

Slow and Steady: Readiness, Pretreatment Weekly Strengthening Activity, and Pediatric Weight Management Program Completion

Daniel E. Ehrmann, BS,¹ Bethany J. Sallinen, PhD,^{2,3} Heidi B. IglayReger, PhD,⁴
Paul M. Gordon, PhD, MPH,⁴ and Susan J. Woolford, MD, MPH^{2,5}

Abstract

Background: Pediatric weight management programs have substantial attrition rates, which have led to recommendations to assess readiness prior to enrollment. Both pretreatment readiness scales and behaviors, such as exercise, have been theorized to predict subsequent program completion. The purpose of this study was to explore the role of self-reported pretreatment exercise in adolescents on completion of a pediatric weight management program and to explore the predictive ability of standard readiness scales.

Methods: A total of 146 obese (BMI \geq 95th percentile) pediatric (ages 11–18) participants joined a 6-month multidisciplinary weight management program between March, 2007, and July, 2010. Completers were compared retrospectively to noncompleters on demographic, readiness, and pretreatment exercise practices from clinic-developed intake questionnaires using univariate analyses. Regression analyses specified the degree to which these variables predicted program completion.

Results: The 6-month completion rate was 53%. There was no relationship between self-reported readiness and program completion. Self-reported pretreatment weekly strengthening activity (SA) was significantly associated with program completion, compared to those who performed SA either never [univariate odds ratio (OR) 3.18, 95% confidence interval (CI) 1.51–6.68, $p=0.002$; multivariate OR 2.43, 95% CI 1.06–5.58, $p=0.036$] or daily (univariate OR 4.90, 95% CI 1.74–13.77, $p=0.002$; multivariate OR 4.69, 95% CI 1.45–15.14, $p=0.010$). No relationship was found between other forms of exercise and program completion.

Conclusions: Self-reported pretreatment weekly SA, but not standard readiness scales, predicted pediatric weight management program completion.

Introduction

Approximately 1 child out of every 6 children in America is obese.^{1,2} Although recent data suggest a slowing of the childhood obesity epidemic compared to the upsurge of the 1980s and 1990s, it remains an important public health concern.^{2,3} Childhood obesity accounts for increased pediatric healthcare use and expenditures and will likely increase future morbidity and premature mortality from preventable cardiovascular and metabolic complications.^{4–6} This is expected to result in exceptionally high future healthcare costs and diminished health-related quality of life.^{5–7} Not

surprisingly, comprehensive pediatric weight management programs have attempted to slow or reverse pediatric weight gain to reduce current and subsequent complications.

However, the overall effectiveness of pediatric weight management programs is modest, in part due to the substantial rates of program attrition.^{8,9} The literature examining predictors of completion and attrition in pediatric comprehensive weight management¹⁰ has thus far revealed demographic (single-parent household, black, Medicaid recipients, low family income),^{11–14} psychological (adolescent depression, lower self-concept),¹⁴ medical (higher BMI, obesity-related medical conditions),^{12,14,15} logistical

¹University of Michigan Medical School, Ann Arbor, MI.

²Department of Pediatrics and Communicable Diseases, University of Michigan, Ann Arbor, MI.

³Division of Child Behavioral Health, University of Michigan, Ann Arbor, MI.

⁴Department of Physical Medicine and Rehabilitation, University of Michigan, Ann Arbor, MI.

⁵Child Health Evaluation and Research (CHEAR) Unit, Division of General Pediatrics, University of Michigan, Ann Arbor, MI.

(scheduling, parking, location),¹⁶ and program-specific (satisfaction) predictors of program attrition.^{11,16}

The high attrition rates combined with these complex, multifactorial predictors have led to recommendations for gauging adolescent “readiness” prior to joining a weight management program.^{17–20} To date, one of the most popular ways to gauge readiness involves the use of readiness rulers aimed at assessing interest in achieving behavior change and confidence in oneself to achieve health-related goals.^{21,22} However, although these scales have been useful in assessing adolescents’ readiness to change some behaviors (e.g., diet),^{23,24} their ability to predict pediatric weight management program completion and ultimately weight loss remains unclear.²⁵

Therefore, some have proposed analyzing pretreatment health behaviors (e.g., diet, exercise), in addition to measuring stated readiness, to better understand the characteristics of program completers and noncompleters.^{26–28} Pretreatment behaviors may reflect robust characteristics related to readiness to change,^{26,28} and have performed better than some self-reported scales of pretreatment motivation/readiness in predicting weight management program completion in adults.²⁹ Furthermore, a history of maladaptive behavior prior to initiation of a weight loss program may identify those likely to “burn out” after initial motivation wanes.³⁰ With regard to pretreatment self-reported exercise, only two adult studies have been conducted to date, with mixed results.^{31,32} To our knowledge, no studies exist that explore the impact of pretreatment exercise on pediatric weight management program completion.

This retrospective analysis was designed to further explore the role of self-reported pretreatment exercise status on program completion while also exploring the predictive ability of standard measures of readiness. We hypothesized that higher levels of pretreatment exercise would be associated with higher levels of program completion and that standard measures of readiness would fail to have any association with the outcome.

Methods

Study Design, Sample, and Program Overview

We performed a retrospective analysis of new patient intake questionnaires and program completion data from 146 obese adolescents (aged 11–18) who entered the Michigan Pediatric Outpatient Weight Evaluation and Reduction (MPOWER) program between March, 2007, and July, 2010. To be eligible for the MPOWER program, patients were required to have a BMI at or above the 95th percentile for age and sex and be between 11 and 18 years of age at the time of enrollment. The MPOWER program is a 6-month, intensive, multidisciplinary weight management program developed at the University of Michigan that includes weekly aerobic and strengthening activities (SAs), biweekly nutrition group classes, and monthly individual and group behavioral sessions aimed at addressing issues such as motivation and goal setting. The family-

focused intervention is based on the self-determination theory and incorporates motivational interviewing and evidence-based behavior change strategies.^{17,33–35} All patients receive a comprehensive multidisciplinary initial evaluation, during which they meet with a pediatrician, registered dietitian, pediatric psychologist, social worker, and exercise physiologist. Baseline data across multiple domains (parent and adolescent enrollment questionnaires, laboratory and anthropomorphic measurements, psychological measures, nutritional logs, etc.) are collected prior to joining the program. After the initial consultation, prospective patients return in 1 week to discuss the results of the intake assessment and engage in collaborative treatment planning with team members. During this visit, families receive detailed information about the program and determine whether they wish to join. Payment for the program is made on a sliding scale relative to the participants’ family income and is free for many participants.

Survey Instrument and Data Collection

Adolescents completed an enrollment questionnaire prior to being seen at the MPOWER program. The questionnaire focused on the adolescents’ demographics, medical history, weight history, social support, eating habits, lifestyle, physical activity, and goals. With regard to physical activity, two items ascertained pretreatment exercise participation. First, we used an item from the 2005 Youth Risk Behavior Survey (United States Department of Health and Human Services and Centers for Disease Control and Prevention): “In an average week when you are in school, how many days do you participate in physical education/gym-like activities?”³⁶ Answer options were ordinal, and included 0 through 5 days. We also adapted an item from the Centers for Disease Control and Prevention’s National Health and Nutrition Examination Survey (NHANES) Physical Activity and Physical Fitness Questionnaire (PAQ-SP): “Over the past 30 days, how often have you participated in any physical activity designed to strengthen your muscles (lifting weights, push-ups, sit-ups, pull-ups)?”³⁷ Answer options included three checkboxes: “None,” “daily,” and “weekly.” With regard to readiness we used standard readiness rulers recommended by the American Medical Association²¹; “On a scale from 1 to 10, with 10 being completely ready to take action, how ready are you to lose weight?” and “On a scale from 1 to 10, with 10 being completely confident, how confident are you in your ability to achieve a healthy weight?”

Data Analysis

Program status was recorded as binary (dropout at any time after joining the program vs. completion of the 6-month program). Program completion was defined as attendance at the required introductory and final comprehensive appointments. Program completers were compared to noncompleters on the basis of demographic information collected from the enrollment questionnaire (age, gender, family income, Medicaid status, race, parent

educational level), responses to the two exercise-related questions, and readiness scales using chi-square tests and Fisher exact tests when there was unsatisfactory group membership. Responses to readiness rulers were initially treated as continuous, and participants were subsequently divided into tertiles (0–5 = not high, 6–8 = high, 9–10 = very high). Univariate and multivariate binary logistic regression analyses using program completion as the dependent variable and the aforementioned significant variables as predictors were performed to generate odds ratios (ORs). Demographic variables that significantly differed between groups were included as covariates in the regression model to check for a significant effect on the relationship between pretreatment exercise

and/or readiness on program completion. All statistical analyses were performed with STATA version 12 by STATAcorp LP (College Station, TX). Statistical significance was set a priori as $p < 0.05$. This study was approved by the Institutional Review Board of the University of Michigan Medical School and written parental consent/child assent for MPOWER participation was previously obtained.

Results

A total of 146 patients joined the MPOWER program during the study period (Table 1). Among those who joined,

Table 1. Descriptive Statistics of Completers versus Noncompleters

	Completers (n=78)	Noncompleters (n=68)	p value
Age (years, mean ± SD)	14.4 ± 1.7	14.2 ± 1.8	NS
BMI (kg/m ² , mean ± SD)	43.9 ± 11.3	43.0 ± 10.5	NS
Gender			NS
Female	69%	66%	
Insurance			< 0.001
Medicaid	31%	63%	
Race			NS
White	60%	43%	
Black	35%	46%	
Other	5%	12%	
Mother, educational level			NS
Some high-school to high-school/GED	14%	25%	
Some college to Associate degree	45%	50%	
Bachelor's degree to Master's degree	29%	12%	
Professional to Doctoral	6%	6%	
Unknown	5%	7%	
Father, educational level			NS
Some high-school to high-school/GED	41%	50%	
Some college to Associate degree	18%	22%	
Bachelor's degree to Master's degree	22%	7%	
Professional to Doctoral	9%	4%	
Unknown	10%	16%	
Household Income			0.001
Less than \$25,000	35%	59%	
\$25,000–\$49,999	21%	23%	
\$50,000–\$74,999	11%	11%	
Greater than or equal to \$75,000	33%	6%	

Note: Percentages may not sum to 100% because of rounding.

SD, standard deviation; NS, not significant.

78 completed the 6-month program (53%). Among those who did not complete the program, 47% and 53% discontinued the program during months 0–3 and 3–6, respectively.

Group Comparisons

Demographics. MPOWER completers' mean initial age (14.4 ± 1.7 years) and BMI (43.9 ± 11.3 kg/m²; 99th percentile) did not differ from noncompleters (14.2 ± 1.8 years; BMI 43.0 ± 10.5 kg/m²; 99th percentile) (Table 1). More noncompleters were economically disadvantaged per self-reported household income of less than \$25,000 ($\chi^2 = 16.8$; $p = 0.001$) and were Medicaid enrollees ($\chi^2 = 15.4$; $p < 0.001$; Table 1). There were no other significant differences between the completers and non-completers in terms of gender, race, and parent education level.

Standard readiness rulers. When asked "...how ready are you to lose weight?", 6%, 22%, and 72% of respondents rated their readiness as not high, high, and very high, respectively. When asked "...how confident are you in your ability to achieve a healthy weight?", 16%, 36%, and 48% rated their confidence as not high, high, and very high respectively. There was no relationship between either the "...how ready are you to lose weight?" item (Fisher $p = 0.595$) or the "how confident are you in your ability to achieve a healthy weight?" item (Fisher $p = 0.455$) and program completion.

Pretreatment exercise. There was no difference between self-reported pretreatment physical education/gym-like activities between completers and noncompleters (Table 2). However, a significant between groups difference emerged when comparing none, daily, and weekly SA in the 30 days prior to program enrollment ($\chi^2 = 14.3$; $p = 0.001$). There was no relationship between readiness level from either readiness item and either exercise item ("...how ready are you" vs. SA Fisher $p = 0.129$; vs. physical education Fisher $p = 0.697$; "...how confident are you" vs. SA Fisher $p = 0.402$; vs. physical education Fisher $p = 0.626$).

Logistic regressions. Binary logistic regression was performed with program completion used as the outcome variable and the significant demographic and SA frequencies used as the predictors. On the basis of this model, Medicaid insurance was associated with significantly lower odds of program completion [reference: no Medicaid, OR 0.26, 95% confidence interval (CI) 0.13–0.51; $p < 0.001$]. Likewise, compared to individuals whose household income was less than \$25,000, those with household incomes greater than or equal to \$75,000 were over nine times more likely to complete the program (95% CI 2.84–29.36; $p < 0.001$). No significant differences were found between other levels of income compared to less than \$25,000 annually.

Furthermore, compared to participants who self-reported no SA in the 30 days prior to answering the questionnaire, individuals who self-reported weekly SA were 3.18 times more likely to complete the program (95% CI 1.51–6.68; $p = 0.002$). Self-reported daily SA during the

Table 2. Pretreatment Self-Reported Exercise in Completers versus Noncompleters

	Completers (n=78) %	Noncompleters (n=68) %	p value
Physical education/gym-like activities			NS
0 days per week on average	53	43	
1 day per week on average	8	6	
2 days per week on average	6	3	
3 days per week on average	5	10	
4 days per week on average	5	4	
5 days per week on average	23	33	
Strengthening activity in the past 30 days			0.001
None, on average	29	47	
Daily, on average	9	22	
Weekly, on average	62	31	

Note: Percentages may not sum to 100% because of rounding. NS, not significant.

30 days prior to completion of the questionnaire was not associated with program completion, and, compared to those who performed daily SAs, weekly SA exercisers were 4.90 times more likely to complete the program (95% CI 1.74–13.77; $p = 0.003$; Table 3). Further analyses revealed that SA, at any frequency, was more likely to be performed by adolescents from households in which the annual income was greater than or equal to \$75,000 (95% CI vs. households who earn less than \$25,000: 1.1–9.72; $p = 0.032$). Other levels of income (e.g., incomes between \$25,000 and \$75,000) did not differ from the less than \$25,000 group. Adolescents enrolled in Medicaid were less likely to perform any amount of SA (95% CI 0.256–0.998; $p = 0.05$). Because insurance status and income were both found to be independently significantly associated with program completion and level of SA performed, they were included in the multivariate logistic regression. Neither income nor insurance status had a significant impact on the main effect of weekly SA on program completion, reflected in the statistically significant adjusted odds ratios for weekly SA (reference: no SA, OR 2.43, 95% CI 1.06–5.58, $p = 0.036$; reference: daily SA, OR 4.69, 95% CI 1.45–15.14, $p = 0.010$; Table 3). No other demographic variables were associated with SA and program completion.

Table 3. Models of Independent Predictors of Program Completion

Predictor	Unadjusted odds ratio (95% confidence interval)	Adjusted odds ratio (95% confidence interval)	Prob > χ^2 (unadjusted/adjusted)
Pretreatment weekly SA (vs. none)	3.18 (1.51–6.68)	2.43 (1.06–5.58)	0.002/0.036
Pretreatment weekly SA (vs. daily)	4.9 (1.74–13.77)	4.69 (1.45–15.14)	0.003/0.01

Discussion

In the current study, 53% of adolescents completed the 6-month intensive weight management intervention. This is consistent with previously reported attrition rates, which generally hover around 50% (range 33–73%) in programs lasting at least 6 months.^{11–16,34,38–40} Like previous studies, lower socioeconomic status and Medicaid insurance were strong predictors of program dropout. Unlike prior studies, we did not find race to be a significant predictor of program attrition.

This preliminary study is the first to find that pretreatment weekly SA was strongly associated with program completion, compared to those who performed SA never or daily. Additionally, our pretreatment readiness scales were unable to differentiate program completers from non-completers and did not relate to pretreatment weekly exercise item responses. These data may have implications for clinical practice and elucidate pathways for future research.

This analysis failed to find an association between self-reported readiness and program completion, and adds to the literature citing the inconsistent utility of these widely used scales in adults,^{27,28,41,42} and adolescents.²⁵ The psychological construct of readiness is likely a complex interplay between motivation, commitment, self-awareness, satisfaction, esteem, and self-efficacy, and thus the ability of a simple 1–10 scale to measure true readiness may be limited in many instances.^{43–45} Additionally, even though one may be “ready” to lose weight, the aforementioned logistical, family, and demographic factors may preclude program completion. Last, in our study population, parental readiness may be at least as important as our patients’ readiness, and this has been shown in prior studies.⁴⁶

In an effort to use past behaviors as a more robust surrogate of readiness and thus of program completion, we analyzed self-reported pretreatment SA. In general, routine pretreatment SA may improve feelings of self-worth prior to program onset⁴⁷ and may reflect commitment to work to achieve weight loss.¹⁴ In our analysis, we found that pretreatment weekly SA, compared to activities performed never or daily, predicted program completion. The reasons behind this finding are unclear.

Specifically, it is not known why patients who practiced SA daily were much less likely to complete the weight management program compared to those who performed SA on a weekly basis. It is possible that teens who practice weekly SA may be more comfortable with the notion of weekly progress, which is one of the core tenets of our

program. Unlike those who perform SA daily, these individuals may be especially receptive to our message that successful weight loss is more analogous to a marathon than a sprint. Furthermore, in a recent qualitative study exploring the perspectives of MPOWER patients and their parents, we found that our weekly SA sessions were one of the most enjoyable components of the program.⁴⁸ Thus, patients who perform pretreatment weekly SA may be especially likely to enjoy both the mission and structure of the program, and this has been linked to program completion in prior studies.^{11,16}

Furthermore, individuals who perform SA daily may eventually find their routine and weight loss goals too challenging and unrealistic. This occurrence has been theorized to contribute to burnout⁴⁹ and weight management program attrition,^{50,51} but this has not been formally studied in the pediatric population. Also, individuals who attempt to accomplish tasks that are too repetitive may eventually become bored with their routine.⁵² Thus, although those who perform daily pretreatment SA may have commendable commitment at the outset, burnout and boredom may eventually lead to waning motivation that compromises program completion. Therefore, a “slow and steady” approach may be more beneficial.

With regard to participation in school-based gym-like activities, there was no relationship between frequency of this exercise and program completion. Although the reasons for this are unclear, this may reflect the fact that school-based exercise is largely out of the adolescents’ control. Thus, it is likely a poor surrogate for the other psychological factors that may be important in program completion.

The content of this preliminary study should be considered in the context of its limitations. First, both of the measures used for obtaining pretreatment physical activity, although used in national surveillance surveys and prior studies,^{53,54} are inherently limited. The gym-like activity item limits respondents to reporting only in-school activity and not in- and out-of-school activity. Also, responses may depend on the specific school, grade, state regulations, and time of year. *Post hoc* analyses did not show any difference in response by season of enrollment but did show that older patients were more likely to perform no gym-like activity, which may reflect the decreasing opportunities for curricular gym-like activities upon entering high school.

Additionally, the strengthening-activities item was not ideal because of the unequal intervals between none, daily,

and weekly; it is unclear how a participant differentiates between daily and weekly. It also asks teens to recall SA over the past 30 days, which may be demanding for this age group. Last, this item may also be subject to seasonal and age-based variation. However, *post hoc* analyses revealed no difference in age and seasonality between respondents.

Furthermore, with only two items addressing physical activity, it is difficult to confidently draw specific conclusions with regard to the nature of the exercise performed. The examples of SAs listed for our participants to consider probably measured both resistance training and calisthenics. The specific effects of these different types of exercises should be analyzed in future studies to better understand the factors that contribute to program completion. Future prospective studies would benefit from the use of validated complete physical activity questionnaires such as the Physical Activity Questionnaire for Children (PAQ-C), physical activity logs, or accelerometers.

Conclusion

This study provides preliminary evidence suggesting that adolescents who report pretreatment weekly SA are significantly more likely to complete a 6-month weight management program than those who do not. Additionally, standard readiness scales may fail to be useful in predicting program completion. This finding should be confirmed in future studies, given both the frequency with which these scales are used in practice and the scarcity of formal investigation²⁵ in the pediatric population.

The use of pretreatment behaviors more generally, and pretreatment SA, may be helpful in screening tools to assist in the determination of those patients who are most likely to remain engaged in a weight management program, which may in turn enhance resource use decisions. Further investigation is needed to clarify the mechanism through which pretreatment weekly SA impacts program completion and its possible relationship to the motivations and outcome expectations necessary to complete a long-term weight loss program. In addition, potential associations between pre-treatment SA and other outcomes of weight management interventions (such as change in BMI, anthropomorphic measurements, and metabolic risk factors) should be elucidated.

Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:

Susan J. Woolford, MD, MPH

Medical Director

C.S. Mott Children’s Hospital Pediatric Comprehensive

Weight Management Center

300 North Ingalls Building, Room 6D20

Ann Arbor, MI 48109-5456

E-mail: Swoolfor@med.umich.edu

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