Development and psychometric validation of the adolescent online responsibility scale

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Abstract: Objective: To develop the Adolescent Online Responsibility Scale and examine its psychometric properties. Methods: Items were initially generated through literature review and interviews. A total of 785 middle school students from Guangdong Province were conveniently sampled for testing. Item analysis was used to screen appropriate items. Data were subsequently split for exploratory factor analysis (EFA, n=447) and confirmatory factor analysis (CFA, n=338). Results: EFA yielded a 20-item scale with five factors: Online Responsibility Cognition, Online Responsibility Emotion, Online Responsibility Volition, Online Responsibility Behavior, and Online-Real World Responsibility Consistency. Factor loadings ranged from 0.50 to 0.80, with a cumulative variance contribution rate of 52.85%. CFA results indicated a good fit for the five-factor model. The scale demonstrated an internal consistency reliability (Cronbach's α) of 0.73, a split-half reliability of 0.67, and a test-retest reliability of 0.89. Conclusion: The Adolescent Online Responsibility Scale meets psychometric requirements for reliability and validity and is suitable for research on adolescents' online responsibility.

Keywords: Adolescent, Online Responsibility, Reliability, Validity, Scale Development

1. Introduction

Responsibility is both a common concept in daily life and a subject of research in fields such as ethics, pedagogy, and psychology [1]. The Dictionary of Psychology defines responsibility as an individual's attitude, specifically a conscious attitude toward the collective activities, behavioral norms of the group to which they belong, and the tasks they undertake. It comprises three components: cognition, emotion, and behavior [2]. Many scholars, both domestic and international, have provided varying definitions of responsibility based on their research objectives, but all acknowledge that responsibility is a personality trait composed of multiple dimensions [3-6]. Research indicates that responsibility possesses characteristics such as relative stability, contextual specificity, motivational function, objectivity, systematicity, and practicality [1]. Responsibility is not innate; rather, it is gradually cultivated within a certain social environment and manifested through responsible behavior [7]. Integrating existing research in related fields, this study defines online responsibility as follows: an important personality quality of individuals using the internet, involving their cognition, judgment, and evaluation of the responsibilities they bear within the online environment, concretely expressed through emotion and behavior, and sustained by volition.

With the widespread adoption of the internet, particularly smartphones and 4G networks, the internet has penetrated every aspect of social life, altering people's lifestyles. However, as people engage with the internet, numerous unethical and irresponsible behaviors have emerged. On the one hand, features of the online world—such as openness, anonymity, concealment, and virtuality—make it easier for adolescents, whose physical and mental development is not yet mature and who have weaker self-control, to engage in irresponsible behaviors online [8-9]. On the other hand, faced with information overload, individuals often lack rational analysis and reflection, leading to a decline in moral self-discipline and self-restraint. The abundance of online resources increases the likelihood of this decline. Due to immature physical and mental development, the influence of diverse cultures, the single-child family environment, and a long-standing emphasis on intellectual over moral education, adolescents' sense of responsibility is often weak. Some adolescents lack awareness of accountability for their own actions, making them prone to inappropriate behaviors in unmonitored and anonymous environments [10-11]. Although the online environment differs

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significantly from real-world social settings, it is an extension of real society. Regulating the behavior of internet users requires establishing behavioral norms and a responsibility system suited to the online environment. Within the online context, individuals similarly need the moral awareness and strong sense of responsibility demanded by society [12].

In previous research on responsibility, most studies have focused on social and real-world responsibility, such as self-responsibility, academic responsibility, and group responsibility, with a notable lack of investigation into responsibility within the online environment. Although past research has covered elementary school students, middle school students, and university students, studies specifically addressing the online responsibility of adolescents in the context of the internet are scarce. Adolescents are at a critical stage of physical and mental development, characterized by high variability and plasticity. As the primary users of smartphones and 4G networks, their internet usage patterns are more unpredictable and flexible, making further in-depth research essential. Domestically, existing questionnaires targeting adolescent students mainly include the Adolescent Student Responsibility Questionnaire, the Middle School Student Responsibility Questionnaire, and the Middle School Student Social Responsibility Questionnaire [1]. Therefore, the development of a questionnaire on adolescent online responsibility will contribute to the improvement of research in the field of responsibility and advance studies related to the physical and mental health development of adolescents.

This study aims to develop an online responsibility questionnaire suitable for adolescents in China, with the goal of providing valuable data and a foundation for comprehensively understanding the current state of adolescent responsibility, regulating adolescent online behavior, and promoting the healthy physical and mental development of adolescents.

2. Objects and methods

2.1. Objects

2.1.1. Pilot test participants

Used for item analysis and exploratory factor analysis. A total of 475 students from grades 7 to 12 were conveniently sampled from 5 middle schools in Guangzhou and Foshan cities. 447 valid questionnaires were collected, including 117 from male students and 330 from female students.

2.1.2. Formal test participants

Used for reliability testing and confirmatory factor analysis. A total of 383 students from grades 7 to 12 were conveniently sampled from 4 middle schools in Guangzhou and Foshan cities. 338 valid questionnaires were collected, including 137 from male students and 201 from female students.

Additionally, a retest was conducted two weeks after the formal test, with 94 valid responses collected, including 38 from male students and 56 from female students.

2.2. Methods

2.2.1. Preliminary theoretical framework of adolescent online responsibility

The theoretical framework was primarily established through the following three steps:

First, analysis of interview data. Eight middle school students who frequently use the internet were selected for interviews, with each interview lasting 20 to 30 minutes. The interviewees were asked to discuss which online behaviors they considered inappropriate and which were appropriate. The criteria for appropriateness were based on whether the behaviors violated daily behavioral norms or ethical standards. The behaviors discussed included both their own and others' actions. After the interviews, the data were appropriately edited and categorized.

Second, drawing on previous research. Both domestic and international scholars have proposed different perspectives on the structure of responsibility based on their research objectives, primarily including three-dimensional, four-dimensional, and multi-dimensional theories. Domestic researchers generally agree that responsibility consists of three dimensions: responsibility cognition, responsibility emotion, and responsibility behavior [2]. Internationally, Schlenker’s three-dimensional model of responsibility rules,

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responsibility events, and responsible agents is representative [5]. Yan Guocai proposed that responsibility primarily comprises four dimensions: responsibility cognition, responsibility emotion, responsibility behavior, and responsibility volition [1]. Rachman et al. divided responsibility into four dimensions: responsibility for harm, responsibility in social contexts, positive perceptions of responsibility, and the integration of cognition and behavior [13]. Other domestic researchers, based on the objects of responsibility relationships, have divided responsibility into multiple components. For example, some scholars studying early childhood responsibility divided its structure into six dimensions: self-responsibility, responsibility for others, collective responsibility, task responsibility, commitment responsibility, and responsibility for mistakes [14]. Tan Xiaohong suggested that middle school students' responsibility comprises a three-level psychological structure: overall responsibility, general responsibility, and specific responsibility, with each level further divided into different dimensions [7]. Wang Yan, in her study on university students' responsibility, examined it from the perspective of social obligations, categorizing it into six types: responsibility to oneself, family, others, profession, collective, and society [15]. Although different researchers have adopted various classification methods, they generally agree that the primary components of responsibility are cognition, emotion, and behavior. Responsibility cognition, responsibility emotion, and responsibility behavior are three indispensable core components in the complex structure of responsibility. Existing research indicates that adolescents often exhibit weak volition and are highly malleable. Sustaining responsible behavior over the long term requires the maintenance of responsibility volition. Therefore, synthesizing previous research findings, this study, from the perspective of the psychological composition of responsibility, posits that responsibility consists of four factors: responsibility cognition, responsibility emotion, responsibility volition, and responsibility behavior. Responsibility cognition serves as the foundational factor, responsibility emotion as the motivational factor, responsibility volition as the sustaining factor, and responsibility behavior as the executive factor [1, 4].

Third, inductive integration. Several psychology professors were invited to conduct in-depth analyses of the interview data, evaluate the objectivity and appropriateness of the categorized results, and compare and integrate the interview findings with previous research outcomes. Through detailed summarization and induction, it was ultimately determined that adolescent online responsibility includes the following four dimensions: online responsibility cognition, online responsibility emotion, online responsibility volition, and online responsibility behavior.

2.2.2. Collection and organization of questionnaire items

Questionnaire items were collected through the following two methods:

First, extraction and refinement of interview data. Directly extracting and adopting statements that effectively reflected the concepts of specific dimensions, such as, "I believe that spreading computer viruses out of curiosity should be condemned." Some statements were modified, for example, "I adhere to moral norms in real life, and the same applies when I am online" was revised to "I will abide by online ethics just as I adhere to moral standards in real life."

Second, referencing research materials from related fields to independently develop item statements. As there is no existing questionnaire specifically on online responsibility domestically, it was not possible to directly draw on previous research results. However, there are questionnaires on learning responsibility, social responsibility, self-responsibility, etc. While referencing other studies, modifications were made according to the unique characteristics of the online environment. Simultaneously, the virtualization of the internet leads to the non-physical nature of online activities. The anonymity and virtuality of the online environment increase the likelihood of individuals engaging in morally deficient and irresponsible behaviors [8]. Based on this, this study considered including items in each dimension to examine the impact of online virtuality on responsibility.

Guided by the preliminary theoretical framework, each dimension of the Adolescent Online Responsibility Questionnaire was defined and categorized accordingly. Three psychology professors were invited to evaluate the items, providing feedback on dimension definitions, semantic clarity, expression, and the number of items. Based on their suggestions, some items were deleted, revised, or appropriately adjusted, ultimately forming a pilot questionnaire. The pilot questionnaire contained 45 items arranged in random order. A Likert 5-point self-rating scale was used, with 1 representing "completely disagree" and 5

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representing "completely agree." To avoid response bias, some items were reverse-scored, with appropriate adjustments made during scoring.

2.2.3. Revision and Refinement

Three psychology professors and two graduate students were invited to fill out the pilot questionnaire. Their feedback and suggestions were collected, focusing on aspects such as wording, ambiguous expressions, and grammatical issues. The questionnaire was meticulously revised based on this input, resulting in a refined version for the preliminary testing.

2.2.4. Criterion Measure and Criterion-Related validity testing

The Neuroticism-Extraversion-Openness Five-Factor Inventory (NEO-FFI) Conscientiousness subscale was used as the criterion measure to establish the criterion-related validity of the Adolescent Online Responsibility Questionnaire. The NEO-FFI, revised by Costa and McCrae in 1992 based on the NEO Personality Inventory (NEO-PI), consists of 60 items [16]. The Conscientiousness subscale includes 12 items. Responses are rated on a 5-point scale (0 = strongly disagree, 4 = strongly agree), and the dimension score is calculated as the mean of its items. Individuals with high scores on this dimension tend to be purposeful, organized, and highly responsible, while those with low scores are often careless, poorly planned, and weak-willed. Research has demonstrated that the NEO-FFI has good reliability and validity. In this study, the Cronbach's α coefficient for the Conscientiousness dimension was 0.81.

2.3. Statistical analysis

Data were analyzed using SPSS 17.0 and Amos 17.0, including item analysis, exploratory factor analysis, and confirmatory factor analysis.

3. Results

Table 1 Factor Loadings, Communalities, Eigenvalues, and Contribution Rates of Items in the Adolescent Online Responsibility Questionnaire

Item Number	Factor Loading					Communality
	1	2	3	4	5	
T42	0.743					0.521
T45	0.702					0.556
T21	0.662					0.592
T19	0.565					0.514
T33	0.498					0.579
T39		0.729				0.587
T44		0.688				0.645
T28		0.68				0.419
T32		0.644				0.422
T14			0.709			0.512
T11			0.699			0.48
T20			0.644			0.578
T2			0.533			0.391

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T25				0.75		0.588
T12				0.69		0.456
T18				0.577		0.433
T27				0.546		0.594
T17					0.722	0.6
T16					0.692	0.546
T5					0.615	0.556
Eigenvalue	4.67	2.392	1.322	1.136	1.049	
Contribution Rate (%)	23.351	11.96	6.612	5.679	5.247	
Cumulative Contribution Rate (%)	23.351	35.311	41.924	47.603	52.849	

3.1. Item analysis

The top 27% and bottom 27% of the total scores on the 45-item test were set as the high-score group and low-score group thresholds, respectively. Difference tests were conducted for each item, and items that did not reach a significance level of 0.01 were eliminated. This step removed 15 items.

3.2. Exploratory factor analysis

Items were selected for the exploratory factor analysis based on the following criteria: Items with a communality below 0.35 were considered insufficient to reflect the measured content; Items with a factor loading below 0.40 on any factor were deemed to have a low correlation with that factor; Items exhibiting high loadings on multiple factors or loadings with minimal differences were considered to have poor representativeness of a specific factor; Ensuring items had high factor loadings on a specific factor while also having high communality; Items that could not adequately explain or reflect the characteristics of a factor, or were inappropriately categorized, were eliminated based on the study's logical reasoning and theoretical framework [17]. According to these criteria, the data for the remaining 20 final items underwent Bartlett's test of sphericity. The chi-square value was 1963.56, and the KMO value was 0.85 ($P<0.001$), indicating the data were well-suited for factor analysis.

After several rounds of factor analysis, the final version of the questionnaire retained 20 items, comprising 5 dimensions. These were named as follows: Online Responsibility Volition, Online Responsibility Behavior, Online-Real World Responsibility Consistency, Online Responsibility Cognition, and Online Responsibility Emotion, as shown in Table 1.

3.3. Questionnaire reliability

Internal consistency reliability and split-half reliability were tested using data from the 338 participants in the formal administration. Test-retest reliability was assessed using one-to-one comparisons of data from 94 participants who completed the questionnaire again after a two-week interval, as shown in Table 2.

Table 2 Reliability of the Adolescent Online Responsibility Questionnaire

Reliability	Cronbach's α Coefficient	Split-Half Reliability	Test-Retest Reliability
Value	0.727	0.668	0.892*

3.4. Questionnaire validity

Criterion-related validity was established using the Conscientiousness subscale of the NEO Five-Factor Inventory (NEO-FFI) as the criterion measure for comparison with the Adolescent Online Responsibility Questionnaire. A correlation analysis was conducted between the scores of the Conscientiousness subscale

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and the total score of the Adolescent Online Responsibility Questionnaire, yielding a correlation coefficient of 0.633 ($P < 0.01$).

Construct validity was examined by performing a confirmatory factor analysis on the data from the formal administration to further assess the questionnaire's structure. The values for each index are presented in Table 3. All indices met psychometric requirements adequately, indicating a good model fit.

Table 3 Confirmatory Factor Analysis of Each Dimension of the Adolescent Online Responsibility Questionnaire

Index	X^2	D f	X^2/d f	CFI	NNFI	IFI	RMSEA
Value	234.799	150	1.565	0.925	0.905	0.927	0.041

4. Discussion

4.1. Construction of the questionnaire structure

Scholars both domestically and internationally have defined responsibility from various perspectives and, based on different research objectives, proposed different views on the structure of responsibility, including three-dimensional, four-dimensional, and multi-dimensional theories. Among these, some Chinese scholars proposed a three-dimensional theory, suggesting that the complex psychological structure of responsibility primarily consists of three dimensions: responsibility cognition, responsibility emotion, and responsibility behavior. Responsibility cognition refers to an individual's attitudinal tendencies or concepts regarding responsibility formed by adhering to certain social norms and ethical standards in social life. Responsibility emotion pertains to the commitment to one's words, actions, and promises, maintaining a genuine, serious, and proactive responsible attitude, along with the associated internal emotional experiences. Responsibility behavior refers to the responsible actions taken by an individual based on judgments of responsibility cognition [4, 18]. Yan Guocai proposed a four-dimensional theory, which differs somewhat from the views of other scholars. He argued that responsibility should also include responsibility volition, consisting of four components: responsibility cognition, responsibility emotion, responsibility volition, and responsibility behavior. Responsibility cognition serves as the foundation of responsibility, the experience of responsibility manifests as responsibility emotion, responsibility emotion acts as the motivational factor, responsibility volition is the sustaining factor, and the actual occurrence of responsible behavior represents the real existence and manifestation of responsibility [1, 4]. Additionally, domestic researchers have divided responsibility into different components based on the objects of responsibility relationships. This study, considering the psychological components and drawing on Yan Guocai's classification method, initially theorized in the pilot phase that adolescent online responsibility primarily consists of four factors: online responsibility cognition, online responsibility emotion, online responsibility volition, and online responsibility behavior. However, considering the unique features of the online environment, such as anonymity and concealment, which differ from the real-world environment, some items specifically targeting the characteristics of the internet were designed during the item development phase. These items were intended to test whether the Specificity of the online environment would lead to discrepancies in individuals' moral and responsible behaviors between the online and real-world contexts. In the subsequent exploratory factor analysis, these items were separately elevated to form an independent dimension, which was validated during the confirmatory factor analysis. Consequently, the questionnaire evolved from an initial four-dimensional structure to a five-dimensional one.

4.2. Questionnaire items, reliability, and validity

To ensure the quality and representativeness of the test items, this questionnaire was developed by creating original items based on the actual circumstances of adolescents and the characteristics of online anonymity and concealment. To verify the authenticity and reliability of the test, some items were designed for lie detection. The pilot questionnaire consisted of 45 items. During data analysis, high-low group difference tests were employed to eliminate items that showed no significant differences or did not meet the

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requirements. Following item analysis, 30 items that met psychometric standards remained for exploratory factor analysis, which complies with questionnaire development requirements.

Reliability is a primary indicator of the stability and dependability of a test [19]. An examination of the reliability of the Adolescent Online Responsibility Questionnaire revealed an internal consistency reliability (Cronbach's α) of 0.727, a split-half reliability of 0.668, and a test-retest reliability of 0.892. All values meet psychometric requirements, indicating that the questionnaire possesses a certain degree of reliability.

Validity is an indicator of how effectively a test measures what it intends to measure [19]. Through exploratory factor analysis, this study ultimately identified 20 items and added the dimension of Online-Real World Responsibility Consistency. It established the five dimensions of the Adolescent Online Responsibility Questionnaire: online responsibility cognition, online responsibility emotion, online responsibility volition, online responsibility behavior, and online-real world responsibility consistency. These dimensions explain 52.849% of the total variance, with item loadings ranging from 0.498 to 0.750. The correlations between each dimension and the total score, as well as among the dimensions themselves, are within reasonable ranges. In the real-world environment, not only are there codified behavioral norms and standards, but also supervision from others. It is difficult for individuals to blatantly engage in immoral or irresponsible behaviors in real-world settings. However, due to the unique virtual nature of the online environment, individual actions are concealed, making it hard for immoral behaviors to be immediately exposed even if committed. Adolescents are in a stage of immature physical and mental development, characterized by strong curiosity and Thirst for Knowledge, yet often possess a weak sense of responsibility [5]. This can lead to situations where they adhere to moral norms and behavioral standards in reality but, driven by curiosity or Gambling Psychology, engage in behaviors online that are inconsistent with their real-world conduct. Therefore, integrating items designed to test whether the Specificity of the online environment causes discrepancies in individuals' moral and responsible behaviors between online and real-world contexts into a separate dimension is appropriate for inclusion in the construct of adolescent online responsibility. Simultaneously, confirmatory factor analysis was further conducted to examine the fit of the questionnaire structure. The data show that all indicators are relatively ideal, indicating a good fit for the model. The five-dimensional model of adolescent online responsibility is scientifically reasonable.

5. Conclusion

Furthermore, the correlation coefficient between the total score of the Adolescent Online Responsibility Scale and the Conscientiousness subscale of the NEO-FFI criterion measure was 0.633 ($P < 0.01$). Both the Adolescent Online Responsibility Scale and the NEO-FFI Conscientiousness subscale measure the trait of responsibility; however, the NEO-FFI subscale assesses responsibility in the real world, whereas the online responsibility scale evaluates this trait within the virtual online environment. While the two are closely related intrinsically, they are evidently not perfectly correlated. A correlation coefficient of 0.633 indicates that the Adolescent Online Responsibility Scale possesses good criterion-related validity.

6. References

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