Analysis of School-Based Physical Activity Network by Secondary School Students

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Abstract

The purpose of this study is to investigate establishing oneself through the network analysis appearing from the learners' physical activity within a middle school group. 494 students in B Public Middle School for both sexes located in A City were selected as the subjects in order to apprehend the structure and distribution of the physical activity network of middle school students. The questionnaires collected through the peer designation method were input according to the 1 Mode coding procedure of the social network analysis and were analyzed by means of R program, a statistical program. As a result, first, a big difference was not found between men and women in the density among physical activity network attributes of total students. Second, the physical activity network of female student group was separated into 2 or 3 subgroups and the male student group formed a huge subgroup. Third, the central men, connectors, and outsiders existed certainly with the subgroup in both physical activity network of total students and one of students in each grade. Fourth, it was shown that the number of male students was bigger than one of female students in connectors among the physical activity network of total students. Fifth, the number of outsiders was 103 among the physical activity network of total students, which was about 21% of total students. The ratio of male students and female students was about 55:45, and as higher the grade was, the bigger the number of students alienated from the physical activity network was.

Keywords: Social network, Physical activity, Hub, Linker, Isolated

1. Introduction

Human beings control themselves through numerous forms of social ties like their roles in groups, solidarity with others, sharing values and such [1], and form their sense of self-identity by expanding relationship with others [2]. It is because one of the [1]most important things in living is forming 'relationship' with others. Knowing with whom and how we make relationship would explain human behaviour and phenomenon [3]. In this context, there have been attempts to analyze human relationship making with the flow of information. Through this analysis, behaviour prediction and analysis has become possible depending on the whether the flow of personal information belongs to a network and if it is, how strong the degree of connection is [4]. Previous studies on

networks including these points show unexpected existence of similar forms of networks in various areas.

Therefore, purpose of this study is to identify individual positioning through network analysis on learners' physical activities in a middle school group. More specifically, it aims to identify who are the hub, linker and isolation of the middle school group network mediated through physical activity and its aspects. The results will provide primary data necessary for educational fields to understand learners' social relationship structure in school group medicated through physical activity and formation of ties between individuals and groups.

2. Research method

2.1. Research subject

In order to identify the structure and distribution of middle school students' physical activity networks, 494 from school B, a co-ed public middle school located in city A. For general characteristics of research subjects, 254 of total students were male and 240 were female. More specifically, there were 85 male students and 79 female students in the first grade, 85 male students and 80 female students in the second grade and 84 male students and 81 female students in the third grade.

2.2. Research tool

A peer nomination method, one of the social measurements, was used to inquire physical activity networks. Data generated by NGQ(Name Generator Questions), which allows respondents to write down the names of their peers, was made into a matrix form to represent relationship variables.

2.3. Data analysis

The collected questionnaires were input according to the 1 Mode coding procedure of Social Network Analysis, and then the images of the physical activity network structure were created using the statistical program R program and the attributes of the network were analyzed. Through the analysis of all students, various connection patterns and distribution within the group were derived.

3. Major findings

3.1. Physical activity network visualization

3.1.1. Comparison of physical activity of all students

As shown in [Figure.1], the physical activity network of all students is found to be largely divided into female student group on the upper, male students group on the lower and group on students who are not connected to anyone on the right. Also, there are hubs and linkers of physical activity in both male and female student groups, and there were isolations that do not engage in physical activity with anyone outside the groups. In addition, if we look at female and male student group, we can see that female students have strong mutual link between small numbers of members while male students form a broad connection.

3.1.2. Comparison of physical activity network of students by grade

As [Figure. 2-4] shows the physical activity network by grade, 1st grades are largely composed of the upper male students group and lower female students group, the 2nd grades with male students group in the middle and female students group on the lower and partially on the upper, and 3rd grades with upper and lower female students group and the middle male students group. In common, they have students who are not connected to anyone on the upper right. In male and female student group, there each exist hubs and linkers of physical activity, and there are isolations outside the groups. Taking a look at female and male student groups by each grade, 1st grade female students have loose mutual connection among minority members in around 1 subgroup, and 2nd and 3rd grades are divided into 3 subgroups and have strong mutual link among their members. On the other hand, male students of 1st, 2nd, and 3rd grades commonly have broad connections in one subgroup, with the hub at its center.
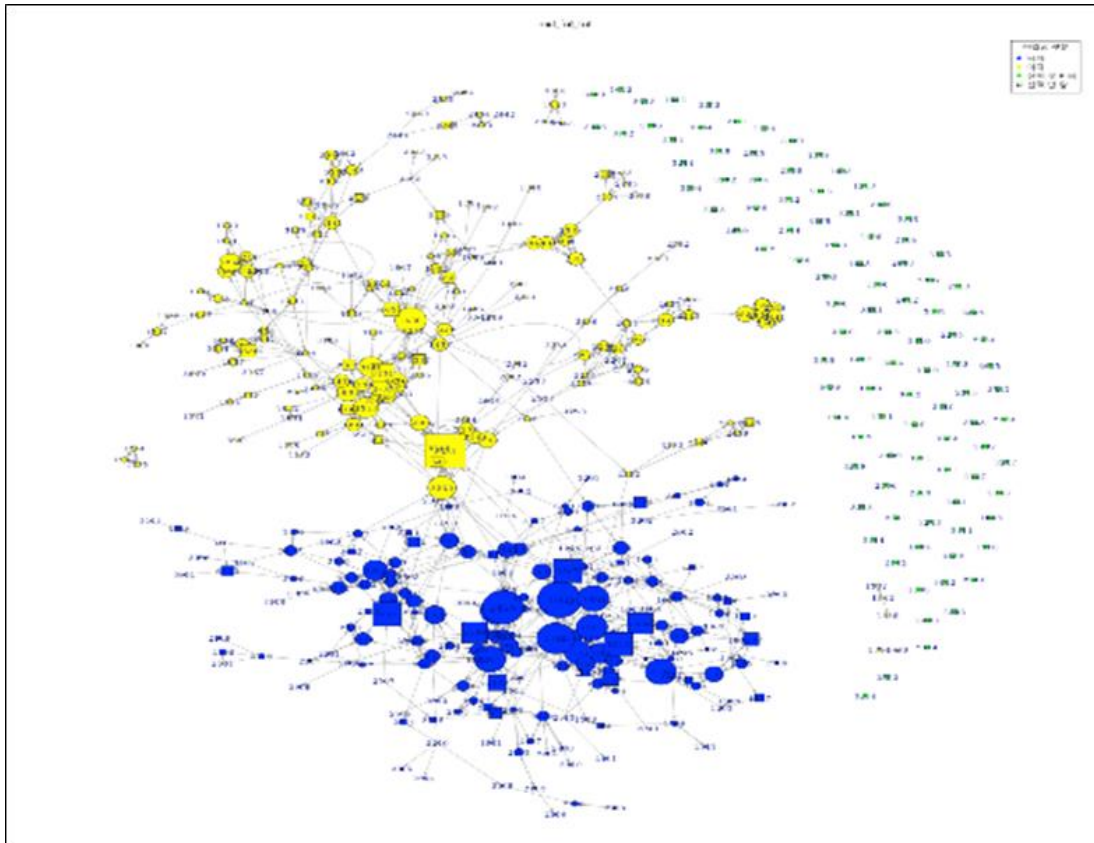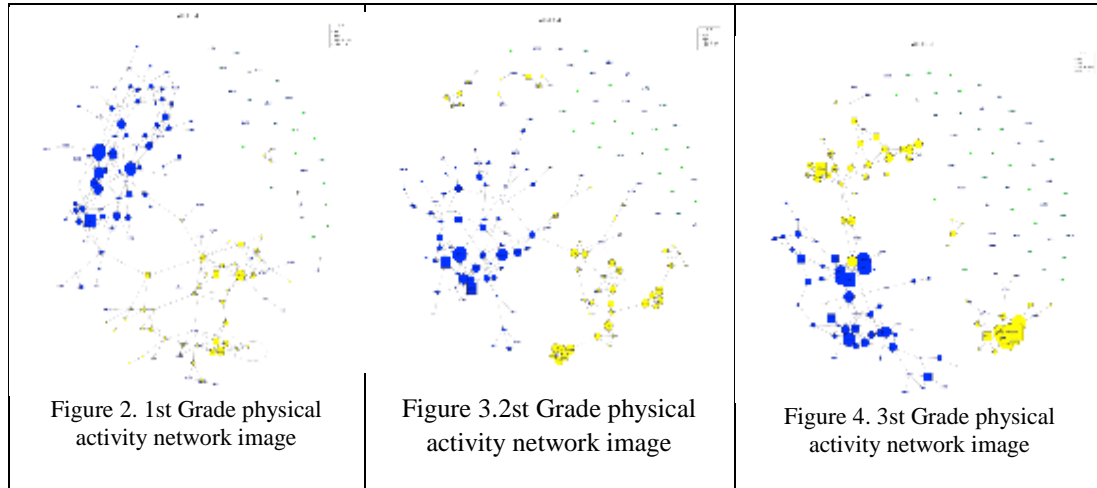

Figure 1. All student physical activity network visualization

| Figure 2. 1st Grade physical activity network image | Figure 3.2st Grade physical activity network image | Figure 4. 3st Grade physical activity network image |

3.2. Characteristics of physical activity network

Physical activity characteristics of all students of [Table. 1] show that 3 male students (60%) and 2 female students (40%) are included in the top 5 hubs. However, only 5 male students (1005) were included in top 5 linkers. Isolations who are not connected to anybody through physical activity network are 103 students (around 21%) out of the total number of 494. They included male students a little more, with 55 male students (54%) and 48 female students (46%). In addition, in terms of physical activity network scales, male students were connected with 199 nodes and female students with 192 nodes. Density was similar, with male students of 0.0148 and female students of 0.0139. However, concentration was higher in male student group with male students of 0.1881, and female students of 0.0181.

Table 1. All students, the physical activity network characteristics of students by each grade level (254 boys, 240 girls)

Group Characteristics	All (494 students)		1st Grade(164 students)		2nd Grade(165 students)		3rd Grade(165 students)	
	Boys (254 students)	Girls (240 students)	Boys (85 students)	Girls (79 students)	Boys (85 students)	Girls (80 students)	Boys (84 students)	Girls (81 students)
Hub (5th)	3 students (60%)	2 students (40%)	5 students (100%)	0 students (0%)	5 students (100%)	0%	2 students (40%)	3 students (60%)
Linker (5th)	5 students (100%)	0 students (0%)	5 students (100%)	0 students (0%)	5 students (100%)	0%	5 students (100%)	0 students (0%)
Isolation	55 students (54%)	48 students (46%)	12 students (55%)	10 students (45%)	19 students (54%)	16 students (46%)	25 students (54%)	21 students (46%)
Scale	199	192	74	70	66	60	59	58
Density	0.0148	0.0139	0.0405	0.0304	0.0338	0.0418	0.0395	0.0457
Concentration	0.1881	0.0181	0.1969	0.0301	0.2259	0.0228	0.1106	0.0124

Taking a closer look at the physical activity network characteristics of students by each grade level, in top 5 hubs, only 5 male students (100%) were found in both 1st and 2nd grades. In 3rd grades, 2 male students (40%) and 3 female students (60%) were included. In top 5 linkers of all grades, only 5 male students (1005) were found in common. Isolations that are not connected with anybody through physical network are found to be 22 students (around 13%) in the 164 1st grade students and 35 students (around 21%) in the 165 2nd grade students. In addition, in terms of the physical activity network scale, boys were connected with 74 nodes and girls with 70 nodes in the 1st grade, boys with 66 nodes and girls with 60 nodes in the 2nd grade, and boys with 59 nodes and girls with 58 nodes in the 3rd grade. The density turned out to be similar in common, boys with 0.0405 and girls with 0.0302 in the 1st grade, boys with 0.0338 and girls with 0.0418 in the 2nd grade, and boys with 0.0395 and girls with 0.0457 in the 3rd grade. On the other hand, the concentration was shown to be higher in male students, boys with 0.1969 and girls with 0.0301 in the 1st grade, boys with 0.2259 and girls with 0.0228 in the 2nd grade, and boys with 0.1106 and girls with 0.0124 in the 3rd grade.

This study identified individual positioning through analysis of students' physical activity network in school groups. The reason why the network analysis is important is because the physical activity network affects the general intrapersonal relations. If instructors could precisely identify hubs, linkers and isolations, they would be able to utilize teaching strategies to support positive relationship formation among students

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