The Influence of Peer Effect in Sports Behavior Among Youth Students

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Abstract:

Over the years, many researchers have studied the motivations that influence a person's behavior on physical activity. Can't deny that motivation plays an essential role in affecting a person's physical activity behavior. Among the many aspects of the motivations, the peer effect is likely to play a significant part in this process. This paper examines to what degree the peer effect influences people's physical activity behaviors, especially youth students. Through Social network analysis, Clustering, and Linear Regression Model in Python, the paper generalizes the primary factor affecting a youth student's physical activity and to what degree the factor plays a role in youth students' sports behaviors. Through the previous research and the technical analysis within the paper, some pedagogical implications are illustrated in the hope of supporting the physical activities guidance and teaching among youth students.

Keywords: students; physical activity, friendship, peer effect, Python, social networking analysis

1. Introduction

A person's sports behavior might be affected by many factors; among all related factors, motivation takes an essential role in a person's physical activity behavior. Generally speaking, there are many aspects in the definition of motivation; the peer effect is likely to play a significant part in the process. Therefore, focusing more specially on this paper, we will investigate only one aspect of the motivations - peer effect: how peer effect influences sports behavior. Namely, to what extent the peer effect influences people's physical activity behaviors. The target object of the paper is mainly youth students. The purpose of this paper is to figure out if the peer effect influences a youth student's sports behavior and to what degree it plays a role in youth students' physical activity. In the first part, we will focus on introducing the key research designs, context, and data collections of the relevant previous studies. In the second part, we will create our own analysis in Python through networking analysis, clustering, and linear regression model to generalize the two main questions we want to find out. In the third part, we will make a conclusion for what we found in previous studies and our own technical analysis, with the hope that our findings illustrate some pedagogical implications and help with supporting youth students' physical activities.

II. Literature Review and Hypothesis

Peer is commonly considered as an input to students' production under the education production function. By definition, 'peer effect' exists when a student learns from other classmates and is influenced by their peers' personality, learning attitudes and hobbies. Researchers have investigated peer effects in various peer types and school levels. According to Sacerdote (2011) study, students are always affected by peers in a disproportionate way. The

‘peer effect’ could not only bring the positive externality but also promotes the negative externality.

The shining light model indicates the positive externality of ‘peer effect’ that a few students with outstanding performance in class could positively enhance peers’ performance by inspiring all students to increase their achievement (Lazear, 2001). This model was proven by the study of Hoxby (2002). In Hoxby (2001) study, he intended to investigate the peer effects among 3rd, 4th, 5th and 6th graders in public school. He divided the treatment group by gender and found out that there is an increase of 0.55 points when a student is surrounded by peers who score 1 point higher.

By contrast, the bad apple model represents the negative externality of the ‘peer effect’ that students with poor academic outcomes might negatively influence the academic performance of peers (Lazear, 2001). This model was reinforced by the study of Zimmerman (2003). In Zimmerman (2003) study, he investigated the peer effects among the college students at dormitory level at Williams College. The results of his study demonstrate that students who have a roommate in the bottom 15% of SAT verbal distribution might be associated with 0.088 points GPA reduction.

Although there are numerous studies focusing on investigating the relationship between ‘peer effect’ and students’ academic performance, there are some researchers concentrating on exploring the relationship between ‘peer effect’ and students’ physical activities. The researchers of Jago et.al (2009), Ali et.al (2011), Stearns et.al (2018) used qualitative assessments and quantitative assessments to analyze the association between peer effects and physical activities.

In Jago et.al (2009) study, researchers analyzed the relationship between peers' friendship and physical activities by using the qualitative method. According to their study, 'friends and peers' could be one of the significant factors which promotes children to attend physical activities based on the self-determination theory (Jago et.al ,2009). They invited 113 children around 10 years old from 11 schools to participate in the focus group and tell them the information about physical activity and friends. They recorded each conversation and transcribed verbatim by three researchers. According to their analysis, there is a clear association between physical activity and peer group status among boys (Jago et.al ,2009). Many participants report that their peers had motivated them to initiate physical activities by three mechanisms which are co-participation, modeling of being active and verbal support.

Ali et.al (2011) also created a study to investigate the association between 'peer effect' and weight-related behaviors of adolescents which include exercising, playing active sports, hours of TV, hours of sleeping etc. They collected data of grade 7^{th} to grade 12^{th} adolescents from the National Longitudinal Survey of Adolescent Health and used the data of 3,898 numbers of adolescents and their peers. Among those adolescents, approximately 85% of them come from the same school. Ali et.al (2011) used the linear regression model and probit models to estimate the correlation between 'peer effect' and weight-related behaviors. According to the linear regression model, Ali et.al (2011) found out 'peer effect' is positively correlated with sports participation and individual exercises. If the proportion of friends for an individual increased by 10 percentage points, the likelihood of individual exercise might enhance by 0.79 percentage points (Ali et.al, 2011).

In Stearns et.al (2018) study, researchers used the Multiple Regression- Quadratic Assignment procedure to examine the association between peers' friendship and children's

physical activity. They intended to find out whether close and best friends were more similar in their physical activity than no-friends. They collected data from 706 students from 5th grade in 27 schools and used a whole-network approach via Netdraw to identify the relationships among children of the same gender (non-friends, close friends, best friends) in the same school. In order to test the amounts of physical activities that children participated in, they used the pedometer as an objective measure to record the steps/hours of each child and used a linear regression procedure to calculate the observed beta coefficient between children' relationships and step/hours. Consequently, the results are consistent with their hypothesis that female friends have similar amounts of physical activities with each other. The difference in amounts of physical activities between females who were not friends was 20 steps/hour higher than that of females who were close friends.

According to those previous studies, we can see a positive correlation between 'peer effect' and students' physical activities. However, different studies utilize different methods to evaluate physical activities. Jago et.al (2009) used numbers of sports types to measure the physical activities; Stearns et.al (2018) used steps/hours to represent the physical activities. In our study, we are going to use the average time-spending on sports each week and frequency to define the degree of likelihood of physical activities.

III. Research Procedure

The sample of this study is going to be 100 students of grade 7 to grade 9 at the same junior high school in the US. They might have courses together or join the same clubs, so they can make friends with each other.

In terms of friendship, we are going to measure it during the last week of the semester by instructing students to dominate their friends in the school. Besides, students need to report the friendship duration on a scale of 1-5 (1 = within one semester; 2 = within one year; 3 = within two years; 4 = within three years; 5 = more than three years). In addition, the friendship quality is measured on a scale of 1-5 (1 = low; 2 = from low to medium; 3 = medium; 4 = from medium to high; 5 = high). Calculate friendship importance by implementing log transformation of friendship duration * friendship quality.

We are going to assess sports behaviors twice with the question: How many hours do you spend on playing sports or doing exercise in a typical week? The first assessment is during the first week of a semester, thus the sports behavior score reflects the baseline. The second assessment is during the last week of a semester, thus the sports behavior score reflects the current frequency. The sports behavior change is calculated by minus baseline sports behaviors from the current sports behaviors. Therefore, positive sports behavior change scores indicate an increasing sports frequency, whereas negative sports behavior change scores indicate a decreasing sports frequency. Apart from this, we look at an individual's average nominated friend's sports behavior by calculating the mean sports behavior scores of those who are nominated as friends. Whereas those who are not nominated are excluded from this variable, even in the case that they report themselves as a friend of this individual.

This study is going to control environmental factors from family and community, so we assess them before the semester by asking: (1) How many hours do the parents/guardians play sports or do exercise in a typical week? (2) How accessible are public recreational facilities in your neighborhood? (1 = not accessible at all; 2 = from low to medium; 3 = medium; 4 = from high to medium; 5 = highly accessible)

IV. Data Analysis

The first step is to build a directed adjacency matrix based on the friendship with the friendship importance (log transformation of friendship duration * friendship quality)as weight. If student *i* named student *j* as a friend, with a friendship importance *q*; then the *i,j* entry in the matrix will be a *q*. Delete participants with any missing data. Then, use Python to implement the social network analysis in order to explore the overall characteristics of friendship at school by calculating the density and centrality. Detect community patterns at school so that we can divide the sample into different groups. Based on the group classification, implement ANOVA to find any between-group differences in physical activities.

The second step is to implement a linear regression analysis with Python. The predicting equation is: $Y = \beta_1 x_1 + \beta_2 x_2 + \varepsilon.$ The predictors include: x_1 : friends' average physical activity; x_2 : control variables(physical activity baseline; family factor; public recreational facility accessibility). The predicted variable is Y: current physical activity change. All variables need to be standardized.

V. Result

In hypothesis, there will be several communities in the school based on the adolescents' network of friendship at school, depending on the friends nomination patterns and the friendship importance between each other. The main effect of group is significant, which means that there is between-group difference for the physical activities. Some communities have members who show a higher level of physical activities than other communities. This outcome indicates the peer effect within a closely related friend circle.

Besides, the second hypothesis is that an individual's friends' average physical activity change can statistically significantly predict an individual's physical activity change after controlling for the pretest physical activity and environmental factors. This analysis focuses on physical level change before and after the semester, thus further indicating the dynamics of peer effect. This analysis is predicted to be more sensitive because the predicted variable has a larger scale from negative to positive, compared to the overall physical activity frequency.

VI. Discussion

This research is meaningful and important to explore the peer effect in adolescent physical activity frequency. According to the previous literature in this area, we predict to detect a salient peer effect in the study and the effect size is expected to be around the medium level.

In practical terms, schools and parents should leverage such an effect to encourage adolescents to imitate their athletic friends by taking part in physical activities together so that they can control body fat percentage in a healthy way. In addition to this, we believe that when teachers in school realize the role of peer effect in students' physical activity, they will be able to apply it in the pedagogical methods to promote more students in doing exercise or any other sports while enjoying with friends or classmates. For instance, teachers can use it to arrange group activities when necessary. It might be able to promote and encourage more students who are slightly less active during the physical activity to enjoy more and increase their activity hours by their peers who are more involved in the group.

However, this approach should be guided carefully in order to prevent possible discrimination in schools. In fact, previous statistics have shown that athletic students tend to be the most popular among their peers(Buchanan, Blankenbaker, & Cotten, 1976), whereas obesity

might cause social marginalization at school(Strauss & Pollack, 2003). The thoughtless and reckless suggestion from adults about friend selection might arouse a dangerous biased culture. A better way to apply our research findings into practice is to encourage friends to spend time together playing sports or doing exercise rather than sedentary activities.

Future research should pay attention to a generalized peer effect that not only considers friends but also includes all the companions that spend time together. Besides, it is also worthy to examine the influence of competency in addition to friendship that are discussed in this study.

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