

## Original Article

# Body Change Behaviors in Adolescent Boys and Associated Risk Factors: A Study from Iran

**Garrusi Behshid, MD**

Professor of Psychiatry, Neuroscience Research Center, Department of Community Medicine, Afzallipour Medical School, Kerman University of Medical Sciences, Kerman Iran

**Baneshi Mohammad Reza, PhD**

Associate Professor of Statistics, Research Center For Modeling in Health, Kerman University of Medical Sciences, Kerman, Iran

**Pakgozar Mostafa, MD**

Student Research center, Kerman University of Medical Sciences, Kerman, Iran

**Amirkafi Ali**

Medical School, Iran University of Medical Sciences, Tehran, Iran

**Koohestani Zarrintaj**

Health Center, Kerman University of Medical Sciences, Kerman, Iran

**Correspondence:** Garrusi Behshid, MD, Professor of Psychiatry, Neuroscience Research Center, Department of Community Medicine, Afzallipour Medical School, Kerman University of Medical Sciences, Kerman Iran  
E-mail: bgarrusi@kmu.ac.ir, behshidgarrusi@gmail.com

## Abstract

**Background:** Body image disturbance and efforts for body change are considered as one of the serious health issues especially in adolescence period. Aims: To identify contributing factors that could be affect body change behaviors in Iranian adolescents.

**Methodology:** Four hundred and thirty- three adolescent boys were selected from high schools. The effects of demographic variables (age, educational grade , parental educational level , economic status and BMI ) ,Social pressure( media, parents and peers) ,body satisfaction and self-esteem on body change behaviors (weight loss and muscle enhancing )were assessed. Descriptive statistics, Pearson correlation test, univariate ANOVA and two-sample t-test, multi factorial linear regression were used to statistical analysis. P-value less than 0.05 were considered as significance level.

**Results:** The mean age of respondents were 15.99(±.86). About 75 %(327) of adolescents had preoccupation with body change behaviors . Use special diet for muscle strengthening was the most methods for body change (41.1%). Positive correlation was seen between body change with body satisfaction ( $r=0.43$ ), social pressure ( $r=0.64$ ), BMI ( $r=0.22$ ). Based on multi factorial regression analysis, only variables that remained significant were body satisfaction, social pressure, and financial status.

**Conclusion:** Although the contributing factors of the body changing behaviors are similar to other studies, however, due to cultural differences, further studies are needed to investigate the factors that influence the body satisfaction and related issues.

**Key words:** Body change behaviors, BMI, Social Pressure, Self-esteem, Iran

## Introduction

Appearance is a major concern in adolescence, beginning of secondary sexual characteristics and changes in weight and height could be result to this body concern. Self-evaluation regarding body changes is prominent across adolescence.

Although this evaluation of self is a normal phenomenon in adolescent period, but its disturbances may be act as risk factor for psychological and physical health. Several factors are involved in body image development. The bio-psycho-social model is one of the

models that can explain body image development. This model can identify interaction between various contributing factors such as physical changes in puberty (biological factors), self evaluation, beliefs, internalization of ideal body and self-esteem (psychological dimensions) and environment influencing on body image such as cultural beliefs, peer-parent pressure and media (social dimension) (Thompson, Coover & Stormer, 1999). Some of researches are believed that negative body image is developed in middle school age and there is a difference between girls and boys. In adolescent girls, body dissatisfaction is greater in high school than middle school age, but in adolescent boys is in contrast (Jones, 2004).

Cultural values regarding body and beauty are different in various societies. Gender roles, economic and religious values even political issues are important contributing factors (Mellor, et al., 2009). It is necessary to consider that globalization and international media could affect these cultural values. In the past decades, some of Eastern cultures such as Iran fatty women were preferred, because it was believed that these women had better femininity and fertility. Masculinity was an ideal image for men, because the male-sex role was necessitated that men had strong muscle, and powerful body. In recent years, female Ideal body has changed to Western schema, "thin female". But it seems that the ideal body for men remained unchanged and has suggested that boys are focused on masculinity (McCabe & Ricciardelli, 2001, Ricciardelli & McCabe, 2004).

Ideal body that is identified by media is associated with attractiveness, success, life and job opportunities. Comparison with this ideal image causes people to have a desire for achieving them. This ideal body contributes in forming a negative self-evaluation in individuals, especially adolescent (Blowers et. al., 2004). Body image disturbances have been predictive factors of serious health problems such as body dysmorphic disorders, unhealthy body change behaviors, and eating disorders. One of serious consequences of body dissatisfaction could be effort for achieving ideal body that is advertised by media. These efforts are including food restriction, unhealthy and sever exercise and substance abuse. Male ideal body that is portrayed by media includes wide shoulders, muscular upper body and flat abdomen. Thus is

not surprising, that for achieving of this body, steroids and enhancing masculinity products are used (Hildebrandt et al., 2007).

The most proportion of dietary supplements, body building, weight loss and performance enhancing substances have been used for increase muscle mass, loss weight, and improve physical performance (Kao et al., 2012). About 31-39% of adolescent boys have been used dieting as a body change behavior. Estimation for heavy exercise to lose weight is about 36.5% of boys (McCabe & Ricciardelli, 2001a).

Adolescents with body image dissatisfaction were more use muscle enhancing products than those who had body satisfaction (2005 et al., 2005). Men that had higher concerns about their masculinity are more engagement in body change behaviors than other men (McCabe & Ricciardelli, 2003). One research showed that more than 27% college males used steroids and enhancing masculinity products (Olivardia et al., 2004).

We know little about the socio-cultural factors that contribute to body satisfaction and body change behaviors in Iranian population especially adolescents. This study was designed to identify socio-cultural factors that influence adolescent boys' body change behaviors.

### **Methodology**

This cross-sectional study was done in Kerman, the capital of the largest province in Iran. The outcome of this study was body change behaviors in male adolescents.

### **Participants**

Four hundred and thirty- three boys were selected from eight high schools. These high schools located in different area and include public and private schools.

### **Procedures**

This study is a Medical thesis project that was approved by the Medical Thesis and Ethical Committee of the Kerman Medical Sciences University. The questionnaires were completed in regular class periods. All of participants signed informed consent.

### **Outcome**

Body change strategies regarding weight loss and muscle enhancing was assessed by asking

questions that developed for adolescents by Ricciardelli & McCabe (2002). Adolescents were asked that selected one proper item on six –point Likert scale for each item from never (1) to always (6). Cronbach's alpha, were 0.86 for loss weight items and 0.79 for increased muscle.

## Measures

### *Demographics/characteristics*

We collected demographic characteristics of subjects, including age, educational grade, parental educational level and economic status (low, medium, good and excellent). To assess the economic status, we simply asked respondents to select one of them.

### *Media*

For assessing the impact of media on body change strategies, we asked subjects that they used Western TV, Iranian television, magazines or the Internet. Therefore, responses were binary (yes, no).

### *Body Mass Index (BMI)*

BMI was calculated by the ratio of body weight (kg) to the square of height (m<sup>2</sup>). previous studies argues self-reported weight and height are reliable (Brooks-Gunn et al., 1987).

### *Body satisfaction*

We used four questions that were proposed by McCabe & Ricciardelli (2001, b) for assessing of body concerns and satisfaction. These questions include 1) How happy are you with your weight? 2) How important to you is your weight? 3) How happy are you with your muscle size? 4) How important to you is the size of your muscles?

Question 1 and 3 was rated on a five –point Likert scale from completely satisfied (5) to completely Dissatisfied (1). Question 2 and 4 was rated on a five –point Likert scale from extremely important (5) to no important (1).

### *Socio-cultural pressure*

The effects of socio-cultural pressure on body change were assessed by The Socio-cultural Influences on Body Image and Body Change Questionnaire (McCabe & Ricciardelli 2001, b) This questionnaire assessed perceived pressure for lose weight and increasing muscle from mother, father, closed friends and media. This questionnaire had acceptable reliability and

validity for adolescents. Adolescents were asked to respond these questions based on six-point Likert scale that ranged from never (1) to always (6). Summation of all questions scores was considered as total score. Higher scores presented as higher perceived pressure.

### *Rosenberg Self-Esteem Scale*

To assess self-esteem, the Rosenberg Self-Esteem Scale (RSE) was used. This questionnaire includes 10 global statements and total scores were between -10 to 10. Positive scores were indicated higher self-esteem and negative scores predicate lower self-esteem. The psychometric properties of the Persian version of the questionnaire were assessed (Shapurian, Hojat & Nayerahmadi, 1987).

### *Statistical analysis*

Descriptive statistics were used to summaries the data in terms of mean (SD) for continuous, and frequency and proportion in terms of categorical variables. To identify the impact of each continuous variable on body change Pearson correlation coefficient was calculated. A series of univariate ANOVA and two-sample t-test was applied to assess role of categorical variables on body change. Then impact of all variables together was assessed through multi factorial linear model. All analyses were done using SPSS. P-value less than 0.05 were considered as significance level.

### *Results:*

Nearly 39% and 32% of fathers and mothers had university degree (Table 1). About half of respondents declared the financial status of their families as good. The coverage of use of fashion magazine, satellite, and Internet was about 25%, 50%, and 75%. Other respondents' characteristics were shown in Table 1. The mean age of respondents were 15.99(±.86). The mean (SD) weight and height were 62.01 kg (14.32) and 1.73 m (.08), respectively. The minimum and maximum scores of BMI were 12.86 and 36.33 (Mean score = 20.63 ± 4.14). Mean (SD), minimum and maximum scores of other variables are presented in Table 2. About 75% (327) of adolescents had preoccupation with body change behaviors. Use special diet for muscle strengthening was the most methods for body change (41.1%). muscle enhancement products were used by 7.2% individuals.

**Table 1. Characteristics of participants**

	<b>Level</b>	<b>Frequency</b>	<b>Percent</b>
<b>Grade</b>	<b>1</b>	<b>163</b>	<b>37.6</b>
	<b>2</b>	<b>186</b>	<b>43.0</b>
	<b>3</b>	<b>77</b>	<b>17.8</b>
	<b>4</b>	<b>7</b>	<b>1.6</b>
<b>Father education</b>	<b>Elementary</b>	<b>66</b>	<b>15.2</b>
	<b>High school</b>	<b>199</b>	<b>46.0</b>
	<b>University</b>	<b>168</b>	<b>38.8</b>
<b>Mother education</b>	<b>Elementary</b>	<b>54</b>	<b>12.5</b>
	<b>High school</b>	<b>242</b>	<b>55.9</b>
	<b>University</b>	<b>137</b>	<b>31.6</b>
<b>Financial status</b>	<b>Poor</b>	<b>37</b>	<b>8.5</b>
	<b>Middle</b>	<b>164</b>	<b>37.9</b>
	<b>Good</b>	<b>202</b>	<b>46.7</b>
	<b>Excellent</b>	<b>30</b>	<b>6.9</b>
<b>Satellite</b>	<b>Yes</b>	<b>213</b>	<b>49.2</b>
	<b>No</b>	<b>220</b>	<b>50.8</b>
<b>Internet</b>	<b>Yes</b>	<b>327</b>	<b>75.5</b>
	<b>No</b>	<b>106</b>	<b>24.5</b>
<b>Fashion magazine</b>	<b>Yes</b>	<b>107</b>	<b>24.7</b>
	<b>No</b>	<b>326</b>	<b>75.3</b>

**Table2. Mean scores of some of risk factors**

<b>Variables</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
<b>Body satisfaction</b>	<b>5.00</b>	<b>20.00</b>	<b>12.11</b>	<b>3.09</b>
<b>Perceived Socio-cultural pressure</b>	<b>12.94</b>	<b>77.00</b>	<b>26.52</b>	<b>10.09</b>
<b>Rosenberg Self-Esteem Scale (RSE)</b>	<b>-10.00</b>	<b>10.00</b>	<b>5.27</b>	<b>4.27</b>

**Table 3: Comparison of mean of body change score based on socioeconomic and media use variables**

Variable	Leve	Mean (SD)	P-value
Internet	No	21.9 (8.2)	0.35
	Yes	22.7 (7.6)	
Magazine	No	22.2 (7.6)	0.10
	Yes	23.6 (8.1)	
Satellite	No	21.7 (7.4)	0.02
	Yes	23.5 (7.9)	
School type	Public	22.7 (7.0)	0.77
	Private	22.5 (8.1)	
Mother education	Elementary	21.2 (8.3)	0.14
	Diploma	22.3 (7.4)	
	University degree	23.5 (7.9)	
Father education	Elementary	22.2 (8.3)	0.58
	Diploma	23.0 (7.6)	
	University degree	22.2 (7.7)	
Financial status	Poor	20.1 (5.2)	0.01
	Middle	21.7 (7.4)	
	Good	23.3 (7.9)	
	Excellent	25.1 (9.6)	

**Table4. Identification of variables associated with body change behaviors through multi factorial linear regression analysis**

Independent variable	Unstandardized Coefficients		P-value
	B	Std. Error	
Body satisfaction	0.53	0.11	<0.0001
Social pressure	0.40	0.03	<0.0001
Rosenberg Self-Esteem Scale (RSE)	-0.04	0.07	0.55
Body satisfaction	0.02	0.23	0.94
BMI	-0.004	0.07	0.95
Mother education	0.27	0.46	0.55
Financial status	1.1	0.39	0.006
Satellite	-0.42	0.56	0.46
Magazine	-0.37	0.66	0.57

Positive correlation was seen between body change with body satisfaction ( $r=0.43$ ), social pressure ( $r=0.64$ ), BMI ( $r=0.22$ ). In all cases P-value was  $<0.0001$ . On the other hand body change was negatively and weakly correlated

with RSE ( $r=-0.12$ ,  $P\text{-value}=0.02$ ). Among categorical variables, the only variables associated with body change was financial status ( $P=0.01$ ) (Table 3). We have seen that mean body change score of poor groups was

significantly different with excellent group ( $P=0.04$ ). Mean (SD) scores in poor and excellent groups were 20.1 (5.2) and 25.1 (9.6) respectively. Difference between poor and good groups was of marginal significance with  $P$ -value of 0.08. Another variable affects the score of body change was use of Western TV. Difference between mean score of body change was about two units ( $P=0.02$ ). On the other hand, type of school, education of parents, or use of internet and magazine was not significantly related to body change. All variables with univariate  $P$ -value less than 0.20 were candidate for multivariate linear regression model. The only variables remained significant were body satisfaction, social pressure, and financial status (Table 4).

### Discussion

The aim of this study was identification of contributing factors of body change behavior in Iranian adolescent boys.

Body dissatisfaction is increasing between males, even Asian males. Body dissatisfaction are estimated between 50-70% of boys (Kao et al., 2012). Although there are limited evidences regarding body image disturbances in Asian adolescents, it seems that phenomenon is increasing. Japanese National Nutrition Survey reported about 24% of adolescent boys had desire for body change regardless their current weight (Chisuwa & O'Dea, 2012). Other studies, confirmed this progression in body dissatisfaction (Xu et al., 2010). Body dissatisfaction is progressing in limited Iranian researches. In this study 75% adolescent boys had desire for body change, which could be representing potential health side effects.

Studies have been emphasized on difference between body change behaviors in both genders. Boys are engaged in exercise and muscle enhancing strategies more than girls, that those prefer dieting for body change (Neumark-Sztainer et al., 1999, & O'Dea, 2012). In one Iranian study, was shown that girls more frequently used dieting and decreasing of eating than boys (Hatami et al., 2013). In our study more than half of boys used muscle enhancing techniques. Heavy exercise and even "weight training addiction" is one of health consequences of body dissatisfaction (McCabe & James, 2009). Although, other body change behaviors such as muscle enhancing products and change of eating

have been used. Increasing of body dissatisfaction in Asian societies such as Iran, could be result to increase of body change strategies. Although there is no detailed statistics about use of these methods especially legal (nutritional supplements) or illegal (anabolic steroids) products for body building or weight loss in Iran, but it seems use of these products have been increased. As the survey results showed, there was a tendency to use of these products.

Body image is considered as multidimensional phenomenon that includes cognitive, affective and behavioral aspects. Some of researches argued that appearance may be act as a powerful determinant of self worth. Satisfaction and validation of individual's body could be affected by some of factors such as self-esteem. Many of cross-sectional and longitudinal researches showed that body dissatisfaction predicted low self-esteem in later years (Mann et al., 2004, McCabe & James, 2009). Unrealistic beauty standards that are offered by Western cultures could be result to worsening of self worth and low self-esteem. Low self-esteem is associated with risky health behaviors, eating disorders and social problem (Mann et al., 2004). In this study, self-esteem was not considered as a risk factor for body change behaviors, but it may be due to greater effects of other influencing factors. Considering the relation between low self-esteem and negative body image is important especially in adolescence, for preventive and therapeutic goals. Body mass index (BMI) is identified as a predictive factors for body dissatisfaction in both genders. The same as, Western cultures, it has been shown that BMI has negative effect on body satisfaction in both Asian adolescent girls and boys. Studies have shown gender differences in the relation between BMI and body image disturbances. Some of researches are argued that relation between BMI and body dissatisfaction is U-shaped in adolescent boys, because underweight boys have great body dissatisfaction such as overweight boys (Jones, 2011). Whereas underweight girls with body dissatisfaction desire to be thinner. In present study, BMI, unlike other studies, had no effect on body change behaviors. Considering that the study was conducted in adolescent boys, the reason of this finding may be gender effect. Another possibility may the majority of adolescents were in the normal weight range.

In this study, exposure to Western TV had significant difference between adolescent boys that used body change behaviors and whom did not. But in consistent with many of researches media had no direct effect on body change behaviors (Xu et al., 2010). In Iran there are no special fashion magazines for men and advertising use of bare images of male is prohibited. Therefore, it seems Western TV have greater effects on body change behaviors. Hargreaves and et al. (2003) showed body dissatisfaction was greater in people that exposed to appearance related commercials than those were exposed to non-appearance related commercials. Some of researches showed, seeing of masculine men in television or fashion magazines could be result to body dissatisfaction, low self esteem and eating disorders in men.

Body image in puberty is developed by interaction with influencing others (peers, parents, society). One source of social pressure is relatives' message for being thin or masculine, especially in adolescent. It seems, socio-cultural contributing factors are similar for boys and girls, but boys are less prone to these factors than girls. Although, parents' opinion and comments about appearance are associated with body dissatisfaction in girls, but researches about adolescents boys are inconsistent. This inconsistency may be due to avoiding of parents to encourage boys to lose weight, because traditional male pattern (McCabe & Ricciardelli, 2009). It was shown that peers had an important effect on body dissatisfaction in both, girls and boys (Ricciardelli et al, 2003). Peers are one of important source of encouragement to use of body change strategies. Peers' opinion about loss of weight has been identified as predictive factor in weight loss behavior, exercise and eating problems (McCabe & Ricciardelli, 2009). Iranian culture as an Asian culture have greater tendency to social collectivism and evaluation by others. It is not surprising that pressure from others had been significant effects on self-evaluation and body satisfaction. Perceived social pressure from others was important contributing factors. Some investigations were believed that socio-cultural effects especially media exposure had lesser effects on adolescent boys than girls (McCabe & Ricciardelli, 2009).

Economic status, in this study it was identified as a risk factor in body change attempts. Previous studies argue that individuals with better socio-

economic situation had higher body concerns than those with fair socio-economic situation (Ogden & Thomas, 1999) This issue it was not only regarding body concerns as these individuals have attempted body change in higher rates than other people. Studies have been argued that there is gender difference in the effects of social class on body image and related issues. The effects of socio-economic status were prominent in women (McLarena & Kuhb, 2004). The reason for that is may be relate to the advertised female ideal body (Thin) in association with success, attractiveness and better life situation. This survey was one of the limited studies in Iranian population especially in adolescent boys. Although these findings roughly are consistent with previous Western and Asian researches, body image and related issues findings are useful for future studies. Our findings are limited by the cross sectional nature of study. Longitudinal surveys can provide a greater understanding regarding effects of socio-cultural factors. Another limitation was the narrow range of the participants' age. Future research must be designed for different adolescent age groups and in both gender.

Despite, these limitation, the results showed body dissatisfaction, attempt to body change especially muscle enhancing behaviors can be potentially serious in Iranian adolescent boys. Although, further research is needed to evaluate the impact of these factors, but the results of this study and previous researches regarding increase of eating disorders in Iranian population show the need to take serious measures on planning related preventive programs (Garrusi & Baneshi, 2012).

**Acknowledgement:** Here would like to thank for their cooperation all the participated students and their teachers that help us.

## References

- Blowers, L.C., Loxton, N.J., Grady-Flesser, M., Occhipinti, S., Dawe, S.(2003). The relationship between sociocultural pressure to be thin and body dissatisfaction in preadolescent girls. *Eating Behavior*, 4(3) 229-244.
- Brooks-Gunn, J., Warren, M.P., Rosso, J., Gargiulo, J.(1987). Validity of self-report measures of girls' pubertal status. *Child Development*, 58(3) 829-841.
- Chisuwa, N., O'Dea, J.A.(2010). Body image and eating disorders amongst Japanese adolescents. A review of the literature. *Appetite*, 54:5-15.

- Field, A.E., Austin, B., Camargo, C.A., Taylor, C.B., Striegel-Moore, R.H., Loud, K.J.(2005) .Exposure to mass media, body shape concerns, and use of supplements to improve weight and shape among male and female adolescents. *Pediatrics* , 116(2) 214–220.
- Garrusi, B., Baneshi, M.R.(2012). Eating disorders and their associated risk factors among Iranian population - a community based study. *Global Journal of Health Sciences* ,5(3) 193-202.
- Hargreaves, D., Tiggemann, M. (2003) .The effect of thin ideal television commercials on body dissatisfaction and schema activation during early adolescence. *Journal Youth and Adolescents* ,32(5) 367-373.
- Hatami, M., Taib, M.N., Jamaluddin, R., Abu Saad, H., Djazayeri ,A.(2013) . Body change techniques in Iranian adolescents .Relationship to sex and body weight status. *Appetite*, 60(1) 27-32.
- Hildebrandt, T., Langenbucher, J.W., Carr, S.J., Sanjuan, P.(2007). Modeling population heterogeneity in appearance- and performance-enhancing drug (APED) use:applications of mixture modeling in 400 regular APED users. *Journal of Abnormal Psychology* ,116(4) 717–33.
- Jones, D.C .(2004) . Body image among adolescent girls and boys: A longitudinal study. *Developmental Psychology*, 40(5) 823–835.
- Jones, D.C.(2011). Interpersonal and familial influences on the development of body image. In T. F. Cash & L. Smolak (Eds.), *Body image: A handbook of science, practice, and prevention* (2nd ed., pp. 110-118, New York: Guilford Press.
- Kao, T., Deuster, P.A., Burnett, D., Stephens, M.(2012) . Health Behaviors Associated With Use of Body Building, Weight Loss, and Performance Enhancing Supplements. *Annals of Epidemiology* 22 331-339
- Mann, M., Hosman, C. M.H., Schaalma, H.P., deVries, N.K.(2004) . Self-esteem in a broad-spectrum approach for mental health promotion. *Health Education Research* , 19 (4) 357-372.
- McCabe ,M.P., Ricciardelli, L. A.(2001) . Parent, peer, and media influences on body image and strategies to both increase and decrease body size among adolescent boys and girls. *Adolescence* ,36 (142) 225-240 (a)
- McCabe , M.P., Ricciardelli, L.A(2001). The structure of the perceived sociocultural influences on body image and body change questionnaire. *International Journal of Behavior Medicine* , 8(1) 19–41.(b)
- McCabe, M.P., Ricciardelli, L.A.(2003) . A longitudinal study of body change strategies among adolescent males. *Journal Youth and Adolescents* ,32(2) 105–113.
- McCabe, M.P., James, T.(2009) . Strategies to Change Body Shape among Men and Women Who Attend Fitness Centers. *Asia-Pacific Journal of Public Health* , 21(3) 268-278.
- McLarena, L., Kuhb, D. (2004). Women’s body dissatisfaction, social class, and social mobility. *Social Sciences Medicine* ,58 (9) 1575–1584.
- Mellor, D., Ricciardelli, L., McCabe, M., Yeow, J., Daliza, N., & Binti Mohd Hapidzal, .(2009).Sociocultural influences on body dissatisfaction and body change behaviors among Malaysian adolescents. *Body Image* , 69(2) 121–128.
- Neumark-Sztainer, D., Story, M., Falkner ,N.H., Beuhring, T., Resnick ,M.D.(1999). Sociodemographic and personal characteristics of adolescents engaged in weight loss and weight/muscle gain behaviors: who is doing what? *Preventive Medicine*, 28( 1) 40 -50.
- Ogden, J., Thomas, D.(1999) . The role of familial values in understanding the impact of social class on weight concern. *International Journal of Eating Disorders*, 25(3) 273–279.
- Olivardia, R., Pope, H.G., Borowiecki, J.J., Cohane, G.H.(2004). Biceps and body image: The relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychology of Men & Masculinity*, 5(2) 112–120.
- Ricciardelli, L. A., & McCabe, M. P. (2002). Psychometric evaluation of the Body Change Inventory: An assessment instrument for adolescent boys and girls. *Eating Behaviors*, 3(1) 45–59.
- Ricciardelli, L.A, McCabe, M.P. (2004) .A biopsychosocial model of disordered eating and the pursuit of muscularity in adolescent boys. *Psychological Bulletin*, 130(2) 179–205.
- Shapurian, R., Hojat, M., Nayerahmadi, H. (1987). Psychometric characteristics and dimensionality of a Persian version of the Rosenberg Self-Esteem Scale . *Perceptual Motor Skills* , 65(1) 27-34.
- Thompson, J. K., Coovert, M.D., Stormer, S.(1999). Body image,social comparison and eating disturbance: a covariance structure modeling investigation. *International Journal of Eating Disorders* ,26(1):43–53.
- Xu, X., Mellor, D., Kiehne , M., Ricciardelli, L.A, McCabe, M.P., Xu, Y.(2010). Body dissatisfaction, engagement in body change behaviors and sociocultural influences on body image among Chinese adolescents. *Body Image*,7(2) 156–164.