Leveraging data and metadata for understanding interpersonal communication in adolescents: A study of Indonesian's junior high schools students

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Abstract: Interpersonal communication is a crucial aspect of development during adolescence, particularly among junior high school students. Well-developed interpersonal communication can positively impact adolescents' lives. This study aims to explore the patterns of interpersonal communication among adolescents in Indonesia using data and metadata collected during the research. The exploration was conducted by comparing differences in interpersonal communication based on gender, age, and socio-economic status. This study employed a comparative research design. Data were collected using the interpersonal communication scale. The respondents in this study were 1,359 junior high school students in Indonesia, selected through simple random sampling. Data analysis was performed using ANOVA. The results of ANOVA indicate significant differences in adolescents' interpersonal communication based on gender, age, and socio-economic status. The findings of this study are expected to serve as a foundation for developing educational programs in schools, particularly in guidance and counseling services, to foster a generation of adolescents in the digital era who can build high-quality interpersonal relationships.

Keywords: Adolescents, Age, Gender, Interpersonal communication, Junior high school, Socio-economic status.

1. Introduction

Interpersonal communication plays a crucial role in identity formation among adolescents. Well-developed interpersonal communication can have a positive impact on adolescent life. These positive effects include the ability to express thoughts and emotions, build quality interpersonal relationships, and support academic success [1, 2]. However, in today's digital era, adolescents' interpersonal communication skills are declining due to the rapid growth of digital technology and social media, which limit opportunities to develop such skills [3].

Previous studies report that a quality interpersonal communication plays important roles in improving individuals' psychological well-being, mental health, and self-efficac [4, 5]. Adolescents with good interpersonal communication have been reported to exhibit more stable social and emotional development [6, 7]. However, previous works on this topic had not considered the use of more detailed and comprehensive metadata.

Today's technological advancements now support the implementation of such research. Digital data and metadata garnered during the study process can serve as important source of information for understanding adolescents' interpersonal communication pattern. While, we can obtain more

comprehensive insight into such pattern by processing the metadata based on gender, age, and socioeconomic status [8, 9]. studies using data and metadata to examine adolescent interpersonal communication, particularly in Indonesia, are still scarce.

Therefore, this study aims to explore interpersonal communication patterns among junior high school students in Indonesia more deeply by focusing on comparisons based on gender, age, and socioeconomic status. Indonesia is selected as the study context based on two reasons: first, its unique cultural diversity, which may potentially lead to various patterns of adolescent interpersonal communication. Second, many Indonesian adolescents are known to spend significant time accessing the internet and social media, which may negatively affect their interpersonal communication development [10].

This study employs data and metadata as primary sources of information to understand adolescents' interpersonal communication in Indonesia. Such an approach allows for more valid and accurate identification of communication patterns compared to traditional survey methods [11]. The findings are expected to provide deeper understanding of the dynamics of interpersonal communication in relation to gender, age, and socioeconomic status. They are also anticipated to inform the development of school-based educational programs, particularly guidance and counseling services, aimed at fostering adolescents who can build quality interpersonal relationships in the digital age.

2. Materials and Methods

2.1. Population and Sampling Method

This study involved adolescents at the junior high school level in Indonesia. A simple random sampling method was used to determine the research sample. Simple random sampling was applied to ensure that all junior high school students in Indonesia had an equal opportunity to be recruited and to allow the findings to be generalized to a larger population. A total of 1,359 students were recruited as the study sample.

2.2. Instrumentation

The study adapted an interpersonal communication scale developed based on the Indonesian cultural context [12]. The scale consisted of 61 items measuring five aspects of interpersonal communication: openness, empathy, supportive attitude, positive attitude, and equality [13]. Prior to its use in the study, the instrument was tested to ensure its validity and reliability.

2.3. Procedures and Time Frame

The study was conducted in several stages. The first stage was preparation, which included developing the research instrument and obtaining research permits from the schools. The second stage was implementation, during which the researcher administered the interpersonal communication scale to the selected participants and asked them to complete it within approximately 45 minutes under the supervision of the researcher. This stage was carried out over a period of two months to ensure data collection from a broader sample. The final stage was data cleaning, which involved identifying missing values or outliers that could affect the statistical results.

2.4. Analysis Plan

Data analysis in this study was conducted using two strategies. The first strategy employed descriptive statistical analysis to describe the characteristics of interpersonal communication among junior high school students. This analysis yielded the mean, median, mode, standard deviation, and frequency distribution to understand general patterns of interpersonal communication. The second strategy used Analysis of Variance (ANOVA) to compare interpersonal communication based on gender, age, and socioeconomic status. Both descriptive statistical analysis and ANOVA were conducted using the Statistical Package for the Social Sciences (SPSS).

2.5. Scope of the Study

This study focused on interpersonal communication among adolescents in junior high schools in Indonesia, with particular attention to how demographic factors such as gender, age, and socioeconomic status influence communication patterns. Specifically, the study aimed to generate new findings regarding differences in interpersonal communication based on these demographic variables.

3. Results and Discussion

3.1. Results

The first stage of data analysis in this study employed descriptive statistical analysis. Table 1 presents the descriptive statistics of adolescents' interpersonal communication at the junior high school level in Indonesia. The results include the mean, median, mode, standard deviation, maximum value, and minimum value.

Table 1.
Descriptive Statistics of Adolescents' Interpersonal Communication.

N	Valid	1359
	Missing	0
Mean		177.82
Median		175.00
Mode		171[a]
Std. Deviation		17.610
Minimum		97
Maximum		236

Based on the descriptive analysis in Table 1, from 1,359 participants, the average interpersonal communication score was 177.82, with a median of 175.00 and a mode of 171, indicating a relatively balanced distribution. A standard deviation of 17.610, along with a minimum score of 97 and a maximum of 236, shows a considerable variation in interpersonal communication levels among individuals. Furthermore, the data in Table 1 were categorized into five levels: very high, high, moderate, low, and very low. The prevalence of adolescents' interpersonal communication in Indonesia is shown in Figure 1.
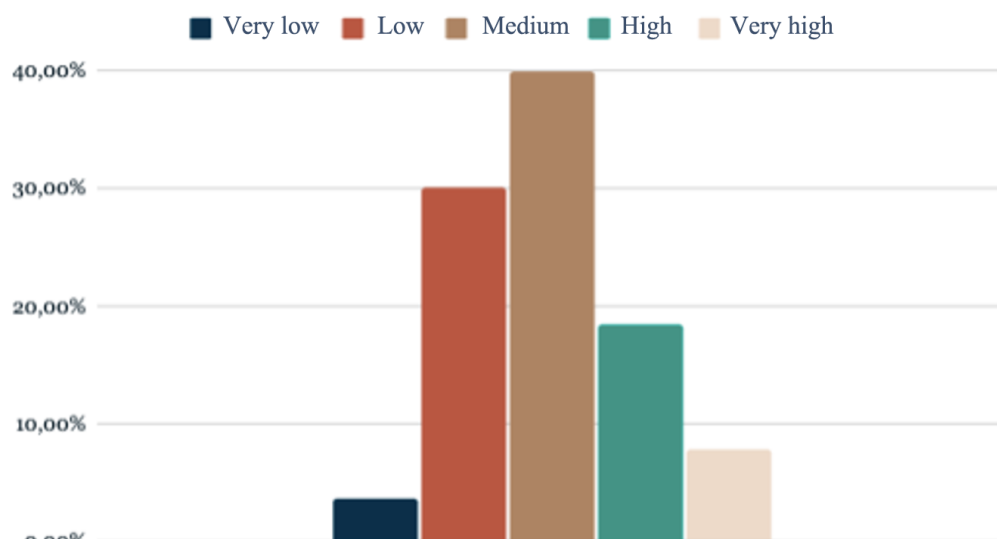

Figure 1.
Prevalence of Adolescents' Interpersonal Communication in Indonesia.

According to Figure 1, interpersonal communication among adolescents generally falls within the low to moderate categories, indicating that most adolescents in Indonesia have relatively poor interpersonal communication. Moreover, the most dominant aspect was supportiveness, accounting for 76%, suggesting that individuals tend to provide support in interpersonal settings. Conversely, the lowest aspect was openness, at 69%, indicating ongoing challenges in expressing ideas, thoughts, or feelings openly to others. A more detailed view of adolescents' interpersonal communication by specific aspects is shown in Figure 2.
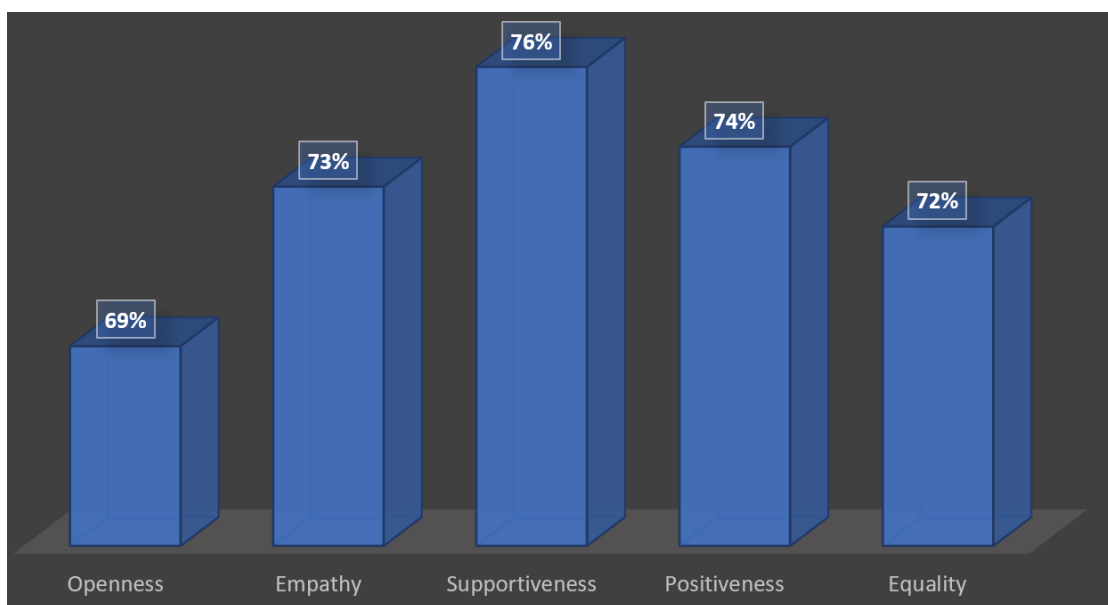

Figure 2.
Adolescents' Interpersonal Communication by Aspect.

The next stage of analysis employed ANOVA. ANOVA was used to examine differences in adolescents' interpersonal communication patterns in greater detail based on gender, age, and socioeconomic status. The results indicated significance values (p) of less than 0.05 for each variable, suggesting that there are statistically significant differences in interpersonal communication among Indonesian adolescents based on gender, age, and socioeconomic status. The detailed ANOVA results are presented in Table 2.

Table 2.
ANOVA Test Results of Adolescents' Interpersonal Communication Based on Gender, Age, and Socioeconomic Status.

Demographic Variables	Category	Number of Participants	Mean	Sig. (p)	Interpretation
Gender	Male	695	173.41	0.000	Significantly, there are differences in interpersonal communication between men and women.
	Female	664	182.45		
Age	12 y.o.	394	175.27	0.001	Significantly, there are differences in interpersonal communication based on age.
	13 y.o.	711	179.61		
	14 y.o.	198	176.17		
	15 y.o.	56	176.00		
Socio-economic Status	Lower-middle	121	175.88	0.000	Significantly, there are differences in interpersonal communication based on socioeconomic status.
	Middle	932	179.80		
	Upper-middle	306	172.59		

4. Discussion

Based on the analysis in Table 1, there is a considerable variation in adolescents' interpersonal communication in Indonesia. This variation may be attributed to factors such as personality, parenting style, age, gender, socioeconomic status, and cultural differences in the social environment [14, 15]. The wide score range further indicates significant differences in interpersonal communication among Indonesian adolescents. These differences suggest that while some adolescents face challenges in interpersonal communication, others demonstrate strong communication skills. Such differences are influenced by factors like self-confidence and social support [16].

Figure 1 shows that most Indonesian adolescents fall within the low to moderate categories of interpersonal communication. This finding aligns with a previous study conducted in Semarang, Indonesia, where 27% of junior high school adolescents demonstrated very low interpersonal communication, 33% were in the low category, and only 7% were in the very high category [17]. These results indicate that the majority of junior high school adolescents face difficulties in communicating, both with peers and in their social environment.

Figure 2 indicates that the most dominant aspect of adolescents' interpersonal communication is supportiveness, while openness is the least developed. This finding is consistent with a previous study in Kediri, Indonesia, where adolescents also scored highest in supportiveness [18]. Another study in Semarang emphasized the need to improve openness among adolescents, as this aspect is crucial for building quality interpersonal relationships [19]. A lack of openness may limit adolescents' ability to express thoughts and feelings, ultimately reducing the quality of interpersonal communication.

The ANOVA results presented in Table 2 indicate significant differences in interpersonal communication based on gender, age, and socioeconomic status. These findings suggest that demographic factors play an important role in shaping adolescents' interpersonal communication patterns in Indonesia. This is consistent with previous studies showing that demographic, biological, psychosocial, and cultural factors contribute to the development of interpersonal communication patterns [8, 20].

The present study found significant differences in interpersonal communication between male and female adolescents. These differences can be explained through gender-based communication theories [21-23]. Specifically, males and females tend to differ in how they express thoughts and emotions, show empathy, and demonstrate openness in social settings [24]. Previous research has shown that females are more likely to adopt interpersonal communication strategies that emphasize relational comfort, while males tend to communicate more directly [25, 26].

In addition to gender, differences in interpersonal communication also emerged based on age. Adolescents aged 13 demonstrated the highest level of interpersonal communication compared to those aged 12, 14, and 15. This finding suggests that the development of interpersonal communication is not linear but is influenced by varying psychosocial development among individuals [27]. Early adolescents tend to experience increased social awareness and improved interpersonal communication, as this stage is marked by a growing inclination to interact with peers [28, 29]. In contrast, adolescents aged 14–15 tend to show lower levels of interpersonal communication, which may be influenced by hormonal changes and a growing preference for technology-mediated communication over face-to-face interactions [30]. Mid-adolescence is also associated with heightened introspection and identity exploration, which may result in changes to communication patterns [31].

Apart from gender and age, socioeconomic status also plays a role in shaping adolescents' interpersonal communication in Indonesia. This study found that adolescents from middle socioeconomic backgrounds had higher levels of interpersonal communication than those from both lower-middle and upper-middle classes. This finding is particularly noteworthy as it contrasts with common assumptions that adolescents from higher socioeconomic backgrounds tend to have better communication skills [32]. One possible explanation is that adolescents from middle-class families have broader opportunities for interaction within their communities. In contrast, those from upper-middle-class backgrounds may have fewer social experiences due to higher reliance on technology and more

protective parenting styles [33]. Previous studies have also found that children from affluent families often have fewer opportunities to develop interpersonal communication skills due to their more structured and less spontaneous social environments [34]. Meanwhile, adolescents from lower-middle-class families may have a self-concept that is highly influenced by others' judgments, which could limit their ability to engage in interpersonal communication [35].

These findings contribute significantly to the development of educational programs, especially school-based guidance and counseling services aimed at improving adolescents' interpersonal communication. Generally, the results support the implementation of group-based collaborative interventions to encourage adolescents to engage more frequently and meaningfully with their social environments [36]. Suggested guidance services include group counseling or group guidance sessions in both small and large groups. Role-play-based group guidance may help adolescents enhance their interpersonal communication by providing opportunities for direct practice [37]. Previous studies have demonstrated that group guidance services are effective in improving adolescents' interpersonal communication [38-40]. In addition, group counseling services have also proven beneficial in this area [41].

Based on the study findings, intervention programs should also focus on male adolescents, as they were found to have lower interpersonal communication levels compared to females. Furthermore, interventions should be targeted toward adolescents aged 14–15 to help them strengthen their communication skills. In light of the socioeconomic status findings, school-based programs should also provide opportunities for adolescents to participate in social activities, as such engagements can encourage more direct and meaningful communication [42].

5. Conclusion

This study concludes that interpersonal communication is influenced by demographic factors, specifically gender, age, and socioeconomic status. These findings highlight the need for further research to explore additional demographic variables that may shape adolescents' patterns of interpersonal communication. Future studies are also recommended to investigate the role of technological and social media developments in moderating the relationship between these factors and interpersonal communication. The implications of this study provide valuable recommendations for the development of intervention programs within educational settings, particularly through school-based guidance and counseling services, to support adolescents in enhancing their interpersonal communication skills.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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This research was conducted to investigate interpersonal communication in adolescents by utilizing data and metadata as the main analytical tool. The focus of this research is junior high school students in Indonesia, with the aim of understanding the dynamics of their social interactions in both digital and face-to-face contexts. It is hoped that this research can provide insights into strategies for strengthening interpersonal communication skills in adolescents, as well as offer recommendations for educational interventions, school curricula, and guidance programs relevant to the social development needs of adolescents in Indonesia.

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