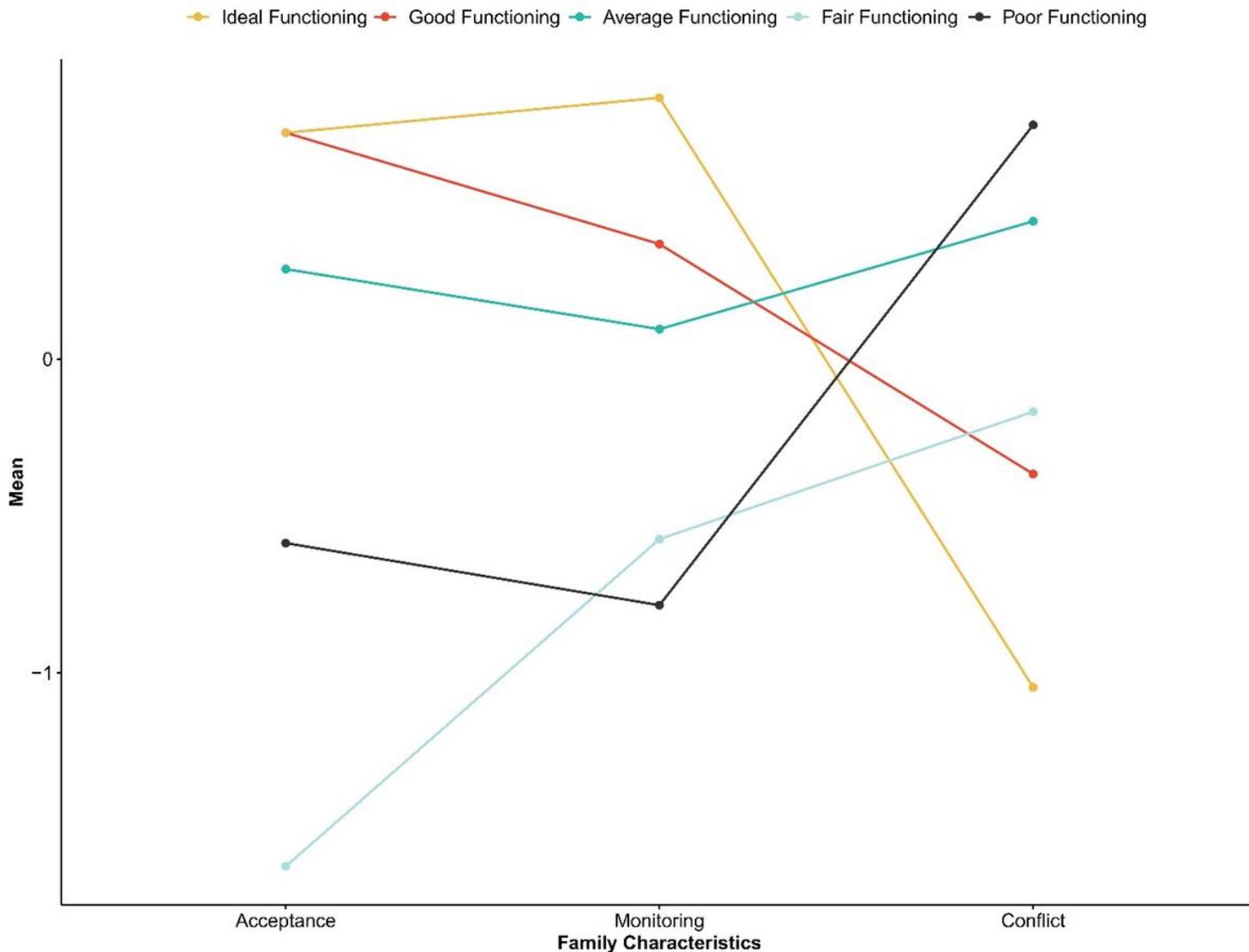


Figure 1

A visual depiction of the differences among the five family typologies. Mean of the standardized values are plotted.

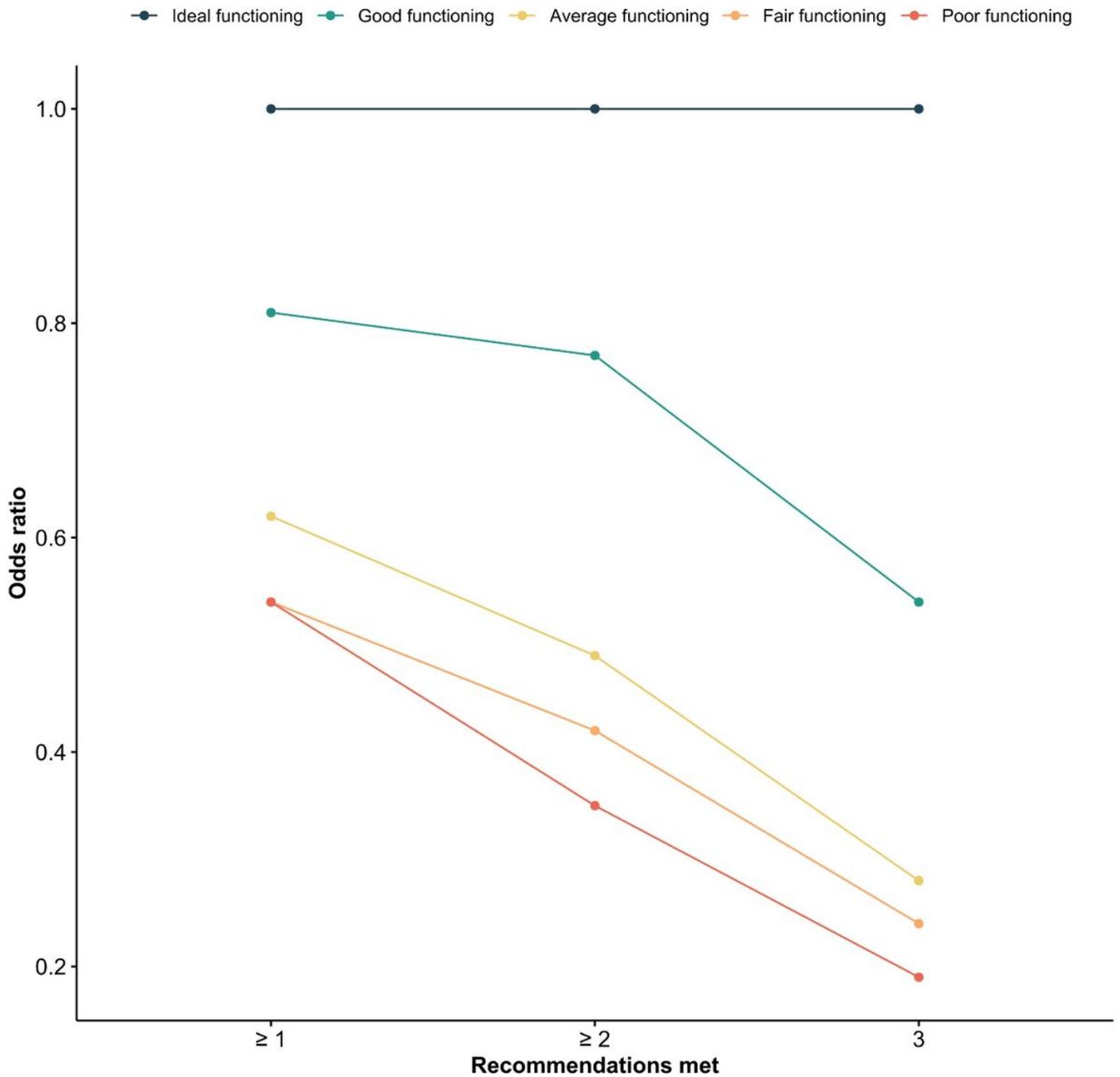


Figure 2

A visual depiction of the odds ratios across the different movement behavior recommendations for good, average, fair, and poor family functioning.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

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