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AN EVALUATION OF OUTDOOR ACTIVITIES ON LIFE SATISFACTION: AN APPLICATION OF PROPENSITY SCORE MATCHING OF A CASE IN TURKEY

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ABSTRACT

A large part of this research focuses on life satisfaction changes depending on the multiple causal effect, but in recent years, the impact of life satisfaction on outdoor sports based on the theory of activity sports, has taken on a new dimension with research methods. This article briefly discusses not only some of the most common causal methods on observational data for comparative effectiveness research to implement propensity score matching, but also presents measurement of life satisfaction. Using the sampling group data set consisting of 1,719 mountaineers, trekkers, cyclists as well as those who do not participate in outdoor activities in Turkey, we found that participating in outdoor activities has statistically positive effects on increasing life satisfaction. Another objective was to determine the propensity matching score of these groups.

Key Words: *Propensity score, matching methods, stratification estimation, kernel matching, life satisfaction.*

JEL Code: *C15, L83, Q26*

1. INTRODUCTION AND CONCEPTUAL FRAMEWORK

Activity theory recommends an assertive relationship between any kind of activity and Life Satisfaction (LS) (Ardahan and Mert, 2013). Recent literature specifies that although leisure and especially participating in outdoor activities may be an important sign of subjective wellbeing, LS and quality of life; there is very little understanding as to how this occurs (Rodriguez et al., 2008; Baker and Palmer, 2006; Iwasaki, 2006).

In this study we had one data set that we divided into two groups: the training and control groups. We described these two groups via numerous backgrounds characteristic.

Our contribution to the literature was three folded. First of all, we analyzed the life satisfaction of those who participate in outdoor activities. Secondly, conversely most of the previous literature has mentioned on the relationship between the groups based on their background characteristic, and test for effect of the treatment. Finally, we focused on basic demographic characteristics, family life as well as educational and job characteristics of the participants.

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We then exercised a suitable empirical methodology for obtaining estimates of the causal impact of participating in outdoor activities on life satisfaction concordantly where a comparison of the control group to the treatment group was essential.

The main purpose of this study was to examine and explain the impacts and direction of some outdoor activities such as cycling, trekking and mountaineering/rock climbing and other determinants on life satisfaction (LS) level by propensity score matching.

2 . CAUSAL METHODS FOR OBSERVATIONAL DATA

It briefly describes four methods of estimating treatment effects using the counterfactual: propensity score matching, double difference, instrumental variables, and regression discontinuity (Stevenson, 2010). However we were also interested in and explained the propensity score matching for observational data on life satisfaction. Satisfaction with Life Scale developed by Diener et al. (1985) was also used with reference to the study by Ardahan and Mert (2013).

2.1. Propensity score matching

Policy evaluation seeks to determine the effectiveness of a particular intervention. In economic policy analysis, we rarely can work with experimental data generated by purely random assignment of subjects to the treatment and control groups. Random assignment, analogous to the 'randomized clinical trial' in medicine, seeks to ensure that participation in the intervention, or treatment, is the only differentiating factor between treatment and control units (Lee, 2010).

In non-experimental economic data, we observe whether subjects were treated or not, but in the absence of random assignments, we must be concerned with differences between the treated and non-treated. For instance, Is that those individuals with higher aptitude join into a job training program a self-selection? If so, they are not similar to corresponding individuals along that dimension, even though they may be similar in other aspects (Baum, 2013).

The key concern is that of similarity. How can we find individuals who are similar on all observable characteristics in order to match treated and non-treated individuals with a single measure; we can readily compute a measure of distance between a treated unit and each candidate match. How are we to balance similarity along each of those dimensions, with multiple measures defining similarity?

The method of propensity score matching (PSM) allows this matching problem to be reduced to a single dimension: that of the propensity score. This score is defined as the probability that a unit in the full sample receives the treatment, given a set of observed variables. And also all the details of propensity score matching can be seen in the study by Rosenbaum and Rubin (1983).

2.2. Why do we use matching methods?

The greatest challenge in evaluating a government policy intervention or a process of determining similarity of patients is obtaining a reliable estimate of the counterfactual: what would have happened to the participants (treated units) had they not participated? Without a credible answer, we cannot rule out the possibility that whatever successes have occurred among participants could have happened anyway. This relates to the fundamental problem of causal inference: it is impossible to observe the outcomes of the same unit in both treatment conditions at the same time.

2.3 . When to use propensity score matching?

From a data perspective, propensity score matching can be used when both baseline characteristics and outcome measures are available for treated and untreated individuals.

Three conditions are necessary for propensity score matching to yield a valid estimate of causal effect (Morgan and Winship, 2007; Khandker et al., 2010):

1. Unobserved characteristics must not account for treatment receipt.

2. Common Support. The distributions of propensities for treatment in the control and treatment groups must overlap sufficiently to allow the pairing of treatment and control individuals.

3. Conditional Independence Assumption (CIA). Individuals in the treatment group must not benefit from treatment differently than the individuals in the control group would have, conditional on propensity to be treated (Stevenson, 2010).

3. Matching Methodology

Conventional regression analysis is not convenient in dealing with this kind of selection bias. Propensity score matching uses observed factors to model the propensity to be in the treatment group and then estimates the treatment effect as the mean difference in differences for pairs of treatment and control individuals with similar propensities. Propensity score matching is a three step process. First, propensities are estimated. Second, treated and untreated individuals are matched. And third, the treatment effect is estimated as the mean of the difference in outcomes within the pairs.

In this study, we attentively matched individuals from the treatment group with individuals from the control group in order to get more accurate estimates of the counterfactual. By comparing the treatment group with the control group we can identify the causal effect of the impact outdoor activities have on life satisfaction (Ardahan and Mert, 2013).

Here we understand “causal effect" as defined by Rubin (1974), and another description about the causal effect by Imbens (2004) and Caliendo and Kopeinig (2008).

3.1 Sampling

The sampling group of this study consisted of 1,719 mountaineers/rock climbers, cyclists, trekkers and non-participants in any outdoor activities. Data was same as the data used in the study by Ardahan and Mert (2013) and this data obtained from the participants in outdoor activities in Turkey. For more details about data, variables and sampling methods, one can see the study by Ardahan and Mert (2013). In that study, they modeled LS by using ordinary least squared regression and they used many variables. In this study, variables were used from the study by Ardahan and Mert (2013).

The analysis approach was as follows. First, it was estimated by a Logit model to calculate the predicted probabilities of some outdoor activities which were used as propensity scores. In this model, all observed covariates were measured prior to the occurrence of occupation on life satisfaction. Second, using the propensity scores, a sample consisting of outdoor activities and their matched cases was generated. Among cycling, trekking and

mountaineering/rock climbing and the other determinants who were not participants, the matched cases include only those who were close enough to outdoor activities in terms of the propensity scores.

4. VARIABLE SELECTION

Smith (2000) and Smith and Todd (2004) argue that, to provide the correct and robust estimates of treatment effects, we need to have a wide variety set of individual characteristics of observations.

Basic demographic and family characteristics: It was expected that gender and age would be important determinants for mountaineering/rock climbing, cycling and trekking. One dummy variable was used for males and four dummy variables were used for age variable measured in five levels. These two variables presumably affected participation in outdoor activities. Marital status (dummy for married) was used as family characteristic. Turkey consists of 7 geographic regions which are called Mediterranean, Aegean, Marmara, Black Sea, Central Anatolia, Easter Anatolia and Southeastern Anatolia. Every region has different geographical characteristics. Hence, the region of residence was anticipated to be a strong determinant of mountaineering/rock climbing, cycling and trekking. For these 7 regions 6 dummy variables were used and the base level was determined as Central Anatolia.

Educational and job characteristics: Educational level and occupation status could also explain a part of the differences in life satisfaction and had effects on participation to mountaineering/rock climbing, cycling and trekking activities. Dummies were used for high school, university and M.S. and Ph.D. The base level was determined as elementary education. In occupation status dummies were used for private sector, public employment, business owner, professional, student and retired. And base level was determined as unmployment and being a housewife.

Income variable: It was expected that income had the greatest effect on participation to outdoor activities and explained a large part of the differences in life satisfaction. Income was measured in five levels. The base level was determined as lower than 400 € and dummies were used for others.

When the defining characteristics of the observations in treated and control groups were the same, we did not need to use any statistical matching method to compare their outcomes. But, in this sample, Table 1 shows the results of two samples test for proportions. According to the test results, the characteristics of the outdoor activity participants and non-participants were statistically different. Relative to the non-participants group, outdoor activity participants were older and more likely to be married; they also had higher monthly incomes and were more educated. Their occupations and living regions were also statistically different. The mountaineering/rock climbing and trekking groups (Table 2, 3 and 4) showed the same differences. Comparison of cycling and control groups were different. We understood from Table 3 that the cycling group members were younger and less educated and also had less monthly income. There was almost no statistical difference regarding their occupations.

Table 1. *Composition of total outdoor activities group and control group*

Variable	Treated group frequencies	Control group frequencies	*z*-test for differences
Male	0.793	0.527	11.27***
Age 24	0.147	0.353	-9.70***
Age 25-34	0.351	0.308	1.75*
Age 35-44	0.257	0.137	5.57***
Age 45-54	0.183	0.141	2.15**
Age > 55	0.060	0.059	0.08
Married	0.394	0.263	5.27***
Elementary education	0.021	0.022	-0.13
High school education	0.215	0.133	4.02***
University education	0.633	0.780	-6.05***
M.sc and Ph. D	0.129	0.063	4.08***
Private Sector	0.347	0.304	7.75*
Public employment	0.211	0.163	2.32**
Business owner	0.112	0.096	1.00
Professional	0.075	0.029	3.71***
Student	0.130	0.237	-5.56***
Retired	0.088	0.089	-0.70
Unemployment and housewife	0.033	0.078	-4.08***
Monthly income<400 €	0.271	0.401	-5.40***
Monthly income 400-800 €	0.344	0.275	2.84***
Monthly income 800-1200 €	0.202	0.182	0.97
Monthly income 1200-1600 €	0.082	0.078	0.28
Monthly income > 1600 €	0.098	0.063	2.39**
Region lived: Mediterranean	0.243	0.602	-14.42***
Region lived: Aegean	0.215	0.092	6.20***
Region lived: Marmara	0.370	0.141	9.62***
Region lived: Central Anatolia	0.099	0.100	-0.06
Region lived: Black Sea	0.039	0.014	2.77***
Region lived: Eastern Anatolia	0.013	0.029	-2.31**
Region lived: Southeastern Anatolia	0.017	0.018	-0.15

Note: * significant at 10% level
**significant at 5% level
***significant at 1% level

Table 2. *Composition of mountaineering/rock climbing and control group*

Variable	Treated group frequencies	Control group frequencies	*z*-test for differences
Male	0.765	0.527	7.61***
Age 24	0.140	0.353	-7.50***
Age 25-34	0.352	0.308	1.45
Age 35-44	0.267	0.137	5.06***
Age 45-54	0.190	0.141	2.02**
Age > 55	0.049	0.059	-0.68
Married	0.396	0.263	4.39***
Elementary education	0.007	0.022	-1.88**
High school education	0.185	0.133	1.19
University education	0.657	0.780	-4.25***
M.sc and Ph. D	0.157	0.063	6.98***
Private Sector	0.354	0.304	1.64
Public employment	0.241	0.163	3.02***
Business owner	0.082	0.096	-0.76
Professional	0.063	0.029	2.56**
Student	0.147	0.237	-3.49***
Retired	0.082	0.089	-0.39
Unemployment and housewife	0.028	0.078	-3.36***
Monthly income<400 €	0.246	0.401	-5.07***
Monthly income 400-800 €	0.314	0.275	1.32
Monthly income 800-1200 €	0.244	0.182	2.35**
Monthly income 1200-1600 €	0.086	0.078	0.45
Monthly income > 1600 €	0.107	0.063	2.47**
Region lived: Mediterranean	0.204	0.602	-12.41***
Region lived: Aegean	0.199	0.092	4.76***
Region lived: Marmara	0.387	0.141	8.76***
Region lived: Central Anatolia	0.126	0.100	1.27
Region lived: Black Sea	0.032	0.014	1.89**
Region lived: Eastern Anatolia	0.014	0.029	-1.56
Region lived: Southeastern Anatolia	0.035	0.018	1.66*

Note: * significant at 10% level
**significant at 5% level
***significant at 1% level

Table 3. *Composition of cycling and control group*

Variable	Training group frequencies	Control group frequencies	*z*-test for differences
Male	0.887	0.527	11.40***
Age 24	0.241	0.353	-3.60***
Age 25-34	0.439	0.308	4.05***
Age 35-44	0.206	0.137	2.76***
Age 45-54	0.075	0.141	-3.08***
Age > 55	0.037	0.059	-1.50
Married	0.340	0.263	2.51**
Elementary education	0.026	0.022	0.39
High school education	0.270	0.133	5.19***
University education	0.621	0.780	-5.23***
M.sc and Ph. D	0.080	0.063	0.99
Private Sector	0.345	0.304	1.30
Public employment	0.142	0.163	-0.86
Business owner	0.101	0.096	0.25
Professional	0.080	0.029	3.48***
Student	0.227	0.237	-0.35
Retired	0.048	0.089	-2.35**
Unemployment and housewife	0.053	0.078	-1.48
Monthly income<1000	0.412	0.401	0.33
Monthly income 1000-2000	0.308	0.275	1.08
Monthly income 2000-3000	0.158	0.182	-0.94
Monthly income 3000-4000	0.034	0.078	-2.75***
Monthly income > 4000	0.085	0.063	1.26
Region lived: Mediterranean	0.313	0.602	-8.58***
Region lived: Aegean	0.107	0.092	0.75
Region lived: Marmara	0.396	0.141	8.79***
Region lived: Central Anatolia	0.093	0.100	-0.35
Region lived: Black Sea	0.067	0.014	4.24***
Region lived: East Anatolia	0.021	0.029	-0.75
Region lived: South East Anatolia	0.000	0.018	-2.61***

Note: * significant at 10% level
**significant at 5% level
***significant at 1% level

Table 4. *Composition of trekking and control group*

Variable	Training group frequencies	Control group frequencies	*z*-test for differences
Male	0.732	0.527	6.29***
Age 24	0.062	0.353	-10.30***
Age 25-34	0.264	0.308	-1.45
Age 35-44	0.295	0.137	5.88***
Age 45-54	0.376	0.141	8.24***
Age > 55	0.094	0.059	2.00**
Married	0.445	0.263	5.75***
Elementary education	0.031	0.022	0.85
High school education	0.235	0.133	4.01***
University education	0.617	0.780	-5.38***
M.sc and Ph. D	0.146	0.063	4.18***
Private Sector	0.340	0.304	1.15
Public employment	0.246	0.163	3.12***
Business owner	0.157	0.096	2.79***
Professional	0.240	0.029	9.83***
Student	0.015	0.237	-9.43***
Retired	0.136	0.089	2.26**
Unemployment and housewife	0.020	0.078	-3.84***
Monthly income<1000	0.162	0.401	-7.78***
Monthly income 1000-2000	0.413	0.275	4.38***
Monthly income 2000-3000	0.198	0.182	0.61
Monthly income 3000-4000	0.125	0.078	2.37**
Monthly income > 4000	0.099	0.063	2.01**
Region lived: Mediterranean	0.219	0.602	-11.52***
Region lived: Aegean	0.340	0.092	9.36***
Region lived: Marmara	0.324	0.141	6.64***
Region lived: Central Anatolia	0.073	0.100	-1.42
Region lived: Black sea	0.020	0.014	0.70
Region lived: East Anatolia	0.005	0.029	-2.63***
Region lived: South East Anatolia	0.015	0.018	-0.35

Note: * significant at 10% level
**significant at 5% level
***significant at 1% level

4.1 Outcome variable

Life Satisfaction: The outcome of all samples is defined as life satisfaction. The factors which affect the LS of individuals are ordered such as taking pleasure from daily life, finding life meaningful, harmony in reaching goals, positive individual personality, confidence in physical health, economic security and positive social relationships (Schmitter et al., 2003; Otacioglu, 2008). Other factors are mental and physical wellness, health and confidence, relation with family and relatives, having a child, close relation in marriage, having close friends, helping others, participating in domestic and national activities,

participating in recreational activities, learning, understanding him/herself, working, reading, listening to music, watching movies and matches, age, occupation, income level, education opportunities and level, quality of life (Bruce et al., 1976; Sung- Mook and Giannakopoulos, 1994; Palmer et al., 2001; Schmitter et al., 2003; Ngai, 2005; Augusto et al., 2006; Sahin, 2008; Ardahan, 2011a; Ardahan, 2011b; Faullant et al., 2011). LS were measured as a continuous variable from 1 to 5. The average LS of participants in outdoor activities was equal to 3.26 and the average LS of mountaineers/rock climbers, trekkers and cyclers were 3.27, 3.36 and 3.16 respectively. All the groups were higher from the average LS of control group which is equal to 3.07.

4.2 Results of the estimation

Dehejia and Wahba (1999, 2002) and O'Backer and Ichino (2002) explained the algorithm used for estimating propensity-scores in seven steps. (See at Rosenbaum and Rubin, 1983; Rosenbaum and Rubin, 1984; Dehejia and Wahba, 1999; Becker and Ichino, 2000; Dehejia and Wahba, 2002; Nevgard et al., 2004; Nivorozhkin, 2005; Stuart, 2010)

A Logit function (Table 5) was used to estimate the propensity score of the models which the treatments were outdoor sporting (overall sample except control group), mountaineering/rock climbing, trekking and cycling separately. In the case outdoor sporting the number of block was determined as 7 at significant level 5%. These numbers of blocks ensured the mean propensity scores of treated and control group were equal in all blocks at a significant level of %5. When the test of balancing property was performed for the full sample the hypothesis of each covariate did not differ between the treated and control blocks and was rejected in some blocks for a few variables at a significant level of 1%. To achieve the balancing property, significance level was used as 0.1% and the base level was rearranged as being a student instead of unemployment. The numbers of blocks were determined as 6 and these numbers of blocks ensured that the mean propensity score was not different for treated and controls and that the balancing property was satisfied for all covariates in each block. Similarly, the number of blocks was 7 in the case that treatment was mountaineering/rock climbing. Eight variables did not satisfy the balancing property in 5 different blocks. At the significance level of 0.1%, 6 blocks were determined and 3 variables were unbalanced in 2 blocks. When the variable age>55 was discarded, the balancing property was satisfied and the block number was determined as 5. The propensity score was estimated for the treatment trekking and the number of block was determined as 8. When the equal means test was performed for the trekking sample at 1% significance level, the hypothesis of equal means was rejected for 8 variables in 3 blocks. To achieve the balancing property, significance level was used as 0.1% and base level was rearranged as living in the Aegean region instead of Central Anatolia whereas age>55 was discarded. Final block number was 7 and these numbers of blocks ensured that the mean propensity score was not different for treated and controls and that the balancing property was satisfied in each blocks. For the cycling sample, significance level was set as 0.1% and base level was arranged as public employment after which being a student was discarded. The number of blocks was determined as 5 and the hypothesis of equal means was not rejected for any variable in any of the blocks. Since according to the algorithm of propensity score estimation, the common support condition was imposed and observations from the control group with excessively high or low propensity scores were discarded. Lechner (1999) argues that discarding some observations may lead to serious bias in the estimation results, but in all samples only a few observations were discarded. Figures 1, 2, 3 and 4 show the number of observations in the blocks according to estimated propensity scores. As one would expect, the numbers of treated and control group observations in blocks are very different. In most blocks if the number of treated observations

are low, control group observations are high and vice versa. This should not bias the results, since the algorithm ensures that treated and control observations are similar in each block.

Table 5. *Results from the logistic model; dependent variable: "treatment" as mountaineering/rock climbing, trekking and cycling.*

Variable	Full Sample	Mountaineering /rock climbing	Trekking	Cycling
Male	1.192***	0.964***	1.018***	1.804***
Age 25-34	1.031***	1.250***	0.889***	0.778***
Age 35-44	1.770***	2.229***	2.095***	1.034***
Age 45-54	1.395***	1.709***	2.208***	-0.104
Age > 55	1.382***	1.464***	-0.060	-0.136
Married	0.133	0.172	-0.028	0.490**
High school education	0.900**	2.062***	0.525	0.968*
University education	0.326	1.610**	0.332	0.174
M.sc and Ph. D	1.143**	2.422***	1.260**	0.713
Private Sector	1.010***	1.252***	1.746***	0.584
Public employment	1.230***	1.355***	1.688***	0.739*
Business owner	0.792**	0.706	-0.409	0.581
Professional	1.528***	1.464***	2.008***	1.139**
Student	1.168***	1.553****	-0.379	0.894**
Retired	0.636*	0.899*	1.185**	0.211
Monthly income 1000-2000	-0.186	-0.276	0.173	-0.334
Monthly income 2000-3000	-0.647***	-0.387	-0.564*	-0.681**
Monthly income 3000-4000	-1.113***	-1.108***	-0.841**	-1.854***
Monthly income > 4000	-0.520*	-0.711*	-0.445	-0.325
Region lived: Mediterranean	-0.644***	-1.224***	-0.349	-0.122
Region lived: Aegean	0.975***	0.569*	1.945***	0.302
Region lived: Marmara	1.142***	0.864***	1.489***	1.461***
Region lived: Black sea	1.464***	1.512**	1.838***	1.658***
Region lived: East Anatolia	-0.848**	-1.430***	-1.765**	-0.136
Region lived: South East Anatolia	-0.226	0.202	0.345	(omitted)
Constant	-2.418***	-4.616***	-4.678***	-3.332***
Number of observations	1719	964	920	901
Pseudo-R^2	0.21	0.24	0.33	0.24
Log-likelihood	-835.81	-500.22	-417.47	-460.26
Prob > Chi^2	0.000	0.000	0.000	0.000

Note: * significant at 10% level
**significant at 5% level
***significant at 1% level

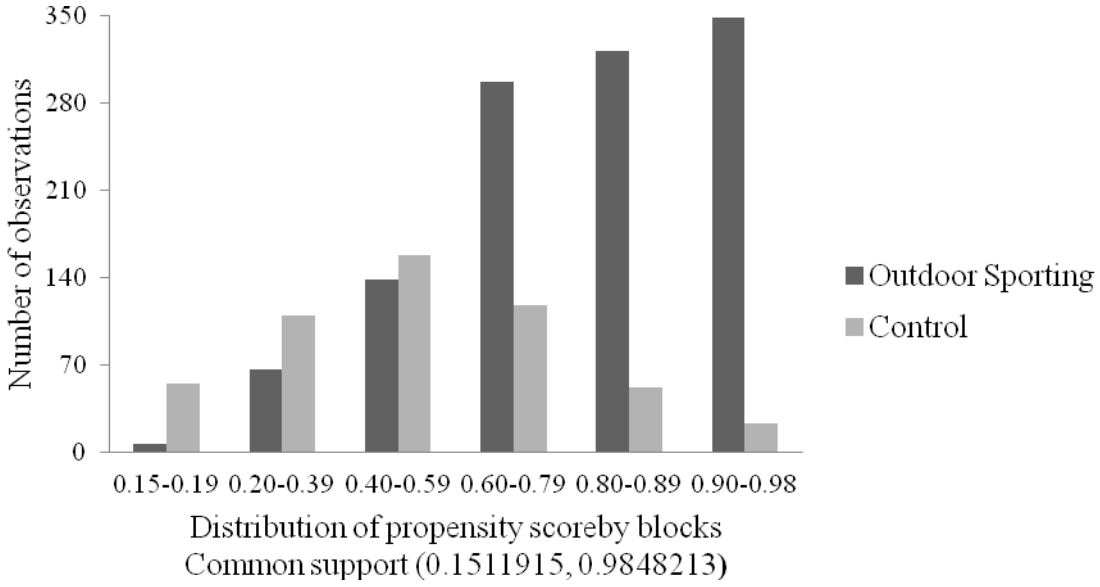

Figure 1. *Histogram of the estimated propensity score.*

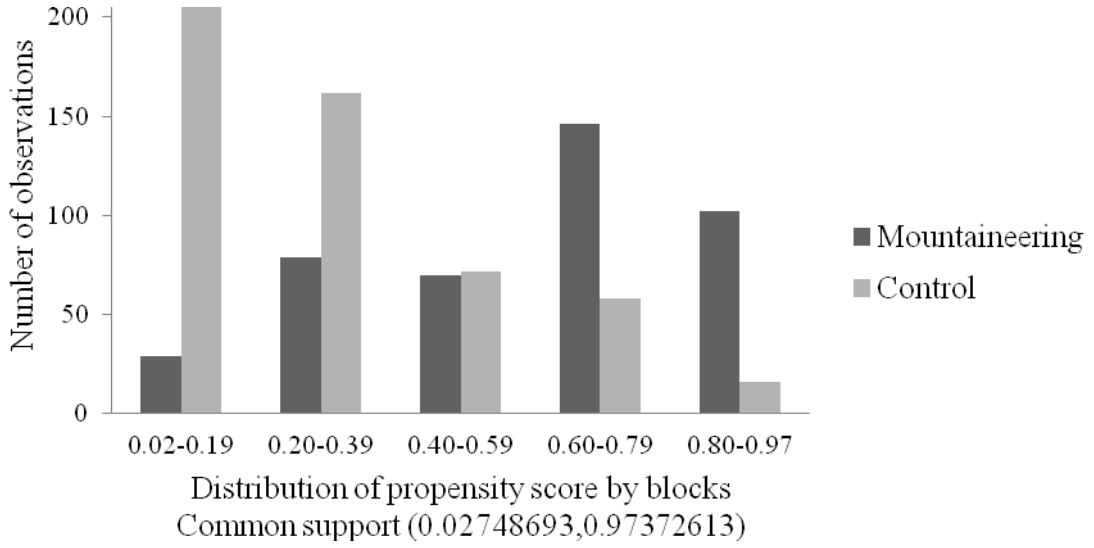

Figure 2. *Histogram of the estimated propensity score.*

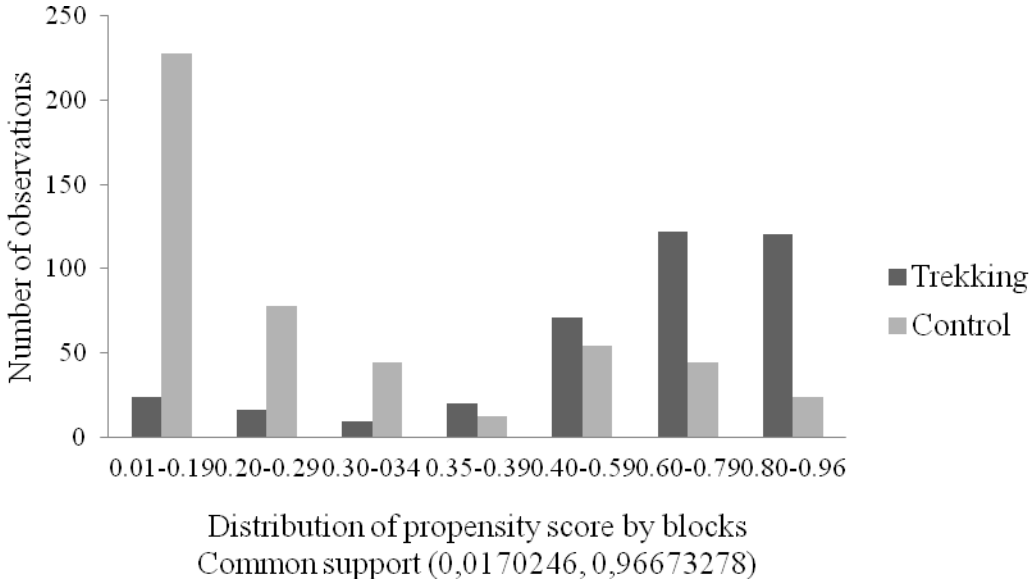

Figure 3. *Histogram of the estimated propensity score.*

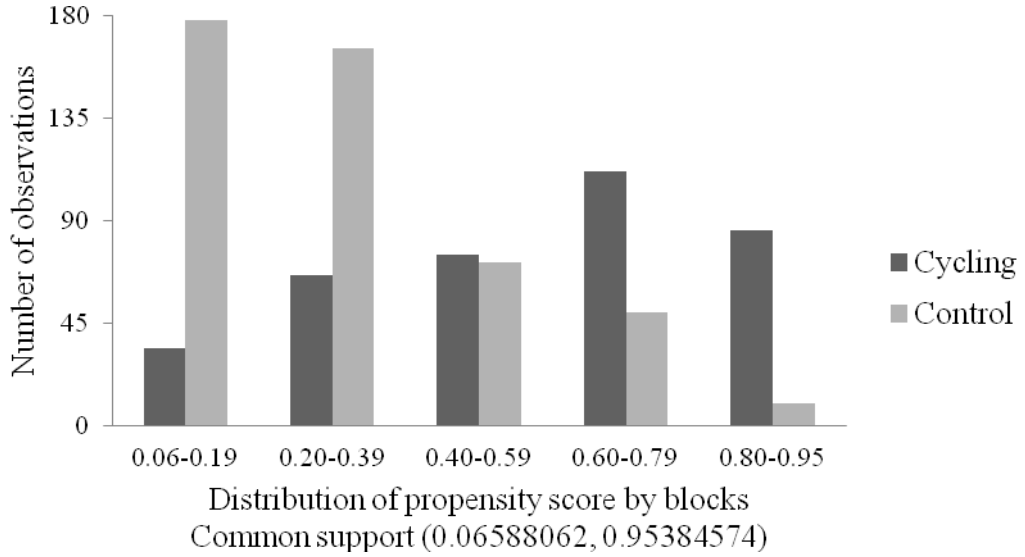

Figure 4. *Histogram of the estimated propensity score.*

4.3 Estimation treatment effect

Before using any statistical matching method, the average LS of participants in outdoor activities was equal to 3.26 and the average LS of mountaineers/rock climbers, trekkers and cyclers were 3.27, 3.36 and 3.16 respectively. All the groups were greater than the average LS of the control group which was equal to 3.07. The effect of participating in outdoor activities, mountaineering/rock climbing, trekking and cycling on LS seemed to be 6.1% ((3.26-3.07)/3.07), 6.5% ((3.27-3.07)/3.07), 9.4% ((3.36-3.07)/3.07) and 2.9% ((3.16-3.07)/3.07).

To compute the average treatment effect of participating in outdoor activities on LS accurately, we had to match the treated and control group observations exactly with each other on the basis of the propensity score. In practice, it was never possible to match the scores exactly, therefore in this study we used four matching methods which were nearest neighborhood, kernel, stratification and radius (radius was taken 3 different values as 0.1, 0.01 and 0.001) matching and compared the results. The details of these methods can be found in the study of Becker and Ichino (2002).

The stratification estimator repeats all the steps used in the estimating propensity score. In addition to this in the final step, the simple difference between average LS of the treated and control groups was calculated for each block. These differences were then weighted by the number of treated in each block. According to Cochran (1968), using five strata or grouping the sample into quintiles will eliminate more than 90- 95% of the covariate bias. The results of stratification estimations of Average Treatment effect of Treated (ATT) are reported in Table 6, in both absolute and relative terms. The relative result, calculated as the ratio of the absolute estimated effect to the mean LS of the control group, indicated the magnitude of the effect.

Table 6. *Stratification estimates of the average effect of outdoor activities on mountaineers / cyclists / trekkers*

	Effects on life satisfaction of outdoor activities	**Number of observations**	
		Treated	**Control**
Outdoor Sporting	0.315 (4.84) *10.3%*	1181	518
Mountaineering/rock climbing	0.303 (3.63) *9.8%*	426	532
Trekking	0.415 (3.37) *13.5%*	382	484
Cycling	0.225 (2.54) *7.3%*	373	476

Note: *t*-statistics in parenthesis, relatively effect in italic, standard errors were calculated by bootstrap method (100 replications).

The stratification estimator showed positive effects of participating in outdoor activities, mountaineering/rock climbing, trekking and cycling for the samples. Participation in trekking had the highest effect on LS and increased the LS by 0.415 and contributed by 13.5% to the individuals. Cycling had the lowest effect on LS and also increased LS by 0.225 while contributing by 7.3% to the individuals. Mountaineering/rock climbing had a positive effect on LS and increased by 0.303. The effects of mountaineering/rock climbing, cycling and trekking are significant at 1% level. It was also determined that the stratification estimator did not discard any of the treated observations in any of the samples. However, in the case of outdoor sporting, 20 control group observations; in the case of mountaineering/rock climbing, 6 control group observations; in the case of trekking, 54 control group observations and finally, in the case of cycling, 62 control group observations were discarded.

Radius matching is another alternative method to compute ATT. In this method, every treated observation is matched with a corresponding control observation that is within a predefined interval of the treatment observation's propensity score. Since each of the treated observations must be matched with a control observation in a given interval, only a certain number of comparisons will be available. Using a smaller radius makes sure that estimates are more precise and accurate. But many treated observations might not find a match with a control observation because of a small radius and would be kept out of the sample. Table 7 shows the estimation results for three radius measures. Smaller radius decreased the number of observations in all samples as was considered. In the case of outdoor sporting, while radius was 0.1 only 20 control group observations was excluded from the analysis and this number increased as radius decreased. It was similar for all the other cases. For all radii in all cases, the ATT of those participating in outdoor activities on LS were positive and close each other.

Table 7. *Radious estimates of the average effect of outdoor activities on mountaineers/cyclists/trekkers*

	Radius	Effects on life satisfaction of outdoor activities	Number of observations	
			Treated	Control
Outdoor Sporting	0.1	0.286 (4.79) *9.5%*	1181	518
	0.01	0.303 (4.85) *10.1%*	1144	510
	0.001	0.275 (3.54) *9.1%*	522	410
Mountaineering/rock climbing	0.1	0.258 (4.01) *8.5%*	426	532
	0.01	0.276 (3.81) *9.1%*	374	522
	0.001	0.297 (2.56) *10.1%*	209	294
Trekking	0.1	0.357 (3.84) *11.8%*	382	484
	0.01	0.414 (3.52) *13.8%*	344	444
	0.001	0.327 (3.14) *11%*	92	144
Cycling	0.1	0.136 (2.13) *4.4%*	373	476
	0.01	0.106 (1.40) *3.4%*	326	456
	0.001	0.102 (0.84) *3.3%*	135	242

Note: *t*-statistics in parenthesis, relatively effect in italic, standard errors were calculated by bootstrap method (100 replications).

Nearest neighborhood matching and radius matching are similar. Both aim to find the best match. In this method, the absolute value of the differences between estimated propensity scores of paired treated and control group observations are minimized. First, the control and

treated group observations are ordered randomly. Then the first treated observation is selected along with a control observation with a propensity score closest in value to it. This method provides us an advantage more than radius matching since any treated observation was not discarded, each treated observation had a match definitely. And also the nearest neighborhood matching method uses the sampling with replacement procedure, which means that a control observation can be used for comparison with more than one treated observation. The only problem of this matching method is that some of the differences between estimated propensity scores of matched observations may be higher. This means that matched observations are not close to each other. Table 8 shows the results of the nearest neighborhood matching estimator. Participation in trekking had the highest effect on LS and increased the LS by 0.532, and contributed by 18,7% to individuals. Cycling had the lowest effect on LS and also increased LS by 0.146 and contributed by 4.8% to individuals. Mountaineering/rock climbing has a positive effect on LS and increased by 0.368. The effects of mountaineering/rock climbing, cycling and trekking were significant at 1% level. We also found out that the nearest neighborhood estimator did not discard any of the treated observations in any of the samples. But more control group observations were excluded according to stratification and radius (0.1) estimators. 114, mountaineering/rock climbing 206, trekking 334, cycling 254 control group observations were discarded for outdoor sporting so that the estimations of ATT on LS were not close to the other results.

Table 8. *Nearest neighborhoods estimates of the average effect of outdoor activities on mountaineers/cyclists/trekkers*

	Effects on life satisfaction of outdoor activities	**Number of observations**	
		Treated	**Control**
Outdoor Sporting	0.336 (5.00) *11.4%*	1181	424
Mountaineering/rock climbing	0.368 (3.88) *12.6%*	426	332
Trekking	0.532 (4.25) *18.7%*	382	198
Cycling	0.146 (1.37) *4.8%*	373	284

Note: *t*-statistics in parenthesis, relatively effect in italic, standard errors were calculated by bootstrap method (100 replications).

Finally Kernel matching was used to estimate ATT on LS. This method runs as radius matching method. Every treated subject is matched with the weighted average of the control subjects. The weights are inversely proportional to the distance between the estimated propensity scores of treated and control group observations. In addition Kernel matching ensures that no observations are lost. Kernel matching estimates are presented in Table 9. And they were broadly in line with the previous results.

Table 9. *Kernel estimates of the average effect of outdoor activities on mountaineers/cyclists/trekkers*

	Effects on life satisfaction of outdoor activities	Number of observations	
		Treated	Control
Outdoor Sporting	0.331 (5.73) *11.2%*	1181	518
Mountaineering/rock climbing	0.338 (4.65) *11.5%*	426	532
Trekking	0.434 (4.79) *14.7%*	382	484
Cycling	0.220 (2.70) *7.4%*	373	476

Note: Standard errors in parenthesis, standard errors were calculated by bootstrap method (100 replications).

5. DISCUSSION AND CONCLUSIONS

This study undertakes an in-depth analysis of participating in outdoor activities for non-participants. It investigates the effects of some outdoor actives like mountaineering/rock climbing, trekking and cycling on life satisfaction. In order to control for a variety of variables that might contribute to different results for treated and control groups, propensity scores were estimated and used in four different statistical-matching procedures: stratification, nearest-neighborhood, radius (with three different radius) and kernel. And also Ardahan and Mert (2013) verified that participating in any outdoor activities had statistically positive effects on LS by using linear regression. And similarly, they found that trekking had the biggest and cycling had the smallest effect on LS as a result of the comparisons of coefficients. In addition to Ardahan and Mert (2013), this paper determined the relative affects as percentages of participating in outdoor activities on LS. Ardahan and Mert (2013) used linear regression model to analyze impact of some independent variables on life satisfaction. These variables are same variables we used. Beside this variables, they used Emotional Intelligence (EQ) level of participants with four sub-dimensions. In this study, EQ level of participant was not included into analyses since this variable had not significant effects on life satisfaction for all sub-dimensions in the study of Ardahan and Mert (2013). Instead of EQ level, we used the regions which participants lived in Turkey in the model. This is the one of the differences of the current study. According to results of logistic model, only South East Anatolia variable has not significant effects on life satisfaction for full sample, mountaineering/rock climbing, trekking and cycling while all the other regions have significant effects. Because of this result, policymakers should think to improve outdoor activities especially in South East Anatolia region in Turkey to get higher life satisfaction. Another difference of the current study from Ardahan and Mert (2013) is the method used. Propensity matching methodology committed irrelevant observations analyzed. That is, the results are robust and more reliable than any linear model. The cumulative effects of the variables are used by matching scores and then finally the relative effects are realized. In the current study, the relative effects of outdoor activities on life satisfaction are obtained.

Compared with those registered as non-participants in outdoor activities, this study found positive and statistically significant effects on the LS. The average LS of participants in outdoor activities was equal to 3.26 and the average LS of mountaineers/rock climbers, trekkers and cyclers were 3.27, 3.36 and 3.16 respectively. All the groups were higher from the average LS of control group which was equal to 3.07. The effect of participating in outdoor activities, mountaineering/rock climbing, trekking and cycling on LS seemed to be %61, 6.5%, 9.4% and 2.9%. When the matching methods were used we found that participating in any outdoor activities increased LS about 9.1-11.4%. Especially this study analyzed the effects of mountaineering/rock climbing, trekking and cycling on LS and found that trekking had the biggest effect (13.5-18.7%) and cycling had the lowest effect (4.4-7.4%).

From all these results; policymakers and government should take roles to raise the participation on outdoor activities especially trekking, in Turkey to get higher life satisfaction. May be educational system should be reorganized. From the primary school to the university level, the lessons about the outdoor activities should be added. Besides, government should support all outdoor clubs and make outdoor equipments to be free of task for people and free of charge for public outdoor clubs to promote people to participate activities for high level of life satisfactions.

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