Published in final edited form as:
Int J Pediatr Obes. 2008 ; 3(4): 240–248. doi:10.1080/17477160802113415.

Reducing sedentary behavior in minority girls via a theory-based, tailored classroom media intervention

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Abstract

Objective—To develop, implement and test an innovative, theory-based classroom media intervention known as Get Moving! to increase physical activity and decrease sedentary behaviors in predominantly Latina middle school girls.

Research methods and procedures—School-based intervention on five to seven consecutive school days in seven schools (four intervention and three control) with high Latino populations (above 60%). Intervention schools were matched to control schools by ethnic makeup and socioeconomic status (SES). Measures conducted 3 months before and 3 months after intervention included height, weight, percentage body fat (bioimpedance analysis), physical activity and psychosocial aspects of activity by questionnaire. Subjects were middle school girls, mean age 12.5 years old, 73% Latina (N=459 girls).

Results—Get Moving! significantly reduced time spent on sedentary behavior (β± standard error, SE=−0.27±0.14, $p<0.05$) and significantly increased intrinsic motivation (β±SE=0.11±0.05, $p<0.05$). There was a trend for mediation effects of intrinsic motivation, but this did not reach significance.

Discussion—Get Moving! is a promising school-based approach that specifically targets physical activity and sedentary behavior in Latina girls, a population at high risk for obesity and related diseases.

Keywords

Physical activity; inactivity; adolescents; females; minorities; Latina

Introduction

Although the health benefits of lifetime physical activity to girls and women are substantial, physical activity declines precipitously during adolescence (1). This pubertal decline in physical activity is most pronounced in girls (2), and particularly in African-American and Hispanic/Latina girls (3,4). Furthermore, these populations report higher levels of sedentary behavior, or inactivity (5). In a recent study, only 23% of California's 5th, 7th and 9th grade school children were able to pass a standard battery of fitness tasks (6,7). Percentages of children passing these tests were lowest for Hispanic/Latino (17.3%) compared with all other ethnicities. Declines in physical activity and fitness levels tend to track into adulthood, leading to lifelong habitual physical inactivity and lower fitness levels (8).

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Controlled studies have repeatedly supported the importance of increased physical activity and decreased sedentary behaviors for pediatric obesity prevention (9). School-based interventions offer an attractive modality because more than 90% of children are enrolled in schools and because schools have accepted at least some responsibility for nutrition and physical education (10). A recent review of 22 rigorously selected interventions to prevent pediatric obesity included 18 school-based interventions to promote physical activity (11). Most of the interventions were not theory based, and none tested their theories by conducting mediational analyses. Of these interventions, only four increased physical activity (12,13) or decreased sedentary behavior (14,15). These results may be due to gender differences in reaction to interventions (14,16,17) or to the lack of cultural tailoring (18–20).

To address the need for gender and culture appropriately, theory-based interventions to help Latina girls adopt more active lifestyles, Get Moving! was developed, which is a Classroom Animation intervention to increase all levels of physical activity and decrease inactivity in Latina girls. The intervention was based on the Self Determination Theory (SDT) (21) and the Theory of Meanings of Behavior (TMB) (22). The SDT holds that **Intrinsic motivation** is an optimal state of autonomy and challenge, and is associated with feelings of satisfaction, enjoyment, competence, and a desire to persist. According to this theory, people who are more intrinsically motivated to be physically active are more likely to engage in physical activity. The TMB was developed to augment existing cognitively oriented behavioral models specifically in adolescent populations (22,23). According to the TMB, adolescents tend to imbue health-related behaviors with affective meanings. Meanings of behavior then trigger behavior that is driven by affect. This behavior may be in opposition to attitudes, outcome expectancies, knowledge and beliefs (24). According to this theory, if adolescents attach positive meaning to physical activity, they are more likely to be active and less likely to be sedentary.

We hypothesized that the intervention would increase physical activity and decrease sedentary behavior, and that these behavioral changes would be partially mediated by program-driven changes in intrinsic motivation and meanings of physical activity.

Methods

School selection and randomization

School selection aimed to recruit schools with high numbers of Latino students (above 60%). Data from the California Board of Education and the Roman Catholic Archdiocese were used to identify the ethnic distributions and socioeconomic status (SES) of schools. Three levels of SES were defined by percentage of children utilizing school free lunch programs: Level 1: no free lunch program, Level 2: approximately 50% of students using free lunch program, and Level 3: over 80% using free lunch program. We aimed to identify eight schools of mixed SES in order to match intervention and control schools. Eight schools (public and private) were identified as having high numbers of Latino students; each school was contacted by the principal investigator and all agreed to participate. These eight schools were matched by socioeconomic status category and then one of each pair was randomly assigned to the intervention condition. However, due to requirements of the school district, one control school later declined to participate, thus we collected data from seven schools. Of the four intervention schools, one had no free lunch program, one had a free lunch program utilized by approximately 50% of the population, and two had a free lunch program utilized by over 80% of the student body. Of the three control schools, one had no free lunch program, one had a free lunch program utilized by 50% of students and one had a free lunch program utilized by more than 80% of students.

Student recruitment

Teachers of physical education classes were contacted in order to recruit individual classrooms within each school. All students in the classes of teachers who agreed to participate were invited to take part in the study. Parent consent and child assent forms were available in English and Spanish. All study procedures were approved by the University of Southern California's Institutional Review Board (IRB). At baseline, 666 students completed surveys (85% response rate) and 617 students participated in the follow-up survey (7.4% attrition). The analyses presented here use data from female participants only (n=459).

Intervention

As the intervention aimed to increase physical activity and decrease sedentary behavior in Latina girls, only girls took part in the intervention. One physical education class from each of the four intervention schools received the intervention. A total of 136 girls received the intervention. Across intervention and control schools, 136 out of 459 girls participated in the intervention (29.6%). Within intervention classrooms, there were 136 girls in these classrooms, therefore 100% of girls available in the selected intervention classrooms participated in the intervention. Within intervention schools, 136/246 (55.3%) of the girls in these schools participated in the intervention.

In collaboration with Royer Studios, a media-based physical activity intervention was delivered to students during five to seven in-class sessions for five to seven consecutive school days in the Spring semester of school (thus one session per school day). In schools where five sessions were provided, the sessions were longer. All curriculum steps were covered in all participating schools. Students received information about physical activity and sedentary behavior, participated in learning activities ("teachable moments") that supported engagement in physical activity and reduction of time spent watching TV, sitting in front of the computer, or 'just sitting around'. All messages were designed to increase positive meanings of physical activity and increase intrinsic motivation for physical activity.

Each intervention classroom was asked to develop animated Public Service Announcements (PSAs) aimed at increasing physical activity and decreasing physical inactivity in girls 'just like themselves'. This type of intervention has previously been used for school-based interventions for tobacco and social skills, among others. However, unlike previous interventions using this modality, Get Moving! was based in behavioral theory. Each step of the PSA development was aimed at increasing positive meanings of physical activity and intrinsic motivation for exercise.

The intervention took place for five to seven consecutive days during two consecutive class periods, for two hours each day. Within each class, students formed teams of 7–10 children each to create a team PSA. Study team members and Royer studios staff were present and provided guidance throughout the intervention.

During each of the lessons, "teachable moments" were delivered either in print or verbally that were designed to increase positive meanings of physical activity and increase intrinsic motivation for physical activity. For instance, in Lesson #1, a physical activity 'fact sheet' was distributed and discussed. The facts included statistics on physical activity and health as well as theory-based messages developed from our earlier research. These messages were intended to increase positive meanings of physical activity (for instance: Some girls say that playing sports and getting enough exercise keeps them out of trouble) and promotes intrinsic motivation for physical activity (example: Girls say that being physically active gives them self-confidence). Table I outlines examples of how theoretical constructs were operationalized during 'teachable moments' for each lesson. The final PSAs created during Get Moving! can

be viewed at:
http://www.royerstudios.com/USC_Get_Moving/USC_Get_Moving_Page.htm

Measures

Baseline data was collected approximately three months prior to intervention. The intervention took place on five to seven consecutive school days at each school early in the Spring Semester. Follow-up data was then collected approximately three months post-intervention.

Physical activity—A modified previous day physical activity recall (PDPAR) instrument was used to assess physical activity and sedentary behavior in blocks of 30-minute bouts throughout the day (25,26). The PDAR was modified by extending the time-frame from the original 3:00–11.30 p.m. to the more extensive 7.00 am–midnight, as well as expanding the list of activities to match the more comprehensive format of the newer 3-day physical activity recall that has been validated in girls (26). Although this instrument has not been validated specifically in Hispanic populations, it has been validated in populations that included Hispanic children and widely used in studies including Hispanic children (27–29). Students identified different activities (from a list of 56 activities provided) to describe each half-hour interval during the day, and rated how much effort (intensity level) they put in to each activity (light, moderate, hard or very hard). Activity types were converted into half-hour blocks of either light, moderate, or vigorous physical activity using a combination of the compendium of physical activity (30) and the intensity ratings provided for each activity by the participants. Based on Metabolic Equivalent (MET) levels obtained, each 30-minute block was assigned a rate of relative energy expenditure according to the equation provided by Weston et al. (25) and these values were used to derive estimates of Total Energy Expenditure (TEE). Half-hour blocks spent watching TV, playing video games, surfing the internet, and watching a movie were coded separately as sedentary behaviors (26). One of the strengths of the PDPAR is that it offers rich contextual data that allows for the specific study of sedentary behaviors like TV watching and computer time, and this approach has been used previously for this purpose in youth (31).

Meanings of physical activity—Meanings of physical activity were assessed via the Meanings of Physical Activity Scale (MPAS) (32,33). This 30-item instrument employs a 4-point Likert scale response format (Never to Always). The MPAS was developed specifically for Latino populations and shows good reliability and validity in minority adolescent girls (33). The MPAS asks children to rate the extent to which items, such as “Being active (exercise, sports, just running around) helps me deal with stress”, described them. Meanings are categorized into four factors: personal, social, functional, and fantasy.

Motivation for physical activity—Motivation for physical activity was measured by the Exercise Self-Regulation Questionnaire (SRQ-E) (34,35) made up of 16 items, with a 3-point Likert scale response option ranging from “not at all true” to “very true.” This scale assesses four types of motivation that might drive a person’s engagement in regular exercise: external regulation (to please someone else), introjected regulation (to avoid guilt and shame), identified regulation (to obtain a personally important goal), and intrinsic motivation (purely for personal enjoyment). These four subscales can be used to calculate a measure of one’s autonomy regarding physical activity (relative autonomy index, RAI). The SRQ-E was derived from the Perceived Locus of Causality Scale (PLOC) developed by Ryan and Connell (36) and later reworked for children in the context of physical activity by Goudas, Biddle and Fox (37). Both the PLOC and the SQR-E use four items, similar concepts, and the same stem. The SQR-E is a newer scale and uses much simpler wording, which is more appropriate for our participants. The PLOC exhibited good psychometric properties **for** several samples of English youth aged 11–15 years of age from diverse socioeconomic backgrounds (38,39). Internal reliability

(Cronbach's alpha) of a reduced 3-item SRQ-E in a mixed gender sample of 7th–12th graders (19% Hispanic/Latino) was 0.80 (40). Cronbach's alpha for the full 4-item SRQ-E was acceptable in our sample (0.76). To date, the SRQ-E has not been validated in minority youth.

Age—Age in whole years was included in all model analyses.

Ethnicity—Ethnicity was assessed via Phinney's ethnic identity scale (41). In a "check all that apply" format, students were asked to check the ethnicity that corresponded to their background. If participants marked more than one, they were categorized as "Multi-ethnic." Several groups had small numbers and were therefore combined into an "Other" category. For model analyses, ethnicity was further condensed into two main groups: Latino and non-Latino.

Height, weight and body fat—Body weight was measured with a Tanita TBF 300/A analyzer. Prior to use, the scale was leveled and zeroed out. Weight was recorded to the nearest 0.1 kilograms when children were lightly dressed and without shoes or socks with clothing weight set at 2 kilograms standard. Height was measured under the same conditions with a Seca Mobile Height Rod while subjects are standing up straight with arms by their sides to the nearest 0.1 centimeters. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared. BMI percentile was determined using SPSS code provided by the Centers for Disease Control, which calculate BMI according to the age and gender specific CDC growth curves for pediatric populations (42). Children greater than or equal to the 85th percentile of BMI for age and gender were classified as at risk for overweight or overweight. Bioelectrical impedance was measured and total percent body fat was estimated using a Tanita TBF 300/A analyzer.

Data analyses—The PDPAR was processed in SAS using code provided to us by the developers of the PDPAR and 3-DPAR to extract ½ blocks of time spent in sedentary, light, moderate and vigorous physical activity and for calculation of TEE. The scoring protocols have been described previously (25,26). Square root transformations were performed for ½ hour blocks of moderate and vigorous activity as well as ½ hour blocks of time spent **i**n sedentary behavior in order to approximate normality. Light physical activity was squared to approximate normality. TEE was log transformed. Mixed regression modeling was used to account for the repeated measures design. Because this is a cluster randomized design, we used hierarchical mixed models to account for the nesting of individuals within schools in order to account for the intra-school correlation. In assessing the effect of the intervention on BMI, percentage body fat, physical activity, sedentary activity, TEE, or meaning and motivation outcomes, the main effects were group assignment (control versus intervention) and test visit (pre- or post-intervention). The interaction of group assignment and test visit, which was the primary term of interest, indicated the effect of the intervention from baseline to post-intervention, as compared with the control group. We used hierarchical regression analyses to account for the effect of school. In all mixed models, the school-level intercept was treated as a random effect while test visit was treated as a repeated effect with unstructured covariance. All analyses adjusted for baseline age and ethnicity (Latino versus others).

Several sets of regression analysis were performed. First, in separate mixed models, we examined the effect of the intervention on BMI percentile and z scores, percent body fat, blocks of vigorous, moderate, and light physical activity, time spent on sedentary behaviors and TEE. Second, again in separate models, we examined the effect of the intervention on meanings (personal, social, fantasy, and functional) and motivation factors (external regulation, introjected regulation, identified regulation, intrinsic motivation, and the RAI). Finally, meaning or motivation variables on which there was a significant intervention effect were used for full mediation analysis to examine whether meaning or motivation factors mediated the effect of the intervention on physical activity, TEE, or time spent **i**n sedentary behavior.

Formal criteria are useful for assessing mediation: 1) the intervention program must cause change in the outcome variable, 2) the intervention program must cause change in the potential mediator, and 3) the mediators must cause change in the outcome variable when the effects of the intervention program are controlled. If perfect mediation is obtained, the treatment effect will become zero in this analysis, showing that all of the effects of the intervention occurred through the mediators. If the intervention effect remains significant, it suggests that there is no mediation or that other variables not included in the mediational analysis might mediate the effects of the intervention on behavior. The fourth criterion for mediation is therefore: 4) the mediated effect must be statistically significant (usually using the method of Sobel) (43,44). A method based on asymmetric confidence limits was used to test mediation as it is the most powerful test with good Type 1 error rates (45).

All analyses were performed using SPSS v.13.0 (Chicago, IL), with the alpha value set at 0.05.

Results

Baseline characteristics are shown in Table II. Participants were, as a whole, within the limits of what is considered healthy weight status (5^{th} percentile to less than the 85^{th} BMI age- and gender-specific percentile). However, standard deviations were substantial (up to 29.28). So, while 60% of participants were normal weight, 17% of participants were at risk for overweight and 20% were overweight (at or above the 85^{th} percentile; 3% were underweight). There were no group differences in percentage of participants per weight category. Current physical activity recommendations for youth suggest between 30 to 60 minutes a day of moderate to vigorous physical activity per day (46–49). In light of these recommendations, participants in this sample would be considered relatively active, with only 16% falling below 30 minutes of moderate and vigorous physical activity per day, and 74% meeting the 60 minute recommendation.

The intervention had a significant effect on reducing time spent on sedentary behavior ($\beta \pm SE = -0.27 \pm 0.14$, $p<0.05$). However, the intervention did not have any significant effects on physical activity of any intensity (p=0.27–0.76), on BMI percentile or z scores (p=0.30–0.48) or on percent body fat (p=0.86). The intervention did not have a significant effect on TEE although there was a trend for greater increase in TEE in the intervention group. Table III shows the adjusted means of TEE, physical activity and time spent **i**n sedentary behavior as well as BMI and percent body fat in the control versus intervention groups from pre- to post-test.

With respect to meanings and motivation factors, the intervention significantly increased intrinsic motivation ($\beta \pm SE = 0.11 \pm 0.05$, $p<0.05$) but had no significant effects on other aspects of motivation or meanings of physical activity (p=0.14–0.94). The adjusted mean (±SE) score of intrinsic motivation increased from 1.11±0.07 at pre-test to 1.16±0.07 at post-test in the intervention group, whereas it decreased from 1.24±0.06 to 1.18±0.06 in the control group.

Based on the analyses above, we examined whether intrinsic motivation mediated the effect of the intervention on reducing TV time. Intrinsic motivation was shown to be significantly and negatively related to TV time ($\beta \pm SE = -0.13 \pm 0.07$, $p<0.05$). When both the interaction of group assignment by test visit (i.e., intervention effect) and intrinsic motivation were tested simultaneously in relation to TV time, intrinsic motivation remained significant ($\beta \pm SE = -0.14 \pm 0.07$, p=0.04) while the effect of the intervention diminished and became non-significant ($\beta \pm SE = -0.23 \pm 0.14$, p=0.09), suggesting that there was a trend for the mediation. However, the asymmetric confidence limits test showed that the mediation effect did not reach statistical significance (Lower confidence limit (lcl) =−0.0415, Upper confidenct limit (ucl)=0.000).

Discussion

Get Moving! is, to our knowledge, the first randomized controlled field trial of a school-based program specifically designed to increase physical activity and decrease sedentary behaviors in Latina middle school girls. Our results show success in decreasing sedentary behaviors, but not in increasing physical activity or significantly changing BMI. However, the reduction of sedentary behaviors in youth has been shown to be independently associated with significant decreases in percent overweight and body fat and improved aerobic fitness (50).

The finding that intrinsic motivation is related to decreasing sedentary behavior is of interest. Making changes in sedentary behaviors by limiting deeply ingrained habits that are generally experienced as highly rewarding, such as watching TV and using the computer, are not passive events. Rather, making these changes is highly effortful and requires active mental processes. Therefore we hypothesized that intrinsic motivation for physical activity would mediate the effects of our intervention by increasing participants' ability to take steps to limit TV time and to limit time in front of a computer. To date, the relationship between intrinsic motivation and decreasing physical inactivity has not been documented. This is one of the unique findings of this study.

While the Get Moving! intervention did not have a significant effect on BMI or body fat, the absolute increase was smaller in the intervention group versus control group. Perhaps future interventions that are longer term, more intensive, and/or contextually more comprehensive (making the environment more enabling) can produce a significant effect. It is interesting to note that out of the 19 school-based obesity prevention interventions included in the recent Cochrane review (11), only four reported decreases in BMI or body fat. Of the four interventions that successfully lowered BMI, two successfully decreased sedentary behaviors (51,52) but showed no impact on physical activity. These findings suggest that school-based interventions that decrease sedentary behaviors might be effective tools for obesity prevention. It is possible that if the kind of intervention we tested were incorporated into the regular school curricula, longer-term and wider changes could be observed in the children's BMI.

Although mediation analyses have been identified as crucial steps in program development and implementation (10,53), Get Moving! is one of the few theory-based physical activity interventions in children to test whether intervention-driven changes in behavior are mediated by intervention-driven changes in psychosocial constructs. Our results show that the intervention increased intrinsic motivation, and this increase was significantly and negatively related to the decrease in sedentary behavior. However, the mediated effect did not reach statistical significance. Because of the abbreviated and novel nature of this intervention, and because this was the first implementation of the program, we might have been limited in our ability to attain the magnitude of change in intrinsic motivation that would be required to fulfill all four requirements of mediation. As several researchers have stated, further work is needed in the field to better develop strategies for producing change in proposed mediators (44).

Get Moving! decreased sedentary behavior, and intuitively one would expect a 'matched' increase in physical activity. This was, however, not the case, and Get Moving! had no significant effects on physical activity. While this may be due to our modest sample size, other, larger studies have had similar results. For instance, Planet Health, a school-based intervention in 1 295 ethnically diverse 6–7th grade students decreased television watching time but had no effect on physical activity (14). It is possible that the use of self report rather than objective measures of physical activity in both Planet Health and Get Moving! obscured effects. However, in his extensive review of correlates of physical activity in children and adolescents, Sallis et al. (54) found that physical activity was unrelated to sedentary behaviors in children under 13 years of age. What are children doing with the 'found time' when sedentary behaviors

are decreased? Several authors suggest that a shift in the nature of behaviors that we commonly consider sedentary (55). With the advent of computer games such as 'Dance Dance Revolution' and 'Wii', playing computer games can no longer be categorized as 'sedentary' across the board. Further, behaviors that once demanded a moderate amount of energy expenditure, such as some daily domestic tasks, require significantly less energy expenditure when performed with the aid of machines or equipment (56). Thus, more appropriate and detailed measures of what we now consider 'sedentary' behaviors might show a shift away from truly sedentary behaviors to behaviors that are being misclassified as 'sedentary' due to error in our current arsenal of measures (57).

This intervention study had several limitations. The primary limitation was that physical activity and sedentary behaviors were measured using self-report rather than objective measures, such as accelerometry or observation. Stronger measures might have shown stronger effects. Although we matched schools according to ethnicity and socioeconomic status of the students, this was nevertheless a geographically limited convenience sample of modest size. Another limitation is the lack of follow-up data. Testing this intervention in a larger, random sample of schools in more than one state with at least a 3-month follow-up (58) would be useful to determine the longer-term effectiveness and generalizability of the intervention. While few measures have been dedicated exclusively to understanding the complexities of sedentary behaviors (55), the field of physical activity research is beginning to develop a comprehensive battery of distinct measures of sedentary behaviors. Future research would benefit from some highly specific measurement of sedentariness. Finally, future studies to tease out specific intervention components that affect mediators and/or outcomes could serve to strengthen the intervention.

Get Moving! is, to our knowledge, the first physical activity intervention to target Latina girls, and one of the few theory-based physical activity interventions in youth to test mediating variables. Research suggests that involving the target population in lifestyle intervention development vastly improves intervention outcomes (59,60). The approach used here, which was the development of PSA's to motivate girls to increase physical activity and decrease sedentary behavior, deeply involves the target population, and is novel, creative and fairly easy to implement in school settings. Although Get Moving! did not increase physical activity, it did decrease sedentary behaviors in this at-risk group. This is important for several reasons: inactivity tracks through adolescence (61) and is longitudinally related to lower levels of physical activity (62). In women, persistent inactivity in youth has been related to obesity (63) and breast cancer (64) in adulthood.

Acknowledgments

The authors would like to thank David MacKinnon and Mathew Fritz for their assistance with the PRODCLIN mediational analyses, Bruce Royer at Royer Studios for collaborative development and implementation of the intervention, Dolly Yang who managed this project, the many undergraduate students who assisted in data collection, and the students and schools who welcomed us into their classrooms. This research was supported by NIDDK KO1D-K59293 (Spruijt-Metz, PI) and the NCI-funded USC Center for Transdisciplinary Research on Energetics and Cancer (U54 CA 116848)(Spruijt-Metz, Project Leader and Core Co-Director).

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Table 1

"Teachable Moments" – operationalization of theory in the 'Get Moving!' program.

Lesson	Materials	Example of Targeted Content	Lesson modality/teachable moment	Reinforced Positive Meanings	Reinforced Intrinsic Motivation
1	Fact sheets (PA guidelines, health facts, etc)	Get up off the couch! All activity counts!	Create team motto	Being active helps deal with stress	Being active boosts self-confidence
2	Physical activity questionnaire reinforcing fact sheets	Girls tend to be less active than boys – and it doesn't have to be that way	Create title & Moral of Story for PSA	Being active can help grades	Being active is fun
3	Video, in-class presentation	How inactive are girls like you? How can you help them to choose more active pastimes?	Create Storyline	Being active combats boredom	Embrace the challenge to change habits
4	"Make your own headline" handout	Female role models (athletes, politicians, stars) endorsing exercise	Create Newspaper Headlines	Being active makes one feel proud and strong	Being active feels good physically
5	"Four ways" handout	Creative ways to lower sedentary behaviors and raise activity at different times of day	Identify ways to be active in the morning, at school, after school and in the evening	Being active is empowering!	Enjoy improving your activity level
6	Reiteration of fact sheets	Elicit overall lessons learned	Brief directed disucssion at each team table	Reinforcement of previous	Reinforcement of previous
7	Presentation of final products to classmates and teachers				

Abbreviations: PA: physical activity; PSA: public service announcements.

Table 2

Characteristics of the sample (N=459).

Age in years[a]	12.47 (0.63)
Ethnicity[b]	
Asian/Asian American	72 (15.7%)
Latino	334 (72.8%)
Other	18 (3.9%)
White	35 (7.6%)

[a] Mean (Standard deviation).

[b] N (%).

Int J Pediatr Obes. Author manuscript; available in PMC 2010 March 15.

Table 3

Physical activity meanings and motivation at baseline and follow-up.

	Control[a]		Intervention[a]		Significance[c]
	Baseline	**Follow-up**	**Baseline**	**Follow-up**	**β, p-value**
Level of Physical Activity[b]					
High	1.32 (1.99)	1.30 (2.23)	1.27 (2.17)	1.33 (1.96)	n.s.
Moderate	3.58 (3.52)	2.84 (2.93)	3.45 (3.94)	2.47 (2.59)	n.s.
Light	29.10 (4.06)	29.86 (3.78)	29.27 (4.40)	30.20 (3.39)	n.s.
TV/Video Games/Internet	3.29 (2.88)	3.79 (3.27)	3.82 (3.47)	3.44 (3.37)	−0.27, p<0.05
Total Energy Expenditure (Kcals)	8.12 (0.02)	8.14 (0.02)	8.09 (0.03)	8.13 (0.03)	n.s.
Measures of BMI and Body Fat					
BMI Percentile	62.62 (2.06)	64.09 (2.01)	66.44 (2.90)	66.85 (2.80)	n.s.
BMI Z Scores	0.49 (0.09)	0.54 (0.09)	0.59 (0.12)	0.62 (0.11)	n.s.
% Body Fat	27.27 (0.99)	27.40 (0.91)	28.46(1.24)	28.67 (1.19)	n.s.
Meanings of physical activity					
Personal	1.27 (0.06)	1.20 (0.06)	1.16 (0.08)	1.20 (0.08)	n.s.
Social	1.73 (0.05)	1.60 (0.05)	1.60 (0.07)	1.48 (0.07)	n.s.
Functional	1.39 (0.07)	1.31 (0.07)	1.19 (0.09)	1.16 (0.09)	n.s.
Fantasy	2.09 (0.08)	1.93 (0.08)	2.07 (0.09)	1.90 (0.09)	n.s.
Motivation for physical activity					
External regulation	0.36 (0.04)	0.44 (0.04)	0.30 (0.06)	0.41 (0.06)	n.s.
Introjected	0.62 (0.05)	0.60 (0.05)	0.61 (0.06)	0.62 (0.06)	n.s.
Identified	1.23 (0.06)	1.17 (0.06)	1.20 (0.07)	1.21 (0.08)	n.s.
Intrinsic	1.24 (0.06)	1.18 (0.06)	1.11 (0.070)	1.16 (0.07)	0.11, p<0.05
Relative Autonomy Index	2.39 (0.23)	2.11 (0.23)	2.29 (0.27)	2.13 (0.26)	n.s.

Note. All parameters adjusted for baseline age (except body mass index, BMI percentile and z scores) and ethnicity.

[a] Mean (standard error, SE).

[b] Physical activity reported in ½ hour blocks.

[c] n.s.=not signigicant.