Obesity Pillars 8 (2023) 100084

Contents lists available at ScienceDirect

Obesity Pillars

journal homepage: www.journals.elsevier.com/obesity-pillars

Parental and familial factors related to participation in a home-based physical activity intervention in children with obesity or Prader-Willi syndrome

Kryston E. Honea, Kathleen S. Wilson, Koren L. Fisher, Daniela A. Rubin *

Department of Kinesiology, California State University Fullerton, 800 N. State College Blvd., Fullerton, CA, 92834-3599, USA

ARTICLE INFO

Keywords:
Employment
Exercise
Family environment
Obesity
Prader-willi syndrome

ABSTRACT

Background: Increasing physical activity (PA) participation is vital to promote the development of health behaviors in childhood. This study examined which parental and familial factors predicted completion of and compliance with a home-based family PA program in a cohort of families with a child with Prader-Willi syndrome (PWS; a rare disorder with obesity and developmental disability) or with obesity but with neurotypical development.

Methods: Participants ($n = 105$) were parents of children with PWS ($n = 41$) and parents of children with obesity but without PWS ($n = 64$). Parents completed a series of questionnaires documenting their demographic characteristics, self-efficacy, social support, and family environment (active-recreational orientation and cohesion). Relationships between these factors and intervention completion and compliance were evaluated using bivariate correlations and logistic regression (compliance) and multiple regression (completion) analyses with groups together and then separately if the child group was a significant predictor.

Results: None of the variables of interest (marital status, employment, employed hours per week, self-efficacy, social support, and family environment) were significant predictors of intervention completion. Intervention compliance was negatively associated with parents working part-time and working full-time and positively associated with family cohesion (Model $R^2 = 0.107$, $F(3,100) = 4.011$, $p = .010$). Child group was not a factor.

Conclusions: Compliance with a 24-week family home-based PA intervention was related to fewer employment hours of the primary caregiver and family environment factors. Future interventions should consider how to reduce the intervention's burden in working parents along with strategies to foster family cohesion.

1. Introduction

While children's physical inactivity is of global concern [1], children with obesity or with disability are at higher risk for inactivity [1]. Prader-Willi Syndrome (PWS) is a rare neurodevelopmental disorder with a prevalence of 1 in 15,000 cases that is the best characterized form of genetic obesity [2]. PWS results from a lack of expression, or an alteration, of the paternal chromosome 15 in the locus 13-15q. Common characteristics include hyperphagia that sets on during childhood, hormonal deficiencies, increased body fat, behavioral, intellectual and motor difficulties and low levels of physical activity (PA) [2,3].

As described by the Parent Socialization model, parental and familial characteristics such as family income, marital status, and education shape the beliefs and behaviors of parents and the beliefs and behaviors of their children [4]. In addition, families have been identified as key vehicles for supporting PA in children and youth so they can meet the Canadian 24-Hour Movement Guidelines for Children and Youth [5]. Thus, the home environment presents a unique setting to implement PA interventions for children [1]. This is true not only in PWS [6–8] but also in youth without disability [9] as parents have been identified as key facilitators for their child's PA [10,11].

Completion of and compliance with PA interventions are a challenge in interventions targeting youth [12]. Many studies report that less than 80% of participants complete lifestyle interventions to treat obesity in childhood [13]. Because PA adherence in children without disabilities is positively influenced by parental support and involvement [14,15];

* Corresponding author.
E-mail addresses: kryston.honea@gmail.com (K.E. Honea), kswilson@fullerton.edu (K.S. Wilson), kofisher@fullerton.edu (K.L. Fisher), drubin@fullerton.edu (D.A. Rubin).

https://doi.org/10.1016/j.obpill.2023.100084
Received 30 June 2023; Received in revised form 11 August 2023; Accepted 15 August 2023
Available online 16 August 2023

studies have shown that increased parents' PA participation and activity level were related to lower dropout rates [16]. Moreover, studies in which parent and child were co-active led to increased participation in the children with disability [17]. Identification of reasons for dropping out of interventions and/or factors that increase intervention adherence will likely aid in the design of more feasible and effective programs in particular for children with health conditions [17–19]. Thus, we used the Eccles' model of Parent Socialization as the theoretical framework to identify potential parental and family characteristics that might influence intervention completion and compliance with a home-based parent-led PA intervention. In this study, we hypothesized that: 1) parental self-efficacy, family environment (family orientation towards recreational activities and family cohesion), and social support would positively predict completion of and compliance with the intervention; and 2) being a single parent and increased hours of employment per week of the parent would negatively impact completion of and compliance with the intervention.

2. Methods

2.1. Study design

This study utilized secondary data analyses of data collected in a home-based intervention study with a quasi-experimental design (intervention and delayed-intervention [control] groups) conducted in the United States [20]. The "Active Play at Home" study evaluated the effectiveness of a 24-week parent-led home-based PA intervention on multiple outcomes in children (body composition, health-related quality of life, motor skills, and PA) and was conducted between 2011 and 2015 [21,22]. The trial was registered in the United States under ClinicalTrials.gov NCT02058342. Parent and child dyads (families) were recruited at both California State University Fullerton (CSUF) (n = 86) and the University of Florida (UF) (n = 30). The present study has a cohort study design as it only includes data from all parents who completed the pre-intervention visit (whether at baseline or after serving as control for 24 weeks [n = 105]). There were four parents who consented to participate but were assigned to the delayed intervention group and did not return after 24 weeks. These participants were excluded from this present study.

This study was approved by the institutional review boards at California State University Fullerton HSR-16-0135, the University of Florida Gainesville original submission 201702437, and Human Subjects Research Protection Office from the U.S. Army Research and Materiel Command HRPO A-16501a. All parents and children signed informed consent and assent forms, respectively.

2.2. Participants

Participants for this present study included 42 parents of a child with PWS aged 8–15 years with the following diagnosis: deletion (n = 17), uniparental disomy (n = 8), imprinting defect (n = 13), or undistinguished genetic diagnosis (n = 4). Participants also included 63 parents of children aged 8–11 years with obesity based on their levels of body fat (>95th percentile for body fat) [23] but without PWS. The group with obesity was recruited for comparison purposes because of the inverse association between childhood obesity and motor proficiency [24].

2.3. Trial visits

Participants attended a baseline visit after being pseudo-randomized to an intervention or a delayed intervention group that served as control. Participants were pseudo-randomized based on their availability to attend pre-planned randomized visit dates. At the recruitment call potential participants were given specific dates in which visits would occur and based on their preference they were allocated to control or intervention groups. Participants assigned to the intervention completed a post-intervention visit after 24 weeks while those in the control group completed a visit that served as a post-no intervention as well as pre-intervention visit. Please see Fig. 1 for the study flow diagram.

2.4. Instruments

The parent questionnaire included items designed by investigators to obtain information regarding the parent demographics (age, sex, ethnicity, education, marital status, employment status, employment hours) as well as previously validated questionnaires to assess their perceived self-efficacy, social support, and family environment (family attitude towards recreational activities and family cohesion) [25–27]. This questionnaire was completed at the pre-intervention visit.

Physical activity sessions checklists were provided at the pre-intervention visit. The checklists (n = 96) were to be completed by parents and children 4 days a week for 24 weeks. The checklist included the following information: date, time activity begun, time activity ended, list of exercises and games played, level of enjoyment and difficulty of the exercises and games, activity modifications/substitutions. Participants returned the checklists in a pre-stamped envelope to investigators every 6 weeks. This information has been previously published [28].

2.5. Study outcomes

2.5.1. Outcomes of interest

All of the outcomes described below were decided a priori as explanatory variables for assessing intervention feasibility aspects such as completion and compliance.

2.5.1.1. Intervention completion. Intervention completion was determined when a participant completed the post-intervention visit (24 weeks after intervention) regardless of the number of pre-planned sessions completed and the original assignment to intervention group or delayed intervention (control) group.

2.5.1.2. Intervention compliance. The information from checklists completed by parents and children for each of the 96 pre-planned PA sessions in the curriculum was used to evaluate intervention compliance. Compliance was defined as the percentage of sessions completed. The target compliance was 70% of the sessions.

2.5.2. Predictor variables

2.5.2.1. Parent demographics. Parent demographics variables were highest level of education attained (education), marital status, and employment hours.

2.5.2.2. Self-efficacy. The 10-item General Self-Efficacy Scale [25] was used to measure the parent's overall perceived self-efficacy for coping with daily stressors. An example item is "I can remain calm when facing difficulties" with the response options of 1 (never) to 4 (very often). A total self-efficacy score was derived by adding the score of each response giving a total score between 10 (low self-efficacy) to 40 (high self-efficacy). Internal reliability in the present sample for this self-efficacy scale was good (Cronbach's $\alpha = 0.90$).

2.5.2.3. Social support. Perceived parent social support was measured using the 12-item Multidimensional Scale of Perceived Social Support [26] which evaluates the sources of social support among family, friends, or significant others. Parents rated the degree of support they received. An example item includes "My family really tries to help me" rated on a scale of 1 (very strongly disagree) to 7 (very strongly agree). The total score was calculated by taking the sum score of each response, giving a score range in arbitrary units of 18 (low support) to 84 (high

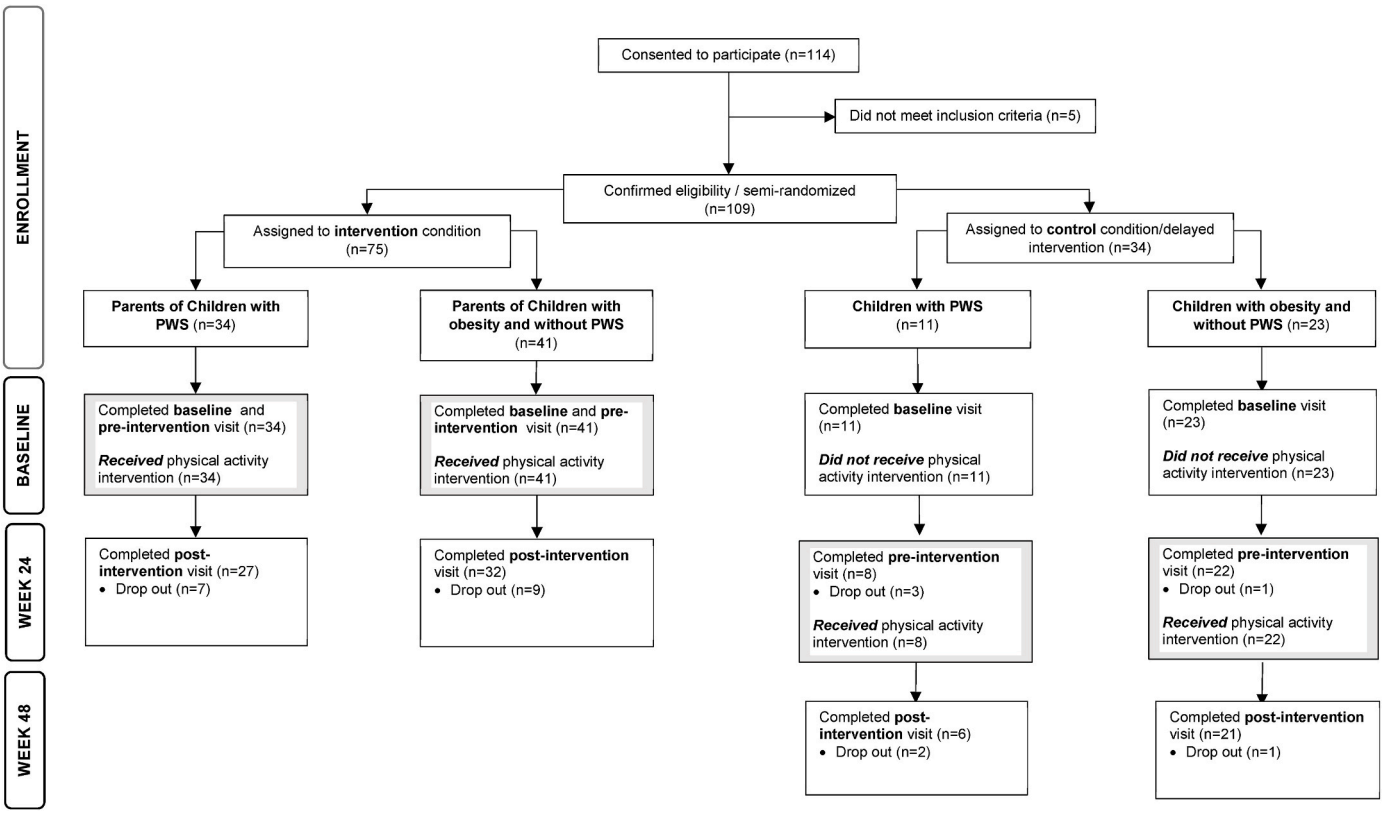

Fig. 1. This figure presents the timeline for participant recruitment, enrollment, and study visits for the intervention and control (delayed intervention) groups separated by parents of a child with Prader-Willi syndrome (PWS) and parents of a child with obesity and without PWS. Shaded boxes correspond to data included in the present study (n = 105).

support). In the present sample, the questionnaire showed good internal reliability (Cronbach's α = 0.95) [26].

2.5.2.4. Family environment. Perceived family environment by the parent, was assessed using two (active-recreational orientation and cohesion) of the 10 subscales from the Family Environment Scale [27]. The active-recreation orientation subscale (9 items) was selected to assess the amount of involvement in social and leisure activities in the family. The cohesion subscale (9 items) was selected to assess the degree of commitment, help, and support family members provide for one another, as well as relationships among family members. Parents rated these scales on a scale of 1 (strongly disagree) to 4 (strongly agree). Responses were scored by reversing items as needed to create a sum score such that higher values depicted the more positive family environment. Both subscales provide a score of arbitrary units ranging 9 (low environment score) to 36 (high environment score). The Cronbach's α obtained in the present sample for each subscales active-recreational orientation (α = 0.68) and cohesion (α = 0.81) were within expected ranges [29].

2.6. Physical activity intervention

For detailed information please see Ref. [20]. In brief, during the pre-intervention visit, families received a training session and the materials needed to carry out the PA program (a printed PA curriculum, sports/play equipment and a video-games console). The PA curriculum was designed at a 6th grade reading level, contained detailed directions, illustrations, and 96 pre-planned PA sessions of video and physically active playground games. The curriculum was available in English and Spanish and included diverse illustrations of children and parents. Families were asked to engage in 4 days of PA per week for 24 weeks (96 PA sessions) and they received phone calls from the research team for support with implementation of the curriculum such as modification of games, maintaining motivation, scheduling, etc. Families documented the sessions completed using daily checklists that were submitted every 6 weeks in which they indicated the activities performed, modifications, and ratings of enjoyment and difficulty [28]. The intent of the checklists was to ascertain the fidelity of the implementation of the intervention, the dose of activity and curriculum acceptability. Children received incentives for their participation: a $30 gift card for each visit and a $60 gift card if they completed 70% or more of the PA sessions every 6 weeks. At the end of the intervention, children who completed 70% of the PA sessions kept all materials to facilitate their continued use once the intervention concluded.

2.7. Statistics

This study had a cohort design in which only those participants who provided pre-intervention data were included. The hypotheses tested whether parental or familial factors predicted completion and/or compliance with a home-based PA intervention in children with PWS and children with obesity but without PWS.

All data analyses were done using SPSS 23.0 (Armork, NY). One parent had 3 children enrolled in the intervention. For this family, only the data corresponding to one child was randomly selected from the 3 children participants to determine intervention compliance and completion. One participant with a child with PWS had missing data for some variables. Unless otherwise stated, $p < .050$ was considered statistically significant in all analyses. Discontinuous variables were coded as follows: marital status (1 = married/living with partner, 0 = separated/divorced/single/widowed), employment hours (0 = none, 1 = 1–30 h/week [part-time], 2 = ≥31 h/week [full-time]), education (0 = less than high school, 1 = high school/technical degree/some college, 2 = bachelor degree or higher).

Table 1
Parent participants' demographic and psychosocial characteristics presented as mean ± standard deviation (SD) and or frequency (N).

	Intervention$N = 75$		Control/Delayed intervention $N = 30$		Total ($N = 105$)	Missing (n)
	Parent of Child with PWS $n = 34$	Parent of Child with Obesity $n = 41$	Parent of Child with PWS $n = 8$	Parent of Child with Obesity $n = 22$		
Age (years)	46 ± 7	40 ± 8	42 ± 4	42 ± 7	103	2
Sex (Female/Male)	29/4	39/2	8	17/5	104	1
Ethnicity						1
African American	0	3	1	2	6	
Asian	3	3	0	2	8	
Caucasian	17	10	7	7	41	
Hispanic	10	23	0	9	42	
Other/Mixed	3	2	0	2	7	
Language spoken at home						1
English	28	30	8	15	81	
Spanish	5	11	0	7	23	
Highest formal education						1
Less than high school	3	6	0	4	13	
High school/technical/some college	18	25	4	13	60	
College or higher	12	10	4	5	31	
Marital Status						2
Married/living with partner	24	28	5	18	75	
Separated/Divorced	6	8	2	2	18	
Single	1	3	1	1	6	
Widowed	2	2	0	0	4	
Employment						1
Yes	22	27	6	14	69	
No	11	14	2	8	35	
Employment hours						1
None	11	14	2	8	35	
1–30 h/week	9	6	1	4	20	
>30 h/week	13	21	5	10	49	
Self-efficacy (10–40)	31.2 ± 4.5	30.2 ± 6.5	31.5 ± 5.8	29.4 ± 5.1	102	3
Social support (18–84)	63.3 ± 17.4	69.5 ± 14.0	65.8 ± 13.1	67.2 ± 12.7	104	1
Active recreation (9–36)	24.8 ± 5.2	23.8 ± 5.2	26.1 ± 2.7	24.0 ± 4.0	104	1
Family cohesion (9–36)	25.4 ± 4.1	26.7 ± 3.6	26.8 ± 2.54	25.4 ± 4.4	104	1

Note: Self-efficacy, social support, family active recreation orientation and family cohesion scores are in arbitrary units. The maximum and minimum possible values are provided for these variables with higher scores indicating more of the perception (e.g., higher self-efficacy, more social support, more active recreation, more cohesive).

To determine the variables included in the prediction models, bivariate correlations (Pearson-for continuous variables; Spearman Rho-for discontinuous variables) were conducted between outcome measures (intervention completion and compliance) and potential predictors: parent demographics (marital status, employment hours per week, education), self-efficacy, social support, and family environment (active recreational orientation and cohesion). Where correlations were significant at $p < .200$, the predictor variables were selected for inclusion in the regression models.

Multiple logistic regression analysis was used to examine the relationship between intervention completion (0 = no, 1 = yes) and predictor variables meeting the criteria of $p < .200$ in the bivariate correlations. Multiple linear regression was used to evaluate the association between percentage of intervention compliance and the predictor variables identified in the bivariate correlations. If the included variables were not significant predictors in the multiple regression model, or did not meet the $p < .200$ criteria, then those variables were removed and a second model was evaluated. The final model included variables that explained the greatest proportion of the variance in the dependent variable and demonstrated statistical significance or met the $p < .200$ criteria. If bivariate correlations were only present in parents of one child group but not in the other, then regression models were conducted solely for that group. When associations were present in both groups, child group was entered into the regression models as a variable. If child group was a significant variable, then separate models were analyzed for parents of children with obesity and parents of children with PWS. In the regression models, two dummy variables (0,1) were created to model the employment hours variable, with no employment as the reference condition.

3. Results

3.1. Participants

Parents were mostly females (88.6%), with a mean age of 42.8 ± 7.5 year. Participants indicated Hispanic (n = 42), or Caucasian (n = 41) ethnicity, and spoke English as the primary language (n = 82) or Spanish (n = 23) (Table 1). Roughly 69% of parents had at least some college education or higher. Most parents reported being married/living with partner (n = 75), and when asked if their spouse/partner was employed, approximately 58% responded in the affirmative. Sixty-seven parents (63.8%) expressed being employed at the time of the study with comparable rates between groups. Forty-nine parents (46.7%) stated they worked 31–40 h per week, while 35 (33.3%) reported not working any hours. There were no differences between parents of children with PWS and parents of children with obesity for self-efficacy, social support, active recreation orientation or family cohesion.

3.2. Intervention completion and compliance

As has been reported elsewhere, 82% of families (N = 86 of 105) completed the intervention. The mean percent of intervention compliance was 75.6 ± 29.6%, and this percentage was similar for both family groups (child with PWS = 74.1 ± 30.2%; child with obesity = 76.6 ± 29.3%).

3.3. Regression analyses: intervention completion

None of the hypothesized predictor variables were correlated with

Table 2
Correlations between the hypothesized predictor variables and completion and compliance with a home-based physical activity intervention.

	Intervention Completion Intervention Compliance					
	Overall Correlation[a] (*p*)	Parent of Child with PWS Correlation[a] (*p*)	Parent of Child with Obesity Correlation[a] (*p*)	Overall Correlation (*p*)	Parent of Child with PWS Correlation (*p*)	Parent of Child with Obesity Correlation (*p*)
Education[c] (N = 104)	−0.019 (.850)	0.055 (.734)	−0.074 (.566)	−0.032[a] (.748)	−0.014[a] (.929)	−0.004[a] (.974)
Marital status[c] (N = 103)	0.047 (.638)	−0.181 (.256)	0.209* (.104)	0.062[a] (.536)	−0.007[a] (.966)	0.112[a] (.388)
Employment hours[c] (N = 104)	0.020 (.842)	−0.137 (.394)	0.120 (.351)	−0.269[a]* (.006)	−0.319[a]* (.042)	−0.251[a]* (.047)
Self-efficacy (N = 102)	−0.030 (.766)	0.052 (.745)	−0.038 (.773)	0.029[b] (.772)	0.113[b] (.481)	−0.012[b] (.925)
Social support (N = 104)	−0.073 (.464)	0.013 (.937)	−0.140 (.279)	−0.031[b] (.756)	0.056[b] (.725)	−0.116[b] (.370)
Active recreation (N = 104)	−0.034 (.734)	−0.060 (.709)	0.001 (.993)	0.096[b] (.333)	0.061[b] (.705)	0.131[b] (.306)
Family Cohesion (N = 104)	0.045 (.647)	0.042 (.795)	0.045 (.726)	0.233[b]* (.017)	0.224[b]* (.160)	0.235[b]* (.063)

[a] Spearman's rho.
[b] Pearson's r.
[c] Marital status: 1 = married/living with partner, 0 = separated/divorced/single/widowed; Employment: 0 = none, 1 = 1–30 h/week [part-time], 2 = ≥ 31 h/week [full-time]; Education: 0 = less than high school, 1 = high school/technical degree/some college, 2 = bachelor degree or higher* $p < .2$ indicating a trend and subsequential inclusion in logistic and/or multiple regression models.

intervention completion at the $p < .200$ criterion in the overall sample or in the parents of children with PWS (see Table 2). In parents of children with obesity, only marital status was correlated with intervention completion at $p < .200$ (rho = 0.209) and therefore, intervention completion was only modeled in this group. In the logistic regression analysis, families of children with obesity were 30% more likely to complete the intervention [OR = 1.301 (0.441–3.841, 95% C·I.)] if the parents were married; however, this was not statistically significant.

3.4. Regression analyses: compliance with the intervention

In the initial model, ($R^2 = 0.108$; $p = .022$; see Table 3), part-time employment (B = -17.167; $p = .036$), full-time employment (B = -12.612; $p = .048$), and family cohesion ($B = 1.477$; $p = .046$) were significant predictors of percent compliance; however, child group was not a significant parameter ($B = -1.697$; $p = .770$). The final model for intervention compliance ($R^2 = 0.107$; $p = .010$) included part-time employment ($B = -17.333$; $p = .033$), full-time employment ($B = -12.612$; $p = .048$) and family cohesion ($B = 1.489$; $p = .043$).

4. Discussion

This study examined the association between selected parental and familial factors with completion and compliance with a home-based PA intervention intended for both the parent and the child in parents of a child with a health condition. There were no factors that predicted completion of the intervention. Part-time employment hours and full-–time employment hours predicted lower compliance; while family cohesion predicted higher compliance with intervention activities. Previous research evaluating intervention completion and compliance focused on children's characteristics [30] or used a clinical setting [16]. Little research on PA interventions for youth with PWS and their families have been done [6,8,28]; therefore, findings from this study can guide strategies in future interventions.

Table 3
Regression models for the prediction of percentage of compliance with a home-based physical activity intervention.

	Model parameters			Variable parameter		
	R^2	SE	*p*	*B*	SE	*p*
Model One	0.108	28.572	.022			
Child Group[a]				−1.697	5.778	.770
Employed Part-time[b]				−17.167	8.095	.036
Employed Full-time[b]				−12.682	6.335	.048
Family Cohesion				1.477	0.730	.046
Model Two (Final)	0.107	28.441	.010			
Employed Part-time[b]				−17.333	8.038	.033
Employed Full-time[b]				−12.612	6.301	.048
Family Cohesion				1.489	0.725	.043

[a] Child group: 0 = with obesity, 1 = with PWS;[b] Reference condition: Not employed; Multiple regression models had an N = 104 as data were missing for different variables including family cohesion and/or demographics.

Increasing PA participation in children in the United States is and has been a public health priority [1]. And, intervention modalities that include families continue to be evaluated in children with disability as well as obesity [9,31]. This 24-week PA intervention was completed by 82% of the families. This completion rate is higher than in other studies (39–80%) [13,32]. None of the parental and familial factors appeared to predict completion rate perhaps for reasons related to the study design. Participants included parents who had a child with a medical condition (obesity or PWS). Self-selection by the participants may have made them more likely for their family complete the intervention [33]. The use of monetary incentives for completing study visits likely encouraged families to complete the post-intervention visit [34]. Further, retention strategies such as minimizing participant burden for visits (e.g., week-end visits), reimbursement (e.g., mileage reimbursement), and providing a study visit timeline at baseline [35] were also used in this study and may have contributed to the completion rate by decreasing barriers to participation. As there was a large proportion of participants identifying as Hispanics (50% of parents with a child with obesity and 24% of parents with a child with PWS); the use of culturally-adapted materials may have also contributed to participation.

Families reported completing approximately 75% of the sessions across the 24 weeks study. We built our intervention including features to encourage PA sessions adherence: a detailed illustrated PA curriculum with potential for adapting level and intensity of the exercises and games, a bag of all equipment needed to do the activity, phone calls check-ins by study staff and monetary incentives. Olvera et al. (2008) also used incentives to ensure adherence in their mother-daughter healthy lifestyle intervention. Providing simple and easy to follow written instructions with examples of activities has also demonstrated increased compliance rates [36,37]. Additionally, approximately 69% of the parents in our study reported having at least some college education, which corresponds with the literature linking education with intervention adherence [38].

Employment hours and family cohesion predicted and accounted for approximately 10% of the variance in compliance with the goal of PA sessions for this intervention. Parents who worked fewer hours (<than 10 h/week), or did not work at all, were more compliant than those who worked more than 10 h/week or full-time. The literature commonly cites time as a major barrier to PA adherence among all age groups [39,40]. As previously reported, scheduling conflicts were one of the most common reported barriers to this intervention [28]. Therefore, future intervention strategies involving parents must consider employment hours as a barrier to compliance and include strategies to counteract this barrier.

Previously, we have shown that families in this intervention reported support from spouse and family as important facilitators for the intervention delivery [28]. Thus, it may be that family cohesion reflected the support or unity in the family that was important to implementing this PA program. The characteristics of the families involved may also explain why family cohesion emerged as a factor as 42% of our parents self-identified as Hispanic. In Latino families, family cohesion is an important factor for supporting moderate-to-vigorous PA in adolescents [41]. In children with disabilities, family cohesion also predicts child participation in leisure PA [42]. Performing recreational activities as PA together as a family may foster collaboration, bonding, and unity, thereby contributing to family cohesion. Thus, it is possible that greater cohesion contributes to greater activity, but also that being physically active together can contribute to greater cohesion [43].

Marital status was not associated with intervention compliance; as most parents (>70%) were married or living with a partner, the number of single parents may have been insufficient to explore this association. In the present study, parents' self-efficacy was examined in relation to the implementation an intervention for their child's PA. Potentially, as parents self-selected to engage in this intervention, it is possible that their level of confidence was enough to meet the challenges of the intervention given they, on average, reported relatively strong levels of confidence (i.e., mean of 30.5 with a maximal possible score of 40). Additionally, as the self-efficacy measure was not specific to PA, this could also have contributed to this aspect not being related to the percentage of intervention compliance.

According to King et al. (2006), social support is a vital element that affects how individuals adapt to adversity [42]. Likewise, for parents of children with chronic disabilities, social support is a primary coping mechanism and buffer to stress [44,45]. In the present study, all parents/guardians were classified as having high social support from family, friends and significant others [26]. Since all participants had reported high social support there likely was insufficient variability in our data to show a relationship with PA compliance.

The findings of this study must be considered within the context of certain limitations. Compliance was measured using self-reported checklists. This might have been subject to social desirability bias as people typically over-report behaviors that are considered appropriate or expected [46]. The use of gift cards and mileage reimbursement as monetary incentives for the study visits may have increased intervention compliance and completion [34]. All financial costs to the parents were also covered to decrease barriers to participation; thus, income was not explored as a factor. This intervention was designed for families with children with disability and/or a health concern (obesity); therefore, the results may not be generalizable to all families. The nature of the secondary data analysis limits the ability of this study to be sufficiently powered to explore potential interactions. Lastly, it is not possible to infer causality based on statistical associations.

5. Conclusions

The results from this study provide insight into two parental and familial factors that predict compliance with a home-based PA intervention for children with health concerns. Building strategies to foster family cohesion could in turn facilitate intervention compliance. Unfortunately, employment hours, is a difficult factor for parents to control and/or modify. This aspect must continue to be considered by including elements that increase flexibility in the intervention delivery to decrease burden to the participants.

Author credit contribution

The concept of the submission was by KH and DAR. Methodology was done by KH, KLF, KSW, DAR. Data curation was done by KH, KLF. Supervision was done by DAR and KSW. Formal analysis was done by KH, KLF and DAR. Funding acquisition was done by DAR and KSW. The original draft was prepared by KH and DAR. The final draft of the manuscript was reviewed, edited, and approved by KH, KLF, KSW and DAR.

Ethical review

The contents of this manuscript represent original work. Exception: some results contained in this manuscript have been previously published as a thesis document by Kryston E. Honea as a requirement for completion of her thesis work towards a Master degree in Kinesiology at California State University Fullerton. This study was conducted in accordance with The Code of Ethics of the World Medical Association. The study protocol was approved by the institutional review boards at California State University, Fullerton HSR-16-0135, University of Florida Gainesville original submission 201702437, and the Human Subjects Research Protection Office from the U.S. Army Medical Research and Materiel Command HRPO A-16501a. All youth signed the approved assent and their parents signed the consent forms before participation in the study.

Funding

This study was funded by U.S. Army Medical Research and Materiel Command [grant numbers: W81XWH-09-1-0682, 2009 and W81XWH11-1-0765, 2011].

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

None.

Acknowledgements

The authors thank Dr. Marilyn Dumont-Driscoll and the study staff at the University of Florida Gainesville for their contribution in data collection.

References

[1] United States Department of Health and Public Services. In: Physical activity Guidelines for Americans. second ed. 2018. Washington, DC.
[2] Butler MG, Miller JL, Forster JL. Prader-willi syndrome - clinical genetics, diagnosis and treatment approaches: an update. Curr Pediatr Rev 2019;15:207–44.
[3] Castner DM, Tucker JM, Wilson KS, Rubin DA. Patterns of habitual physical activity in youth with and without Prader-Willi Syndrome. Res Dev Disabil 2014; 35:3081–8.
[4] Eccles JS, Wigfield A, Schiefele U. Motivation to succeed. In: Damon W, Eisenberg N, editors. series editors. Handbook of child psychology: Social, emotional, and personality development. fifth ed. New York: Wiley; 2018. p. 1017–95.
[5] Rhodes RE, Guerrero MD, Vanderloo LM, Barbeau K, Birken CS, Chaput JP, et al. Development of a consensus statement on the role of the family in the physical activity, sedentary, and sleep behaviours of children and youth. Int J Behav Nutr Phys Activ 2020;17:74.
[6] Eiholzer U, Nordmann Y, l'Allemand D, Schlumpf M, Schmid S, Kromeyer-Hauschild K. Improving body composition and physical activity in Prader-Willi Syndrome. J Pediatr 2003;142:73–8.
[7] Morales JS, Valenzuela PL, Pareja-Galeano H, Rincon-Castanedo C, Rubin DA, Lucia A. Physical exercise and Prader-Willi syndrome: a systematic review. Clin Endocrinol 2019;90:649–61.
[8] Schlumpf M, Eiholzer U, Gygax M, Schmid S, van der Sluis I, l'Allemand D. A daily comprehensive muscle training programme increases lean mass and spontaneous activity in children with Prader-Willi syndrome after 6 months. J Pediatr Endocrinol Metab 2006;19:65–74.
[9] Brown HE, Atkin AJ, Panter J, Wong G, Chinapaw MJ, van Sluijs EM. Family-based interventions to increase physical activity in children: a systematic review, meta-analysis and realist synthesis. Obes Rev 2016;17:345–60.
[10] Davison KK, Cutting TM, Birch LL. Parents' activity-related parenting practices predict girls' physical activity. Med Sci Sports Exerc 2003;35:1589–95.

[11] Maitland C, Stratton G, Foster S, Braham R, Rosenberg M. A place for play? The influence of the home physical environment on children's physical activity and sedentary behaviour. Int J Behav Nutr Phys Activ 2013;10:99.
[12] Howie EK, McManus A, Smith KL, Fenner AA, Straker LM. Practical lessons learned from adolescent and parent experiences immediately and 12 Months following a family-based healthy lifestyle intervention. Child Obes 2016;12:401–9.
[13] Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, et al. Interventions for treating obesity in children. Cochrane Database Syst Rev 2009: CD001872.
[14] Happ MB, Hoffman LA, Higgins LW, Divirgilio D, Orenstein DM. Parent and child perceptions of a self-regulated, home-based exercise program for children with cystic fibrosis. Nurs Res 2013;62:305–14.
[15] Lindqvist AK, Kostenius C, Gard G, Rutberg S. Parent participation plays an important part in promoting physical activity. Int J Qual Stud Health Well-Being 2015;10:27397.
[16] Sola K, Brekke N, Brekke M. An activity-based intervention for obese and physically inactive children organized in primary care: feasibility and impact on fitness and BMI A one-year follow-up study. Scand J Prim Health Care 2010;28: 199–204.
[17] Ku B, MacDonald M, Hatfield B, Gunter K. Parental influence on the physical activity behaviors of young children with developmental disabilities. Adapt Phys Act Q (APAQ) 2020;37:441–60.
[18] Moroshko I, Brennan L, O'Brien P. Predictors of dropout in weight loss interventions: a systematic review of the literature. Obes Rev 2011;12:912–34.
[19] Soltero EG, Pena A, Gonzalez V, Hernandez E, Mackey G, Callender C, et al. Family-based obesity prevention interventions among hispanic children and families: a scoping review. Nutrients 2021;13.
[20] Rubin DA, Wilson KS, Wiersma LD, Weiss JW, Rose DJ. Rationale and design of active play @ home: a parent-led physical activity program for children with and without disability. BMC Pediatr 2014;14:41.
[21] Rubin DA, Wilson KS, Dumont-Driscoll M, Rose DJ. Effectiveness of a parent-led physical activity intervention in youth with obesity. Med Sci Sports Exerc 2019;51: 805–13.
[22] Rubin DA, Wilson KS, Castner DM, Dumont-Driscoll MC. Changes in health-related outcomes in youth with obesity in response to a home-based parent-led physical activity program. J Adolesc Health 2019;65:323–30.
[23] McCarthy HD, Cole TJ, Fry T, Jebb SA, Prentice AM. Body fat reference curves for children. Int J Obes 2006;30:598–602.
[24] Tsiros MD, Tian EJ, Shultz SP, Olds T, Hills AP, Duff J, et al. Obesity, the new childhood disability? An umbrella review on the association between adiposity and physical function. Obes Rev 2020;21:e13121.
[25] Schwarzer R, Jerusalem M. Generalized self-efficacy scale. In: Weinman J, Wright S, Johnston M, editors. Measures in health psychology: a user's portfolio. Causal and control beliefs. Windsor, UK: NFER-NELSON; 1995. p. 35–7.
[26] Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J Pers Assess 1988;52(1):30–41.
[27] Moos RH, Moos BS. Family environment scale manual. Consulting Psychologists Press; 1994.
[28] Rubin DA, Wilson KS, Honea KE, Castner DM, McGarrah JG, Rose DJ, et al. An evaluation of the implementation of a parent-led, games-based physical activity intervention: the Active Play at Home quasi-randomized trial. Health Educ Res 2019;34:98–112.
[29] Kline GH, Wood LF, Moorephd S. Validation of modified family and interparental conflict scales for use with young adults from divorced and non-divorced families. J Divorce & Remarriage 2003;39:125–42.
[30] Alberga AS, Fortier M, Bean C, Freedhoff Y. Youth get a D+ grade in physical activity: how can we change public health messages to help reverse this trend? Appl Physiol Nutr Metabol 2019;44:567–70.
[31] Grant SJ, Beauchamp MR, Blanchard CM, Carson V, Gardner B, Warburton DER, et al. Parents and children active together: a randomized trial protocol examining motivational, regulatory, and habitual intervention approaches. BMC Publ Health 2020;20:1436.
[32] Jang M, Chao A, Whittemore R. Evaluating intervention programs targeting parents to manage childhood overweight and obesity: a systematic review using the RE-AIM framework. J Pediatr Nurs 2015;30:877–87.
[33] Hill LG, Rosenman R, Tennekoon V, Mandal B. Selection effects and prevention program outcomes. Prev Sci 2013;14:557–69.
[34] Brueton V, Stenning SP, Stevenson F, Tierney J, Rait G. Best practice guidance for the use of strategies to improve retention in randomized trials developed from two consensus workshops. J Clin Epidemiol 2017;88:122–32.
[35] Robinson KA, Dinglas VD, Sukrithan V, Yalamanchilli R, Mendez-Tellez PA, Dennison-Himmelfarb C, et al. Updated systematic review identifies substantial number of retention strategies: using more strategies retains more study participants. J Clin Epidemiol 2015;68:1481–7.
[36] Olvera NN, Knox B, Scherer R, Maldonado G, Sharma SV, Alastuey L, et al. A healthy lifestyle program for latino daughters and mothers. Am J Health Educ 2008;39:283–95.
[37] Katz-Leurer M, Rotem H, Keren O, Meyer S. The effects of a 'home-based' task-oriented exercise programme on motor and balance performance in children with spastic cerebral palsy and severe traumatic brain injury. Clin Rehabil 2009;23: 714–24.
[38] Havas S, Anliker J, Greenberg D, Block G, Block T, Blik C, et al. Final results of the Maryland WIC food for life program. Prev Med 2003;37:406–16.
[39] Stutts WC. Physical activity determinants in adults. Perceived benefits, barriers, and self efficacy. Journal of the American Association of Occupational Health Nurses 2002;50:499–507.
[40] Shields N, Synnot A. Perceived barriers and facilitators to participation in physical activity for children with disability: a qualitative study. BMC Pediatr 2016;16:9.
[41] Bigman G, Rajesh V, Koehly LM, Strong LL, Oluyomi AO, Strom SS, et al. Family cohesion and moderate-to-vigorous physical activity among Mexican origin adolescents: a longitudinal perspective. J Phys Activ Health 2015;12:1023–30.
[42] King G, Law M, Hanna S, King S, Hurley P, Rosenbaum P, et al. Predictors of the leisure and recreation participation of children with physical disabilities: a structural equation modeling analysis. Child Health Care 2006;35:209–34.
[43] Dodd DCH, Zabriskie RB, Widmer MA, Eggett D. Contributions of family leisure to family functioning among families that include children with developmental disabilities. J Leisure Res 2009;41:261–86.
[44] Paster A, Brandwein D, Walsh J. A comparison of coping strategies used by parents of children with disabilities and parents of children without disabilities. Res Dev Disabil 2009;30:1337–42.
[45] Armstrong MI, Birnie-Lefcovitch S, Ungar MT. Pathways between social support, family well being, quality of parenting, and child resilience: what we know. J Child Fam Stud 2005;14:269–81.
[46] Donaldson SI, Grant-Vallone EJ. Understanding self-report bias in organizational behavior research. J Bus Psychol 2002;17:245–60.