Case Study of a Transtheoretical Case Management Approach to Addressing Childhood Obesity

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Childhood obesity is an increasing health concern that is strongly associated with chronic health problems persisting into adulthood. Obesity in childhood is resistant to interventions that involve only recommendations to decrease caloric intake and to increase caloric expenditure. The challenge with this approach to childhood obesity is twofold: It is neither theoretically based nor does it consider the children’s or their parent’s perceptions of their health problems. Of significance, this traditional approach also ignores the transition along the stages of behavioral change. Case management has proven to be successful in managing various chronic health problems in both adults and children. This case study will present a new intervention model to treat childhood obesity based on the transtheoretical framework utilizing case management in a primary care setting.

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CHILDHOOD OBESITY HAS become a major health concern that is strongly associated with chronic health problems persisting into adulthood, resulting in long-term physiological, psychological, economic, and social problems (Ogden, Flegal, Carroll, & Johnson, 2002). Using guidelines from an international panel’s (comprising 65 physicians and other health professionals from 9 countries) consensus statement, childhood obesity is defined as having a body mass index (BMI = kg/m²) greater than the 95th percentile for gender and age, whereas overweight in children is defined by exhibiting a BMI between the 85th and the 95th percentiles (Hedley et al., 2004; Speiser et al., 2005). The purpose of the present article is to describe the effectiveness of a 12-week pilot study that investigates the efficacy of a case management approach to reducing childhood obesity. To our knowledge, this is the first case study to examine the potential positive impact that a case management approach may have on reducing risk factors associated with childhood obesity and markers of obesity among obese African-American children.

PREVALENCE

There has been a marked increase in the prevalence of overweight and obesity in children in the past 25 years (Hedley et al., 2004). In the United States, the percentage of obese children aged 6–11 years has increased from 5% in 1970 to 18.8% in 2002 (Ogden et al., 2002). The percentage of overweight children aged 6–11 years rose from 28.2% in 1999 to 33.6% in 2004 (Ogden et al., 2006). Furthermore, data from 2003 to 2004 indicate that the burden of overweight and obesity in children is disproportionately distributed among ethnic minorities: 33.5% White non-Hispanics, 35.1% Black non-Hispanics, and 37% Hispanics (Ogden et al., 2006).
UNDERLYING CAUSE AND OUTCOMES

Healthy People 2010: Understanding and Improving Health lists low level of physical activity and overweight/obesity as the top two leading indicators of health among children and adults (U.S. Department of Health and Human Services, 2000). Childhood obesity is the result of a seemingly complex interaction between genetics, caloric intake, and caloric expenditure. Modifiable risk factors associated with childhood obesity can be dichotomized into two groups: physical inactivity and excessive caloric intake. Low levels of moderate to vigorous physical activity, defined by achieving < 3 metabolic equivalents (MET) and excessive amounts of sedentary behavior, are contributors to insufficient physical activity (Committee on Nutrition, 2003; Ravens-Sieberer, Redegeld, & Bullinger, 2001). Risk factors and correlates for excessive caloric intake include inadequate intake of fruit, vegetables, and fiber, coupled with excessive intake of calories, refined sugar, and sodium (Epstein, Myers, Raynor, & Saelens, 1998; Ludwig, Peterson, & Gortmaker, 2001; Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002).

Overweight and obesity among adults are associated with hypertension, type 2 diabetes, congestive heart failure, atherosclerosis, hyperlipidemia, obstructive sleep apnea, joint problems, and a severely decreased quality of life (Epstein et al., 1998; Ravens-Sieberer et al., 2001). Although it was once thought these problems would not manifest until adulthood, obese children can often be found to have many comorbidities much earlier in life than their leaner counterparts. Although hypertension occurs infrequently in children, one study found that obese children had elevated blood pressure nine times more frequently than normal-weight children (Dietz, 1998). School-based screenings of > 5,000 children showed that 11% of obese children were hypertensive (Schwimmer et al., 2003). In addition, elevated liver enzymes, a screening marker of nonalcoholic steatohepatitis, was found in up to 6% of obese children, with even higher prevalence in certain high-risk groups such as African Americans (Schwimmer et al., 2003; Strauss, Barlow, & Dietz, 2000).

Adolescent obesity has been associated with depression, eating disorders, distorted body image, and low self-esteem (Must, Jacques, Dallal, Bajema, & Dietz, 1992; Power, Lake, & Cole, 1997). A study of women who were overweight as young girls found that they were less likely to be married, had lower household incomes, and had higher rates of poverty than their average-weighted peers (Gortmaker et al., 1999). In addition, a longitudinal study found that overweight and obese adolescents aged 12–14 years experienced higher rates of depression and suffered significant deleterious effects on self-esteem, school functioning, and social functioning (Swallen, Reither, Haas, & Meier, 2005).

RATIONALE FOR THE STUDY

One potential low-cost treatment for overweight and obesity is increased physical activity. There is an increasing amount of evidence supporting the immediate health benefits associated with physical activity, including weight management and reduction of adiposity among children (Janz, Burns, & Levy, 2005). It is widely accepted that physical activity of moderate intensity results in enhanced general health in youth, with increased intensity (i.e., activities that record higher MET levels) producing superior benefits (Watts, Jones, Davis, & Green, 2005). The dose of physical activity has been defined as physical activity equating to approximately 6–9 MET or physical activity of sufficient intensity to maintain the child’s heart rate between 120 and 150 beats/minute for 20–30 minutes (Després, 1998). It is hypothesized that higher intensity physical activity (150–180 beats/minute) may be especially effective in reducing excessive body weight due to increased total energy expenditure and lipid oxidation both during and after completion of a high-intensity versus a moderate-intensity session (Gutin, Barbeau, & Yin, 2004). Consequently, physical activity can have a positive impact on weight and body composition by moderating aversive behavioral habits (e.g., poor dietary habits). The positive message of increased physical activity can also be more palatable to children than messages of caloric restriction.

BACKGROUND

One of the most logical starting points for the treatment of the obese child is the primary care provider. Unfortunately, interventions targeting the physician as the catalyst for weight loss have yielded mixed results (Galuska, Will, Serdula, & Ford, 1999; Stafford, Farhat, Misra, & Schoenfeld, 1997).
A potentially promising approach is expanding the target to other health care providers (e.g., health educators, dieticians, and nurses) through case management of children and their families. Case management is defined as a collaborative process of an interdisciplinary team that assesses, plans, implements, coordinates, monitors, and evaluates options and services needed to meet a person’s health needs. This method has been shown to be effective in other studies of children with long-term chronic conditions such as asthma and type 1 diabetes (Beck et al., 2004; Schulte, Musolf, Meurer, Cohn, & Kelly, 2004; Vafiadou & Ranuro, 1999). Because case management has been effective in the treatment of other childhood chronic conditions, it seems prudent to examine the potential of this approach in decreasing markers of childhood obesity and its associated risk factors.

Case management subscribes to the principle that managing a chronic health condition, such as childhood obesity, must be individualized to the patient’s current perceptions and environment. This approach also incorporates family involvement as a key component of the case management process. In a review of 16 clinical trials examining family involvement and weight loss among children, researchers concluded that parental involvement was a key component in effective interventions that resulted in weight loss in children (McLean, Griffin, Toney, & Hardeman, 2003a). These case management approaches commonly involved an assessment of the child’s and the parent’s perceptions of overweight and obesity, and an analysis of their resources. Consequently, the child, the parent, and the case manager collaborated in developing individualized interventions consistent with the perceptions and resources of the family.

CONCEPTUAL FRAMEWORK

Integrated into the case management approach described in this article is the use of Prochaska and DiClemente’s (1992) Transtheoretical Model (TM) of behavioral change. Inherent to the TM is the notion that individuals progress through as many as six distinct stages as they attempt to make a lasting change in behavior. The interpretation of the TM for this study refers to four stages of change through which individuals progress as they attempt to modify their weight status. These four stages include “precontemplation,” “contemplation,” “action,” and “maintenance.” Assessing the stage of change in both the obese child and the parent is essential to providing effective individualized case management interventions. Other authors have included one or two additional stages entitled “preparation” and “termination.” Although conceptually important in other studies involving the extinguishment of addictive behaviors (Migneault, Adams, & Read, 2005), these two additional stages are not applicable for this study, which involves modification—not extinction—of existing behaviors.

The initial stage of the TM, precontemplation, describes an individual who does not recognize the existence of a behavior-related health problem or does not plan to change one’s health behaviors. For the purposes of this case study, this stage includes

![Theoretical framework.](image-url)
the parents, children, or parents and children who do not recognize the child as obese or do not believe that they need to modify the diet or physical activity behaviors of the child.

The second stage of the TM, contemplation, is defined as the stage in which a person is seriously considering changing one’s behavior but has not yet initiated such a change. Parents, children, or parents and children in this stage recognize the child as obese and are considering behavioral change to reduce the child’s weight but have not yet initiated a change in the child’s behavior to address this issue.

Action is the third stage of the TM and occurs when the person is changing or adapting one’s behaviors in an attempt to address the health problem. Parents, children, parents and children in this stage of change actively attempt to modify the child’s obesity risk behaviors, including increasing the child’s physical activity and favorably modifying the child’s dietary intake.

The final stage in the TM, maintenance, is characterized by the individual having established new behavior patterns in an attempt to address a health problem. Parents, children, parents and children in the maintenance stage will have established a consistent pattern of increasing the child’s physical activity and favorably modifying the child’s dietary intake. The child will realize a reduction in one’s markers of obesity as a result of this maintained behavioral change.

In summary, the literature supports the efficacy of case management intervention, consistent with TM principles, in reducing the risk factors associated with childhood obesity and in reducing markers of obesity among African-American children. Figure 1 displays this model graphically.

UNDERLYING ASSUMPTIONS

The TM has been utilized by a number of investigators to design successful interventions to modify health behaviors, including smoking, emotional distress, alcohol abuse, weight loss, and mammography screening (Prochaska & DiClemente, 1992). The success of these previous interventions has been dependent upon two assumptions of the model. First, movement between stages in the model is linear and may involve back-and-forth movement between stages before permanent transition to the next stage is realized. The second assumption stipulates that the individual’s present stage of change has implications for the type of intervention that will allow that individual to progress through the stages to arrive at the maintenance stage.

PURPOSE AND HYPOTHESIS

The primary purpose of this study was to examine the efficacy of a case management intervention pilot program that is designed to decrease markers of childhood obesity and the risk factors associated with childhood obesity. A secondary purpose was to pilot test the feasibility of administering this program in 12 weeks and its impact on participants’ stages of change.

RESEARCH METHODS

Two African-American children and their parents were recruited from primary care community-based clinics and randomized to receive either 12 weeks of family-based case management interventions designed to decrease the markers of childhood obesity and the risk factors associated with childhood obesity in the African-American population, or a control weight management program for the same period. The subjects provided informed consent and were advised that they would receive monetary incentives for their participation. Inclusion criteria consisted of the following: child’s age between 8 and 12 years, African American, and BMI greater than the 85th percentile for age and gender. Before any recruitment of subjects, this study received approval from the Institutional Review Board.

The control subject, J.D., a 12-year-old boy, received the standard therapy for childhood obesity that was offered through the pediatric clinic from which J.D. was recruited. This therapy included referral to a dietician and distribution of literature regarding the hazards of obesity and techniques to increase physical activity. The intervention subject, A.W., a 10-year-old girl, received individualized interventions based on the expertise of the case management intervention team. The case management intervention team consisted of a case manager, a nurse, an exercise physiologist, a health educator, a nutritionist, a pediatric psychologist, a pediatrician, and the technicians who conducted the baseline data collection.

The markers of childhood obesity were determined from, and an assessment of the risk factors associated with childhood obesity was performed on, the two subjects at baseline and at the conclusion of the 12-week protocol. Markers of
obesity included body composition (body fat and lean percentages and BMI). Body fat percentage was calculated using the sum of three skinfolds using the American College of Sport Medicine (2000) guidelines for skinfold sites (triceps, suprailium, and abdomen for female subjects; triceps, suprailium, and subscapula for male subjects). BMI was calculated as: weight (kg)/height (m²). Trained research assistants collected anthropometric measurements, whereas a registered nurse took blood pressure measurements. Blood pressure and heart rate were measured at 1-minute intervals for 5 minutes following 5 minutes of quiet sitting; values were averaged to produce a final value.

Risk factors associated with childhood obesity included physical activity and dietary intake. Physical activity was continually measured in a 7-day period using a Mini-Mitter Actical monitor (Mini Mitter Co., Inc., Bend, OR), which was affixed to the subject’s wrist. Calibration of the Actical monitor was performed by an exercise physiologist prior to use. For the purposes of this study, the Mini-Mitter Actical monitor defined the following physical activity levels: 0–3 MET = sedentary; 3–6 MET = light; 6–9 MET = moderate; 9–12 MET = vigorous. Physical activity was also assessed as each subject’s response to a cardiovascular fitness test. This cardiovascular fitness test employed a modified step-test protocol—a 3-minute test that utilized a 12-in. step and required the participant to step up and down at a rate of 24 steps/minute (Golding, 2000). For each subject, physical activity and cardiovascular fitness measures were assessed at baseline and at the conclusion of the 12-week protocol.

Each subject’s dietary intake was operationalized as a result of two separate 24-hour dietary intake recall interviews taken at baseline and at the end of the 12-week protocol. The two 24-hour dietary intakes of each subject were then entered into the FoodPro computer program, which analyzed the intakes for sources of calories, fiber, sodium, and sugar. The results for the two intake records were averaged at each data collection point.

Stage of change (ability of the parent and the child to identify the child’s weight problem) was assessed for both subjects’ families prior to (baseline) and following the 12-week protocol using two modified versions of the University of Rhode Island Change Assessment developed by Sefton-Silver (1996). This instrument consisted of four subscales corresponding to the four stages of change (precontemplation, contemplation, action, and maintenance) regarding each child’s weight problem. Interventions were grouped according to the risk factors of physical activity and dietary intake, and cross-referenced to the appropriate stage of change. Stage of change was dichotomized into precontemplation/contemplation (see Appendix A) and action/maintenance (see Appendix B) based on the broad objective of the intervention module.

The case management intervention team selected the modules from a list of 39 possible intervention modules, as mentioned previously (see Appendices A and B). The objective of the modules administered to individuals exhibiting the precontemplation/contemplation stage of change was to change their cognitive perceptions of the child’s weight problem. The objective of the modules administered to individuals exhibiting the action/maintenance stage of change was to facilitate changes in their physical activity, dietary behaviors, or both. The content of these modules was adapted from published guidelines developed by the American Dietetic Association (n.d.), the American Heart Association (n.d.), the National Weight Control Registry (1994), and the U.S. Department of Agriculture (2006).

The case management intervention team met after A.W. had completed the baseline testing to review the baseline data (markers of childhood obesity, risk factors associated with childhood obesity, and stage of change of the child and the parent). Based upon these initial findings, the case management intervention team selected four interventions (Modules 1, 2, 8, and 9) from a list of 39 possible intervention modules (see Appendices A and B) that the parent and the child would complete in the next 4 weeks. The case manager then met with the child and the parent in their home and explained how they would complete the four intervention modules, including the documentation of the completion of the modules. A.W. and her parent were encouraged to complete one of the modules per week for the next 4 weeks. Weekly follow-up phone contacts with the family were conducted by the case manager to encourage compliance and to address questions or difficulties with completing the modules. Depending upon the questions and concerns of the family, phone calls ranged from 15 to 30 minutes.

During the fourth and eighth weeks of the intervention, the case manager revisited A.W.’s home. During these home visits, the case manager would review and discuss completed interventions, address any questions or concerns raised by A.W. or
her parent, and administer stage-of-change assessments to both the parent and the child. The results of these assessments were again discussed by the case management intervention team who decided upon a new set of four modules to be administered by the case manager on Weeks 5–8 (Modules 18, 19, 20, and 21) and Weeks 9–12 (Modules 34, 37, 39, and 40). This process of reassessing A.W.’s and her parent’s stage of change every 4 weeks was performed to individualize the interventions and to make them consistent with their progress along the stage-of-change continuum relative to the child’s weight problem.

RESULTS

Both A.W. (intervention) and J.D. (control) and their parents exhibited similar stage-of-change scores for precontemplation, contemplation, action, and maintenance stages at baseline, indicating similar inabilities to identify and address the children’s weight problems. In addition, both subjects recorded similar baseline levels of physical inactivity, spending most of their time in light physical activity, closely followed by sedentary activity. However, stage-of-change scores revealed differences between the subjects, in which A.W. scored highest in the contemplation stage at baseline whereas J.D. scored highest in the action stage. The data on stages of change and physical activity for both A.W. and J.D. are presented in Tables 1 and 2.

A.W. and her parent exhibited the highest scores in the contemplation stage of change at baseline. A.W.’s Week 4 stage-of-change assessment showed no movement along the stages (i.e., A.W. remained in the contemplation stage), which is not atypical. This lack of movement may be due to several factors. First, the intervention modules may not have been entirely appropriate for A.W. and A.W.’s parent; thus, the impact of the modules was limited, as exhibited by the stage-of-change scores. Second, the TM accounts for emotions, as well as cognitions and behaviors. It is possible that A.W. and her parent were in a chronic state of contemplation in which the balance between the pros and the cons of behavior change produced ambivalence.

On Week 8 assessment, A.W. exhibited some movement based on her raw subscale scores, but still remained in the contemplation stage. Again, regression or lack of movement along the stages of change is common before permanent transition to the next stage, and, ultimately, movement to the maintenance stage are realized. A.W. was administered an intervention packet designed to increase A.W.’s compliance with a more physically active lifestyle. Consequently, A.W.’s Week 12 assessment produced movement out of the contemplation stage and into the action stage. Conversely, at the end of the 12-week intervention, A.W.’s parent moved back to the precontemplation stage.

This movement along the stages of change can perhaps be seen in the post-BMI assessment. A.W.’s BMI started at 23.24 (BMI percentile = 93.52), with her postintervention BMI score dramatically decreasing to 20.07 (BMI percentile = 78.57). This is in stark contrast to J.D., whose BMI was originally calculated at 29.45 (BMI percentile = 97.73), with an end-of-study BMI of 28.44 (BMI percentile = 96.97).

Baseline and Week 12 retest results for markers of childhood obesity and the risk factors associated with childhood obesity for A.W. and J.D. can also be found in Tables 3 and 4. Results indicate that both A.W. and J.D. reported, exhibited, or reported and exhibited low levels of physical activity at baseline (A.W. spent approximately 5 minutes/day in vigorous activity; J.D. spent < 3 minutes/day in vigorous activity). On Week 12 retest, both subjects demonstrated an increase in time spent

### Table 1. Stage of Changes Scores

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Baseline (Ranking)</th>
<th>Week 12 Retest (Ranking)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A.W.</td>
<td>J.D.</td>
</tr>
<tr>
<td>Child</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precontemplation</td>
<td>17 (4)</td>
<td>15 (4)</td>
</tr>
<tr>
<td>Contemplation</td>
<td>38 (1)</td>
<td>35 (2)</td>
</tr>
<tr>
<td>Action</td>
<td>37 (2)</td>
<td>36 (1)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>33 (3)</td>
<td>30 (3)</td>
</tr>
</tbody>
</table>

### Table 2. Descriptives for A.W. and J.D.

<table>
<thead>
<tr>
<th>Subjects' Physical Characteristics</th>
<th>Baseline</th>
<th>Week 12 Retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>10.98</td>
<td>12.97</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>119</td>
<td>159.75</td>
</tr>
<tr>
<td>Height (in.)</td>
<td>60</td>
<td>61.75</td>
</tr>
</tbody>
</table>

### Table 3. Obesity Markers for A.W. and J.D.

<table>
<thead>
<tr>
<th>Obesity Markers</th>
<th>Baseline</th>
<th>Week 12 Retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total skinfold (cm)</td>
<td>70.67</td>
<td>69.67</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>27.75</td>
<td>34.5</td>
</tr>
<tr>
<td>BMI</td>
<td>23.24</td>
<td>29.45</td>
</tr>
<tr>
<td>BMI percentile</td>
<td>93.52</td>
<td>97.73</td>
</tr>
</tbody>
</table>
in vigorous activity: A.W.’s activity increased nearly fourfold to 20 minutes/day, whereas J.D.’s activity increased fivefold to 15 minutes/day. In spite of a fivefold increase in vigorous activity, J.D. remained relatively stable at previous BMI and activity (sedentary and moderate) levels, whereas A.W. realized a decrease in time spent in sedentary and light activities.

**DISCUSSION**

Previous research supports a number of assumptions underlying the basis of this case study. First, obesity among African-American children is increasing in the United States at an alarming rate (Ogden et al., 2006) and is associated with a number of chronic health conditions during childhood (Dietz, 1998; Ogden et al., 2002). Second, childhood obesity commonly persists into adulthood; adult obesity is also associated with a number of chronic health conditions (Epstein et al., 1998; Ravens-Sieberer et al., 2001). Third, previous attempts to reduce childhood obesity by targeting primary care physicians have been inconsistently effective (Galuska et al., 1999; Stafford et al., 2000). Fourth, prior research indicates that successful interventions to treat other chronic health problems among children have included a case management approach and parental involvement in the process (Beck et al., 2004; McLean, Griffin, Toney, & Hardeman, 2003b; Schulte et al., 2004; Vafiadou & Ranuro, 1999).

The findings from the case study also indicate that administering the family case management intervention can positively move the child along the stage-of-change continuum. In turn, this cognitive change will provide the driving mechanism in reducing markers of childhood obesity and the risk factors associated with childhood obesity. Although both subjects showed decreases in BMI and BMI percentile, only the intervention subject A.W. realized positive movement along the TM, suggesting that this cognitive change served as the catalyst for the dramatic changes in outcome measures. Consequently, the results of this case study indicate that a case management approach utilizing the TM may be effective for treating childhood obesity.

The results of the self-reported 24-hour dietary intake recall questionnaire and the observed energy expenditure of both subjects revealed a significant caloric deficit that was inconsistent with weight gain. This observation suggested that there was substantial underreporting of caloric intake by our subjects. Subsequent analysis of the main trial data confirmed underreporting of caloric intake by most participants, similar to the analysis of previous investigators who have reported that obese individuals frequently underreport dietary intake (Moore et al., 2006) by as much as 30% (Heitmann & Lissner, 1995). Due to inaccuracies in self-reported dietary consumption and frequent underreporting, the nutritional assessment of both subjects is omitted from this article. Consequently, an accurate assessment of energy balance (i.e., between caloric expenditure and caloric intake) for both subjects was not performed. In addition, participant adherence and compliance to the intervention protocol were not fully achieved.

From a clinical standpoint, the results of this case study provide preliminary support for the feasibility of utilizing case management intervention to support patient interaction outside a clinical setting. Although cost-efficiency was not a primary aim of this study, this approach provides easy-to-follow, low-cost intervention modules that may be expanded to service a number of patients, including those with limited resources. The intervention modules are cost-effective for potential populations because they do not require participants to spend additional money on suggested physical and nutritional activities. The greatest strength of this intervention lies in its simplicity of implementation, which allows for numerous delivery methods based upon the assets of a particular health delivery setting. For example, this intervention can be administered by a physician, a nurse, a dietician, a health educator, a social worker, or a medical resident. Furthermore, as financial compensation for the treatment of obesity increases through both private insurance and Medicaid, new avenues to support such programs will emerge.

<table>
<thead>
<tr>
<th>Obesity Risk Factors</th>
<th>Baseline</th>
<th>Week 12 Retest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A.W.</td>
<td>J.D.</td>
</tr>
<tr>
<td>Heart rate, at rest</td>
<td>87</td>
<td>93</td>
</tr>
<tr>
<td>[beats/minute]</td>
<td>98.33</td>
<td>74</td>
</tr>
<tr>
<td>Blood pressure, at rest [mmHg]</td>
<td>110</td>
<td>94</td>
</tr>
<tr>
<td>Systolic</td>
<td>130</td>
<td>112</td>
</tr>
<tr>
<td>Diastolic</td>
<td>44.33</td>
<td>60</td>
</tr>
<tr>
<td>Fitness score</td>
<td>54.88</td>
<td>60.2</td>
</tr>
<tr>
<td></td>
<td>47.87</td>
<td>54.05</td>
</tr>
<tr>
<td>Physical activity [minutes (%)]</td>
<td>547 (38)</td>
<td>495 (34)</td>
</tr>
<tr>
<td>Sedentary</td>
<td>478 (33)</td>
<td>551 (38)</td>
</tr>
<tr>
<td>Light</td>
<td>476 (39)</td>
<td>510 (35)</td>
</tr>
<tr>
<td>Moderate</td>
<td>433 (30)</td>
<td>392 (27)</td>
</tr>
<tr>
<td>Vigorous</td>
<td>5 (0.37)</td>
<td>2 (0.16)</td>
</tr>
<tr>
<td></td>
<td>20 (1.4)</td>
<td>11 (0.75)</td>
</tr>
</tbody>
</table>

*Dietary intake was not analyzed due to underreporting.*
This interdisciplinary case-management-based intervention is innovative because it is based upon the TM to individualize interventions to the stage of change of obese children and their parents. It also appears to be effective in reaching the ultimate goal of decreasing risk factors associated with childhood obesity and markers of obesity in African-American children. Further studies with larger numbers of subjects are needed to support the data from this case study before this novel approach can become the preferred low-cost alternative for treating the ever-increasing influx of childhood obesity cases presented to pediatric clinics on a daily basis.

**APPENDIX A. PRECONTEMPLATION/CONTEMPLATION**

**Nutrition**
1. Complete a family tree of obesity and obesity-related diseases
2. Watch "supersize me" video
3. Complete a family tree of obesity and obesity-related diseases
4. Complete a 3-day log of the duration of time spent watching television, working on a computer, or playing video games
5. Pros and cons of overweight discussion
6. Identify fat in foods
7. Complete the food guide pyramid
8. Identify fat and sources of calories of foods in a fast-food restaurant
9. Identify "health" foods containing vegetables and fruits
10. Identify health foods containing dairy and other sources of calcium
11. Identify ways in which fat, calories, and sodium are added to foods cooked in the home
12. Identify one friend who maintains a "healthy" dietary intake
13. Identify your favorite foods and how you feel when you eat them
14. Identify how you feel about your body, your health, your food choices, activities, and so on

**REFERENCES**


