Using Fuzzy Statistical Analysis to Investigate Students' Perception on Relational Bullying

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Abstract. In order to manage and prevent bullying incidents at school, it is important to do researches about it. The research used fuzzy statistical methodology to investigate junior high students' perception on relational bullying. The purposes of the research have two: one is to investigate students' perception on relational bullying, and the other is to use scale which is designed about the forms of relational bullying to make the participants do further thinking. 32 junior high school students were asked to answer the scale. According to the fuzzy mode and the fuzzy expected value of the result, it showed that students have quite clear perception on relational bullying. The results of the research can provide a reference for the staffs of schools, especially for teachers of elementary and junior high schools. They can make students know more about what kinds of behavior belong to relational bullying. Hoping the research can help prevent school bullying and let students have more perception on it.

Keywords: relational bullying, fuzzy statistic, junior high students

1. Introduction

In recent years, the events of campus bullying are frequently reported. Sometimes we can see the bullying incidents appear on TV news, especially in the United States. There were students to fire arms in the campus and caused students or teachers in deaths. Exploring the reasons why the shooters did so, we found that they had been bullied by peers for a long time at school. They were so disgruntled and feared of physical and psychological harms by peers. Accumulating stresses and dissatisfaction for a long term, they committed the murders and harmed others. Many of the deaths or the injured students or teachers in the accidents had nothing to do with bullying, and many of them were the innocent ones. Of course, those who committed homicides might commit suicide or to be arrested in final. The news had shocked people around the world, and people would pay attention to campus bullying after the accidents.

School bullying has been a long time, especially relational bullying. Its occurrence is usually caused by the live of group. It usually awakes people's attention after happening serious bullying incidents. Once a bullying event was reported and then many similar events would be reported at a short period of time. They sharked people and make the public fear that their children were the victims. A researcher [1] pointed out that the victims were likely to be bullied in direct or indirect way by the same or different offenders. Direct aggression refers to physical, verbal, theft, and sexual assault. Indirect aggression is a kind of elusive behavior, including gossiping, excluding, spreading rumors and so on. The victims of bullying mean that individual suffers negative actions from others, or someone intentionally do such an injury to them.

Bullying is not necessary face to face, but it often concerns with the third party. Some researchers [2] pointed out that relational bullying is a kind of behavior which behaves by someone attempting to undermine the relationship of friends or feelings of others, especially excludes some classmates from the peer groups. Some people on the surface are very friendly to treat a person, but behind that they say something bad about his/her friends or steal from his /her friends. We can see that relational bullying is a kind of more hidden and

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covert sabotage behavior. So we should defense others in an appropriate way. We can tell ourselves not to do bad things to others, but we can't stop others doing that to us. As long as we behave positively and keep nice attitude to others, we can let ourselves be away from relational bullying. This research focuses on relational bullying. The content of the questionnaire is collected from the researches which mentioned about the forms of relational bullying.

Relational bullying occurs when students try to get along or to form peer relationships with peers. They are refused by their peers (For example, they are not allowed to join the game of the group, they want to join the conversation among peer but are ignored by the group, or they become the target of being laughed or gossiped). Teachers often underestimated the seriousness of vocal and relational bullying. The will to intervene in such bullying is lower than physical bullying [3]. Some researchers [4] found out teachers think of students who are excluded and have nothing to do with them. They could not identify with the victims, and they were less likely to interfere. Some students also did not understand it. Sometimes they made such kinds of bullying to others and they were not aware of it. In view of the prevalence of bullying and its negative impact on students, the societies and schools should develop some practices. According to the characteristics of relational bullying, I investigated junior high school students with fuzzy statistic methodology to know the perception of relational bullying among them. Fuzzy statistic is based on human thinking. The thinking of human is full of vague and uncertain, so the fuzzy questionnaire is a good tool to match it. There are differences between the traditional mode and fuzzy mode. The purpose of the research is to let teenagers have a deeper understanding on the relational bullying, and avoid it to happen again.

In the researches of social science, many decisions, evaluations, or purposes of evaluations are done by surveys or questionnaires to seek for people's consensus. The common method is asking people to think in binary logic way from a design of multiple options. However, these processes often ignored the fuzzy situation. Sometimes ambiguous thinking and behaviors are perceived in human logic and recognition. In fact, our thoughts filled with a lot of uncertainties and ambiguities such as young, happy, sad, weak, and optimism. These concepts could not been explained by advancing knowledge and innovative technology. It has been used in researches and applications a lot.

Fuzzy theory is based on fuzzy logic. It extends the traditional binary mathematics. It is no longer just a dichotomy. The relationship between elements and a collection of ancient code set theory, elements belong to set A, and they must be very clear not fuzzy. $X \in A$ or $X \notin A$ must belong one, and it is either one or that one. This logic is called binary logic. However, human thinking is affected by the natural and social phenomena of subjective awareness. The statement of people also affects by their subjective sense, time, environment and judgment. The perspective of people is ambiguity. Except "right" and "wrong", there are still "not completely right" and "not completely wrong." It is so-called "gray area" and "fuzzy concept." Especially, when we wanted to know the opinion of the public on the environmental pollution, fuzzy statistics provided a powerful research tool [5]. Because the public might think that there are many kinds of pollutions around the environment. The questionnaire which used fuzzy numbers allowed participants to give points to each item of each question according to the degree of their judgments or their concerns of their environmental pollutions. They can express their view by simple way of fuzzy numbers. If they answer the traditional questionnaire, they can only check one answer to each question. Thus, it could make them not know how to express their thinking or not know how to check. Using fuzzy statistics can get data which closes more to people's real thinking. These data can be used as a reference of sequences to improve environmental pollution.

From above, we can see that using fuzzy method to answer the questionnaires which can stimulate the responders to do more in-depth thinking. And the results of the research can keep up with human nature. The measurement methods are more complicated, and making more explanation to the responders is needed. The following describes of the methods are used in this research.

2. Research method

In social science, if the researches made in quantitative methods, the scales are often used. Then they are often used Likert's five points scale. The respondents could only select one from the five options, but in this way, it ignored the uncertainty of human thought. The traditional way had its limitations, but using fuzzy

numbers to respond could let respondents express their thinking more broadly. The advantages which used fuzzy number to answer include: (i)Let the respondents have multi-choices to answer. Using fuzzy numbers to answer could let different people express different ideas. (ii)It could stimulate the respondents' brains and make them think more circumspectly and deeply. (iii)It could make the respondents view the questions of the scale in objective attitude, rather than in subjective one. (iv)The findings of the results might be different from the traditional ones. Maybe using fuzzy numbers would make the results close more to the humanity and the reality.

The participants were 32 junior high school students. Using the scale surveyed students' perception on relational bullying. It included background variables, and 6 items which included taking nickname, excluding, spreading rumors, deliberately destroying someone's goods, neglecting someone's behavior, and imitating the action or speech of others. Students were checked with the background data. The options of relational bullying are strongly disagree, disagree, no opinion, agree, and strongly agree. The students were asked to answer the questions of relational bullying with fuzzy number.

Definition 2.1. Fuzzy Numbers

Let U be an universal set, $A = \{A_1, A_2, \cdots, A_n\}$ be the subset of discussion factors in U. For any term or statement X on U, it's membership corresponding to $\{A_1, A_2, \cdots, A_n\}$ is $\{\mu_1(X), \mu_2(X), \cdots, \mu_n(X)\}$, here $u : U \to [0,1]$ is a real function. Then the fuzzy number of X can be written as the following:

$\mu_U(X) = \sum_{i=1}^{n} \mu_i(X) I_{A_i}(X)$ where $I_{A_i}(x) = 1$, if $x \in A_i$; $I_{A_i}(x) = 0$, if $x \notin A_i$..

If the domain of the universal set is continuous, then the fuzzy number can be written as：

$\mu_U(X) = \int_{A_i \subseteq A} \mu_i(X) I_{A_i}(X)$.

Note that, in many writings, people are used to write a fuzzy number as

$\mu_U(X) = \dfrac{\mu_1(X)}{A_1} + \dfrac{\mu_2(X)}{A_2} + \cdots + \dfrac{\mu_n(X)}{A_n}$ (where "+" stands for "or," and" $\div$ "stands for the membership

$\mu_i(X)$ on A_i) instead of $\mu_U(X) = \sum_{i=1}^{n} \mu_i(X) I_{A_i}(X)$.

Definition 2.2. Fuzzy sample mode (data with multiple values)

Let U be the universal set (a discussion domain), $L = \{L_1, L_2, \cdots, L_k\}$ a set of k-linguistic variables on U, and $\{FS_i, i = 1, 2 \cdots, n\}$ a sequence of random fuzzy sample on U. For each sample FS_i, assign a linguistic variable L_j a normalized membership $m_{ij}(\sum^k m_{ij} = 1)$, let $S_j = \sum^n m_{ij}$, $j = 1, 2, \cdots, k$. Then, the maximum value of S_j (with respect to L_j) is called the fuzzy mode (FM) of this sample. That is $FM = \{L_j \mid S_j = \max_{1 \le i \le k} S_i\}$.

Traditional statistics deal single answer or certain range of the answer through the samples of surveys, and they are unable to sufficiently reflected the complex thought of an individual. In our daily life, we find that the information we usually use embeds with uncertainty and ambiguity. It should be the first step to take to collect the information which based on the fuzzy mode.

Definition 2.3. Fuzzy sample mean (data with multiple values)

Let U be the universal set (a discussion domain), $L = \{L_1, L_2, \cdots, L_k\}$ be a set of k-linguistic variables on U, and $\{Fx_i = \dfrac{m_{i1}}{L_1} + \dfrac{m_{i2}}{L_2} + \ldots + \dfrac{m_{ik}}{L_k}, i = 1, 2, \ldots, n\}$ be a sequence of random fuzzy sample on U,

$m_{ij}(\sum_{j=1}^{k} m_{ij} = 1)$ is the memberships with respect to L_j. Then, the Fuzzy sample mean is defined as

$$Fx = \dfrac{\dfrac{1}{n}\sum_{i=1}^{n} m_{i1}}{L_1} + \dfrac{\dfrac{1}{n}\sum_{i=1}^{n} m_{i2}}{L_{i2}} + \ldots + \dfrac{\dfrac{1}{n}\sum_{i=1}^{n} m_{ik}}{L_k}.$$

3. Empirical Studies

3.1. Using fuzzy mode analyzed the perception on relational bullying of the students

After calculating the fuzzy membership of each item, the result showed at table 1.

Table 1: The fuzzy mode of teenagers' perception on relational bullying

items	strongly disagree	disagree	no opinion	agree	strongly agree
taking nickname	4.4	7.9	10.2	5.4	5.1
excluding	5.4	7.7	7.5	7.8	4.6
spreading rumors	7.2	4.1	5.9	9.1	6.7
deliberately destroying someone's goods	8.5	4.4	5.3	7.5	7.3
neglecting someone's behavior	1.5	2.6	8.6	9.3	10.0
imitating the action or speech of others	1.7	6.7	10.4	7.4	5.8

From the result of the study, we can see that in the item 1, the dimension of "no opinion" got the highest score; in the item 2, the dimension of "agree" got the highest score; in the item 3, the dimension of "strongly agree" got the highest score; in the item 4, the dimension of "strongly agree" got the highest score; in the item 5, the dimension of "strongly agree" got the highest score; in the item 6, the dimension of "no opinion" got the highest score. The more score of the dimension to each item meant that it got the most students' agreement. It meant that most students "strongly agree" to the behavior of item 3, item 4, and 5 were relational bullying; "agree" to the behavior of item 2, and "no opinion" to the behavior of item 1 and item 6.

3.2. Analyzing the whole sampling

The fuzzy expected value, the fuzzy mean, showed at table 2.

Table 2: The fuzzy expected value of teenagers' perception on relational bullying

items	strongly disagree	disagree	no opinion	agree	strongly agree
taking nickname	.134	.247	.375	.141	.156
excluding	.031	.122	.234	.394	.253
spreading rumors	.025	.059	.184	.353	.378
deliberately destroying someone's goods	.025	.031	.163	.341	.441
neglecting someone's behavior	.047	.081	.269	.291	.313
imitating the action or speech of others	.053	.209	.325	.231	.181

From the result of the study, we can see that the highest ranking of the 6 items was the dimension of "strongly agree" of item 4. It meant that such behavior got the most identification as bullying and they took it as a serious aggressive behavior. The second high ranking was the dimension of "agree" of item 2, and the third one was the dimension of "strongly agree" of item 3. It meant that no one wanted to be excluded or be spread rumors. Adolescents pay attention to friendship, and they want to be accepted by their peers. If they encountered the situation we mentioned above, they would become worried and feel upset. They would not take them as easy things, maybe they would defend themselves by doing something wrong or express behaviors out of control. So they took them hard to do such behavior on peers or to be treated from peers like those. It meant that they were sensitive about some forms of relational bullying.

4. Conclusion and Suggestion

4.1. Conclusion

In this research, we used fuzzy statistic methodology to investigate the perception on relational bullying of students. The accuracy logic of the development of fuzzy theory provides us a powerful tool. It can express and control the uncertainties. It combines the information, and its form is better than traditional

contingent theory. Some scholars tried to prove that it was feasible with probability theory can also be feasible with fuzzy theory. The point of fuzzy statistical methods provides additional value foe statistics. It also opens a new view to basic and applied statistics [6].

32 junior high school students joined to answer the questions. The outcome of the research got great identification. From the result, it showed that students had quite clear conception on relational bullying. They could tell what was right and what was wrong. With good perception on relational bullying, they can avoid doing these behaviors to peers. And once encountered one of these behaviors, they can seek help from the ones they can trust. But to the question 1 and question 6, most of them held the attitude of no opinion. To the two questions, it depended on the situation and the relationship of peers. The staffs of school can use methods like story telling, playing, or talking to let students tell clearly about them.

The behavior of relational bullying is not obvious, so each person's perception on it becomes different. Some people took advantage of this ambiguous situation. In order to control or manipulate someone and make them get rid of being punished, they found ways. They attempted to rationalize their behavior or tried to make others think that the victims were narrow-minded. Further more, the bullies would make others think that the victims were deserved. Schools should strengthen students' perception on relational bullying according to the results of the research. And same of the purpose of the Legislative Yuan of Taiwan approved the law on calling others "sissy" or "tomboy" as "sexual bully". The aims are to make students, teachers, and the public have clear perception on relational bullying. Let students pay more attentions to their own behaviors. With clear perception on relational bullying, they can avoid hurting others intentionally or unintentionally or being hurt by others. Hoping the research can arouse the attention of the public who concerned about the education.

4.2. Suggestion

Counseling the students who were bullied should take notice of their emotion regulation, internalized behavior, self-esteem, social skills, and effective response actions to reduce the impact on them. The issues of school bullying are not only education problems, but also social problems. All educators and the community, especially parents should work together to create a harmony campus environment, so students can feel safe beneath it. Teachers should play roles that worth students' trust. They should provide assistance and support for students, and when students encounter problems they know where they can get help. The best solution methods to bully not only face the problem and deal with it immediately, but also prevent it from happening.

On the stage of junior school happens relational bullying frequently, and the public should pay attention on it. Everyone takes notice on it, and the chances of happening would reduce. Relational bullying is not an actual form of bullying, and it should be understood by the public. Once students reported to the adults about suffering from peers, they should take action immediately. To protect the children of ours and let them keep away from bullying is our duty.

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