

# Research on the Contagion Distance of Unsafe Behavior of Construction Workers

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**Abstract:** Through the statistical analysis of the unsafe behavior of construction workers on a construction site and the data of relatives and friends, unsafe behavior was determined to have behavioral contagion in the second-degree relationship, thereby locking workers who are about to have unsafe behavior, and providing a theoretical basis for the prevention and control of unsafe behavior in the construction industry.

## 1. Introduction

The theory of social contagion was considered to be the theoretical basis for exploring the distance of contagion of unsafe behaviors in social networks. Based on the theory of social contagion, comparing existing behaviors such as drinking, drug use, voting, and cooperation, it was found that voting and cooperation behaviors with second-degree relationship distance had social attributes <sup>[1-8]</sup>. Drinking behavior with a three-degree relationship had a dual social-physiological attribute <sup>[9]</sup>. Drug abuse and insomnia behaviors with a four-degree relationship had physiological attributes <sup>[10]</sup>. The distance of behavioral contagion was related to the nature of the behavior itself. There was a lack of research on the contagion distance of unsafe behavior. Then, was the distance between behaviors that have both social attributes of unsafe behavior classified as the second-degree relationship distance as well? By collecting data on unsafe behavior in social networks, the social relationship distance of unsafe behavior contagion from the perspective of social networks was explored in this study.

## 2. Data Collection and Model Construction

### 2.1. Data collection

Through semi-structured interviews, data on the personal unsafe behavior of 97 construction workers on a construction site in Jinan City, relatives and friends in the same class (that is, relatives or friends working at the same time and place), and relatives and friends in different classes (that is, relatives or friends working at different times and places) were collected. It was attributed to the fact that behavioral contagion could easily be triggered by strong connections, therefore, when collecting data, only the data of an individual worker's relatives and friends in the same class and a relative in a different class were collected. Through the construction of the employee social relationship network, the node location of unsafe actors was clarified, the second-degree relationship “connecting person-individual-connecting person” and the third-degree relationship “connecting person-individual-connecting person-connecting person” the relationship path of unsafe behavior were determined, and accordingly, the contagion distance of unsafe behavior was measured.

### 2.2. Model construction

After deleting the shortest path and redundant path of the collected unsafe behavior of construction workers and the data of relatives and friends, a social relationship network of relatives

and friends of construction workers was constructed. In the previous research, the existence of behavioral contagion of unsafe behaviors in a relationship has been revealed. The second-degree relationship path of “relatives and friends of different classes-individuals-relatives and friends of the same class” was studied. Based on the univariate Logit model, the correlation between the unsafe behavior of relatives and friends in different classes and the unsafe behavior of relatives and friends in the same class was tested. If the result was significant, the unsafe behavior in the three-degree relationship would continue to be tested, and so forth. Since the data in this study came from the same construction site, the data of relatives and friends in different classes of relatives and friends in the same class was limited. Using the Tobit truncated regression model, the correlation between the unsafe behaviors of relatives and friends in different classes and the unsafe behaviors of relatives and friends in different classes of relatives and friends in the same class were tested. The model was shown as Figure 1.

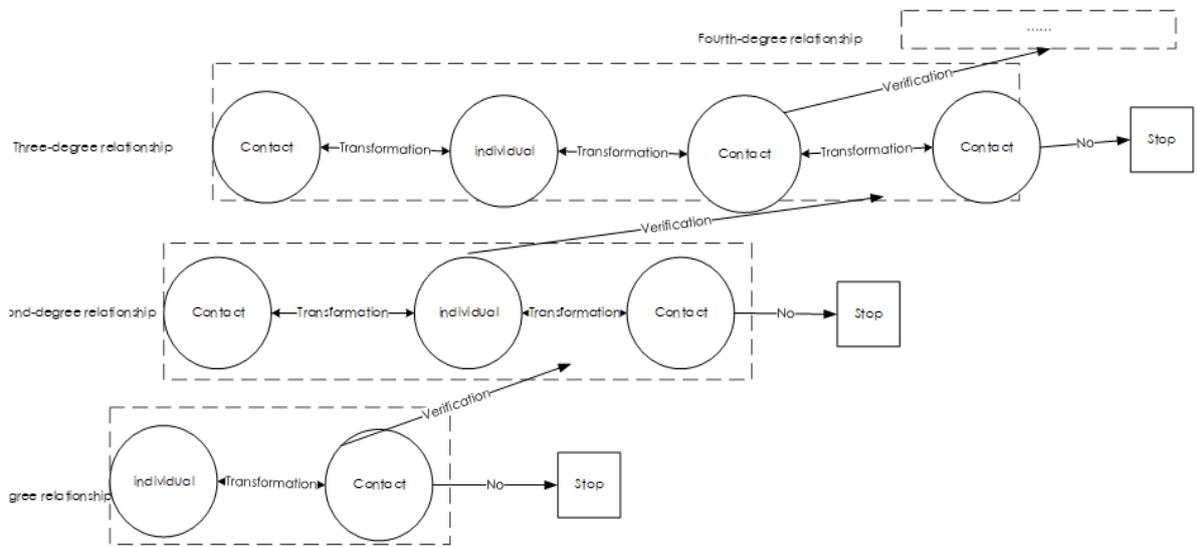


Figure 1: Research Model

### 3. Data Analysis

#### 3.1. Social Network Characterization

A total of 97 construction workers from a construction site in Jinan City were collected as samples, after excluding invalid ones, 92 valid data were collected. Through the analysis of the social networks of the above data (unsafe behavior and data of relatives and friends), it was found that in terms of quantity, there was no obvious difference between the relationship between relatives and friends of unsafe actors and those who do not have unsafe actors. In other words, the relationship position of insecure actors in the social network was indistinguishable from that of non-insecure actors.

#### 3.2. Second-degree Relationship Test

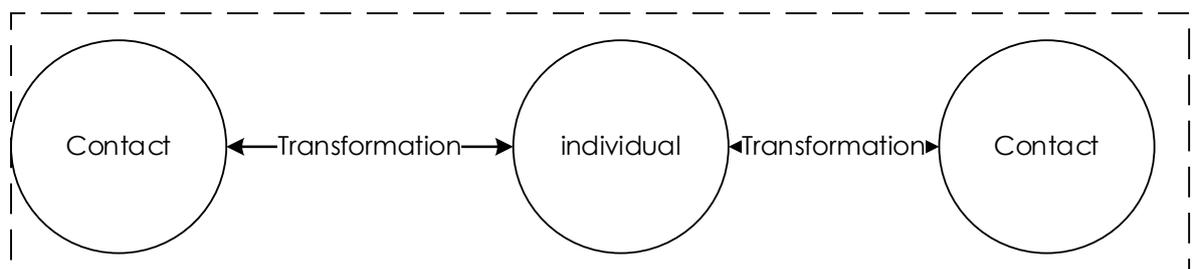


Figure 2: Second-degree Relationship Path

In the second-degree relationship path connection of “relatives and friends of different classes-individuals-relatives and friends of the same class” (Figure 2), through the use of a binary Logit model, the unsafe behavior of relatives and friends of the same class was used as a response variable, and the unsafe behavior of relatives and friends of different classes was used as an explanatory variable for univariate Logit regression analysis, the results were shown as Table 1.

Table 1: Logit Regression Test Results

	Coefficient	SE	Wald	Sig
C	-2.531	0.623	13.247	0.000
relatives and friends of different classes	2.279	0.339	36.529	0.000

According to the results, the significance test was passed, and there was a positive correlation between the unsafe behavior of relatives and friends in the same class and the unsafe behavior of relatives and friends in different classes. It was explained that when the possibility of unsafe behavior of relatives and friends in different classes increased, the possibility of unsafe behavior of relatives and friends in the same class increased correspondingly. Unsafe behavior could get contagion through the second-degree relationship path of “relatives and friends in different classes-individuals-relatives and friends in the same class”. It can be considered that there was a second-degree contagion of unsafe behavior.

### 3.3. Three-degree Relationship Test

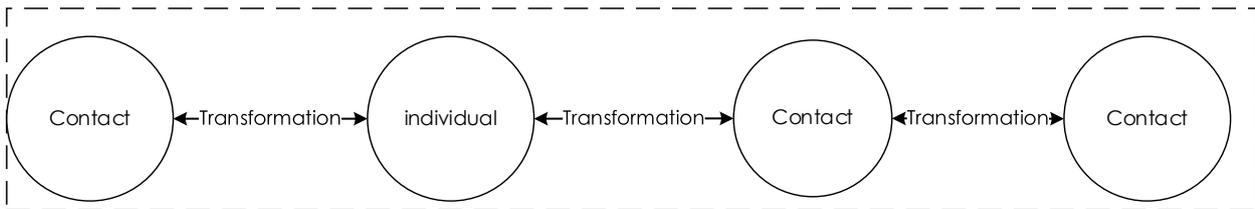


Figure 3: Three-degree Relationship Path

In the connection of the three-degree relationship path of “relatives and friends of different classes-individuals-relatives and friends of the same class-relatives and friends of different classes of relatives and friends of the same class”, based on the Tobit truncation regression model (Figure 3), the significance test of the correlation between the unsafe behaviors of relatives and friends of different classes and the unsafe behaviors of relatives and friends of the same class was performed. the results were shown as Table 2.

Table 2: Tobit Truncated Regression Test Results

	Coefficient	SE	Z	Sig
C	0.121	0.038	2.981	0.003
relatives and friends of different classes	0.079	0.077	0.923	0.298

The results indicated that there was no significant difference between the unsafe behavior of relatives and friends in different classes of relatives and friends in the same class and the unsafe behavior of relatives and friends in different classes, that is, there was no correlation between the two. It can be inferred that in a three-degree relationship, there is no contagion of unsafe behavior.

Unsafe behavior did not have behavioral contagion in the third-degree relationship, thus, the test of unsafe behavior contagion in the fourth-degree relationship become meaningless. It can be concluded that unsafe behavior was contagious merely in the social relationship network of relatives and friends of construction workers.

## 4. Conclusion

Unsafe behavior had significant behavioral contagion in second-degree relationships. However,

in the three-degree relationship, behavioral contagion was no longer significant or even disappeared, that is, the influence of unsafe behavioral contagion was declining in the contagion. In the social relationship network of construction workers, the unsafe behavior of individuals affected the unsafe behavior of relatives and friends, and even affected the relatives and friends of relatives and friends. In a manner of speaking, individual insecurity was affected by the unsafe behavior of neighboring people in the relationship, and individuals would affect other neighboring people, which manifested itself as the contagion of unsafe behavior in the social network. Nevertheless, along with the increase of relationship distance in the social network, the contagion of unsafe behavior declined gradually or even disappeared, which manifested itself as the contagion of unsafe behavior that did not exist in the third-degree relationship.

In the social network of construction workers, the contagion distance of unsafe behavior contagion has been studied, and it has been concluded that individuals have unsafe behavior. The conclusion that there was a correlation between the direct connection of the individual and the unsafe behavior of the connecting person was drawn. It could be explicitly stated that unsafe behavior in social networks was contagious in second-degree relationships. It is expected to target workers who are about to have unsafe behaviors based on existing workers who have undergone unsafe behaviors, so as to provide a theoretical basis for the prevention and control of unsafe behaviors in the construction industry.

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