

## Digital literacy and ICT skills of senior high school learners in the technical vocational and livelihood education track

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### Abstract

This paper examines the digital literacy and Information and Communication Technology (ICT) skills of Grade 12 learners in the Technical Vocational and Livelihood (TVL) track in Marcial O. Rañola Memorial School. The study used a quantitative descriptive-developmental design with sample size of 184 respondents. The aim of the study was to evaluate the competencies of the learners in the main areas of digital literacy, barriers experienced by the learners, and the creation of Digital Literacy Enhancement Program (DIGI-TVL) to support the existing gaps.

The results indicated that the respondents mostly exhibited a high degree of digital literacy (WM = 3.72), especially in communication and collaboration, digital safety and security. But the skills related to problem solving and higher order thinking abilities were relatively less. At the same time, the findings revealed that students had moderate barriers in all areas, but critical thinking, information evaluation, and technology access were the most significant barriers, which demonstrates the existence of a digital divide between students.

The research finds that TVL learners have the basics of digital skills but still require much on enhancing higher-order abilities including problem-solving skills and critical thinking skills. Moreover, everyone should have equal access to ICT assets and systematic digital literacy programs to make sure that learners are sufficiently equipped to meet the requirements of the technology-oriented labor market.

In relation to these findings, the schools are recommended to make ICT more accessible and introduce the developed systematic digital literacy training like the DIGI-TVL intervention into the school curriculum.

**Keywords:** Digital Literacy; ICT Skills; TVL Learners; Senior High School; Educational Technology; Development and Validation

### 1. Introduction

This study is anchored on existing laws and policies that support the integration of technology and digital literacy in Philippine education. As such, the Constitution of the Philippines in 1987 under Article XIV, Section 2 dictates that the State has to ensure that learners get quality and accessible education, which includes adjusting the system based on developments in technology. Complementary to this law is Republic Act No. 10533 or the Enhanced Basic Education Act of 2013, which focuses on developing skills required for employability, entrepreneurship, and lifelong learning, especially the Technical Vocational Livelihood (TVL) strand. Likewise, other laws that require integration of ICT in lessons to help learners be better equipped to handle a technology-filled world have been released by the Department of Education.

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With the growing requirements for technology-filled workplaces and globally competitive workforces, it is important to assess the ICT skills of TVL learners at the Grade 12 level since they are supposed to enter the workforce immediately after completing school. Similarly, this study also supports the application of the United Nations' Sustainable Development Goal (SDG) number 4, which focuses on the need to provide quality inclusive and equitable education as well as facilitate lifelong learning opportunities for everyone. As far as Senior High School Technical Vocational and Livelihood Education is concerned, digital literacy and ICT knowledge have become critical competency areas to ensure that the learner is prepared to join the digital economy as part of his/her future career journey. The improvement of the digital literacy level in TVL education results in the creation of globally competitive and industry-ready graduates who possess technological competence, which is vital in meeting the requirements of modern education and career sectors. This research further emphasizes the need to strengthen the new Senior High School curriculum through the inclusion of the technical and academic tracks by incorporating digital literacy skills. The suggested intervention material should serve as additional tools for enhancing digital literacy competencies in the learners to help them develop essential industry and lifelong learning skills.

While ICTs have been introduced in educational settings, many students still suffer from deficiencies in fundamental computer skills and face obstacles that prevent them from fully participating in digital learning. Therefore, this study aims to examine the degree of digital literacy and ICT skills possessed by Grade 12 TVL students and to pinpoint the problems that obstruct them from achieving such skills. The results of this study will enable the formulation of a Digital Literacy Improvement Program tailored to address the students' needs and promote ICT-based tasks that focus on developing digital skills, namely information management, communication, digital content production, cyber safety, and problem-solving. Ultimately, this study addresses an evident gap between existing competencies and industry expectations, thereby contributing to the body of knowledge and supporting the development of a digitally competent workforce aligned with the demands of a globalized economy

### 1.1. Statement of the Problem

This research is designed to find out the profile of Senior High School students during the School Year 2025-2026, measure their digital literacy and ICT competencies, and pinpoint the barriers that hinder them from acquiring those skills.

- What if the profile of Senior High School learners in terms of:
  - Age
  - Gender
  - Strand Enrolled
  - Previous School Attended
  - Access to Technology
- What is the level of digital literacy and ICT skills of Senior High School learners along:
  - Information and data literacy
  - Communication and collaboration
  - Digital content creation
  - Safety
  - Problem solving
- What are the barriers encountered by the learners in developing their digital literacy along:
  - Information and data literacy
  - Communication and collaboration
  - Digital content creation
  - Safety
  - Problem-solving
- What intervention material can be designed based on the findings of the study?

### 1.2. Scope and Delimitation

This study is limited to Grade 12 Senior High School learners during the School Year 2025–2026 enrolled in the Technical, Vocational, and Livelihood (TVL) track at Marcial O. Rañola Memorial School, specifically in the Automotive Servicing (AS), Home Economics (HE), and Computer Systems Servicing (CSS) strands. It focuses solely on the learners' digital literacy and ICT skills, including their competencies in information and data management, communication, digital content creation, safety, and problem-solving within their vocational fields. The study excludes learners from other tracks or grade levels, as well as teachers, administrators, policymakers, and other stakeholders in the educational process. Data collection was conducted only at this school to maintain focus and consistency, and the dry-run conducted

at another school was not included in the analysis. Strands with unavailable respondents, such as Agriculture, were not part of the study. The interventions proposed are tailored specifically to enhance the digital literacy skills of the selected TVL learners and do not extend to other technological initiatives or general educational reforms.

## 2. Materials and Methods

### 2.1. Research Design

The researcher utilized a Descriptive-Developmental Quantitative Research Design to address the objectives of this study. Descriptive research refers to a research technique aimed at describing the nature, state, and interrelationships of variables in a study without manipulation. This is often employed in determining the present situation by collecting, analyzing, and interpreting data. The developmental type of research, meanwhile, focuses on the planning, creation, and assessment of educational resources or programs aimed at correcting perceived problems or weaknesses among the participants. This design was chosen because it allowed a systematic and comprehensive examination of the profile of Senior High School learners in the Technical, Vocational, and Livelihood (TVL) track, their level of digital literacy, and the challenges they encountered in developing ICT skills. The descriptive component provided a detailed picture of learners' characteristics, including age, gender, strand enrolled, previous school attended, access to technology, and socio-economic background, as well as their competencies in information management, communication, digital content creation, safety, and problem-solving. By examining these attributes, the study captured the existing conditions of digital literacy among TVL learners and identified the socio-economic and technological barriers that influenced their skill development.

The developmental component of the design supported the creation of targeted educational interventions. Based on the findings from the descriptive phase, the researcher developed an ICT-Based Digital Literacy Intervention Program tailored to the specific needs of Grade 12 TVL learners. These interventions aimed to fill gaps in digital literacy, enhance students' practical ICT skills, and provide solutions to the challenges they faced in applying technology within their vocational fields. By combining descriptive assessment with developmental design, this approach enabled both the evaluation of the current digital literacy situation and the formulation of practical, context-relevant interventions to improve learners' competencies and readiness for a technology-driven workforce.

### 2.2. Respondents of the Study

The respondents of the study were 184 Grade 12 Senior High School students enrolled in the Technical Vocational and Livelihood (TVL) track at Marcial O. Rañola Memorial School. Only students from the Automotive Servicing (AS), Home Economics (HE), and Computer Systems Servicing (CSS) strands were included, while the Agriculture strand was excluded due to unavailability of respondents. Participants were selected using a sampling method to represent the TVL population without total enumeration.

The participants were supposed to be presently taking up the TVL track for the Academic Year 2025-2026 and would be able to give information about their digital literacy skills and digital technology use. There were 338 Grade 12 students enrolled in the TVL track, and 184 participants were selected through a sampling technique. This sample was considered sufficient to represent the population and generate reliable data for analysis across both rural and urban settings.

### 2.3. Data Gathering Tools

The researcher used the following data gathering tools:

#### 2.3.1. Questionnaire

The questionnaire was through researchers designed in terms of clarity, specificity, and simplification such that the respondents would be able to easily understand and fill the questions. It was concluded according to the following criteria:

Preparation of the Questionnaire. The questionnaire used in this study was carefully developed by the researcher to assess the level of digital literacy and ICT skills of Grade 12 Senior High School learners under the Technical Vocational and Livelihood (TVL) track, as well as the barriers they encounter in developing these skills. The construction of the questionnaire was based on the objectives of the study and the key domains of digital literacy, namely: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving.

The questionnaire consisted of three major parts. Part I focused on the demographic profile of the respondents, which included age, gender, strand enrolled, previous school attended, and access to technology. Part II assessed the level of digital literacy and ICT skills of the learners across the five identified domains using structured statements. Part III is to determine the barriers encountered by the learners in developing their digital literacy skills along the same domains to ensure consistency between the research questions and the instrument. To ensure content validity, the questionnaire items were formulated based on related literature and previous studies on digital literacy and ICT skills.

The initial draft of the questionnaire was subjected to validation by experts in the field of education and research, including the research adviser and the statistician, to determine the clarity, relevance, and appropriateness of the items. Suggestions and comments from the validators were incorporated to improve the instrument. Prior to the actual data gathering, the questionnaire underwent a dry run conducted among Grade 12 TVL learners from Daraga National High School. The data gathered from the dry run were not included in the final analysis of the study.

Administration and Retrieval. The researchers tested the questionnaire on a dry run using non-participant students to check the clarity and reliability of the questionnaire. The dry-run included contributions of the input that was feedback into the official version of the questionnaire. The researcher himself gave the 184 TVL students of the chosen schools the questionnaire. They provided information on the informed consent in explaining the purpose of the study to the subjects before it was distributed as well as obtaining their informed consent.

### 3. Results and Discussion

#### 3.1. Profile of Senior High School Learner

##### 3.1.1. Age

The age profile of Senior High School learners shows the distribution of students across different age groups. It helps identify the majority age range of the learners, as well as any younger or older students, providing insights into their developmental stage and learning needs.

**Table 1** Profile of Senior High School Learners in terms of Age

| Age          | f   | %      | Rank |
|--------------|-----|--------|------|
| 15-17 years  | 138 | 75.00  | 1    |
| 18-20 years  | 44  | 23.91  | 2    |
| 21 and above | 2   | 1.09   | 3    |
| Total        | 184 | 100.00 |      |

Table 1 shows that most learners are within the expected age range, suggesting that they are likely to possess basic familiarity with digital devices and online learning tools. The highest concentration of students in the 15–17 age bracket reflects the standard progression of the formal education system, whereas the presence of older learners' points to cases of educational delay or adult returnees. These findings are consistent with Rini et al. (2022)<sup>1</sup>, who emphasize that self-guided learning enhances digital competency and that learners benefit more when they understand the purpose of technology use rather than relying solely on frequent usage. Similarly, Maya and Suseno (2022)<sup>2</sup> highlight the importance of introducing 21st-century skills during this developmental stage to cultivate holistic competencies, and Özer and Kulooglu (2023)<sup>3</sup> stress that digital literacy at this educational level involves not only technical proficiency but also critical thinking and responsible technology use, essential for professional and academic advancement.

##### 3.1.2. Sex

The profile of the learners of Senior High School as far as sex is concerned. This variable was added to explain how the respondents were distributed in terms of sex and give a better picture of the demographic make-up of the respondents in the study. The knowledge of such a profile can be used to put the analysis of digital literacy and ICT skills among the learners in context.

**Table 2** Profile of Senior High School Learners in terms of Sex

| Sex    | f   | %      | Rank |
|--------|-----|--------|------|
| Male   | 136 | 73.91  | 1    |
| Female | 48  | 26.09  | 2    |
| Total  | 184 | 100.00 |      |

Table 2 reveals a pronounced male predominance, which corresponds with both national and local trends in technical vocational education. The significant imbalance in gender composition may stem from persistent societal perceptions regarding technical and mechanical tasks, while the smaller proportion of female learners underscores the necessity of addressing systemic and cultural barriers. These trends are supported by Abiddin et al. (2022)<sup>4</sup>, who stress the importance of holistic and community-based interventions to facilitate equitable learning conditions for all students. Kalapala and Patel (2024)<sup>5</sup> further highlight that instructors should be conscious of gender dynamics to serve as role models, ensuring that digital literacy and technical skills are promoted inclusively. Likewise, Lim and Yeo (2024) note that digital literacy strengthens soft skills such as communication and interpersonal effectiveness, which are vital for dismantling traditional gender barriers in vocational education.

### 3.1.3. Strand

The profile of the Senior High School learners based on the strand they are attending. This was incorporated to determine the proportion of respondents to the various Technical Vocational and Livelihood (TVL) strands. The knowledge of the strand enrollment will give the context on which the digital literacy and ICT skills of the learners in their respective vocational fields can be analyzed.

**Table 3** Profile of Senior High School Learners in terms of Strand

| Strand                                   | f   | %      | Rank |
|------------------------------------------|-----|--------|------|
| Information and Communication Technology | 30  | 16.30  | 2    |
| Automotive Servicing                     | 127 | 69.02  | 1    |
| Home Economics                           | 27  | 14.67  | 3    |
| Agriculture and Fishery Arts             | 0   | 0.00   | 4    |
| Total                                    | 184 | 100.00 |      |

Table 3 shows the distribution of enrollments suggests that vocational preferences among learners are not uniform, and the implications for digital literacy integration differ by strand. Students in ICT are naturally exposed to technology-intensive coursework, while those in Automotive Servicing and Home Economics encounter digital tools in more industry-specific contexts rather than through general computing. These trends align with Masong and Barillo (2022)<sup>6</sup>, who note that TVL strand selection is deliberately designed to position learners in environments where technology interacts with career-specific practices, supporting effective workplace preparation. Additionally, Irkha et al. (2024)<sup>7</sup> emphasize that the use of multimedia resources and digital simulations enhances learning in varied vocational settings, and that technology integration should be personalized to the needs of each strand. Adeleye et al. (2024)<sup>8</sup> further assert that digital competence is essential for learners to efficiently search, synthesize, and generate information, ensuring that all students, regardless of strand, are equipped with relevant ICT skills to remain competitive in the modern labor market.

### 3.1.4. Previous School Attended

The profile of learners' previous schools highlights the educational background of students before entering Senior High School. It provides insight into the types of schools they came from—public or private, rural or urban—which can influence their prior learning experiences, preparedness, and adjustment to the current academic environment.

**Table 4** Profile of Senior High School Learners in terms of Previous School Attended

| Previous School Attended                           | f   | %      | Rank |
|----------------------------------------------------|-----|--------|------|
| Science High School                                | 7   | 3.80   | 2    |
| Laboratory School of State University and Colleges | 1   | 0.54   | 5    |
| Alternative Learning System                        | 0   | 0.00   | 7    |
| Overseas School                                    | 1   | 0.54   | 5    |
| Catholic School/Parochial                          | 2   | 1.09   | 4    |
| Public High School                                 | 168 | 91.30  | 1    |
| Private High School                                | 5   | 2.72   | 3    |
| SPED Center                                        | 0   | 0.00   | 7    |
| Others                                             | 0   | 0.00   | 7    |
| Total                                              | 184 | 100.00 |      |

Table 4 presents the distribution highlights the dominant role of public secondary schools in preparing students for the Technical Vocational and Livelihood (TVL) track, particularly in terms of accessibility and availability. While most learners come from public schools, the data suggest potential disparities in prior exposure to ICT and digital resources, which can influence students' readiness to engage with technology-intensive learning in senior high school. These observations are supported by Samartin et al. (2022)<sup>9</sup>, who identify significant gaps in digital access for students from resource-limited schools, affecting their preparedness for technology-integrated learning. Edralin and Pastrana (2023)<sup>10</sup> further emphasize that disparities in educational infrastructure can hinder modernization efforts in the TVL track, necessitating compensatory strategies to equalize opportunities.

### 3.1.5. Access to Technology

The profile of learners' access to technology reflects the availability and use of digital tools such as computers, smartphones, and the internet. It provides insight into the students' readiness for digital learning, their ability to engage with online resources, and the potential support they may need to effectively use technology in their studies.

**Table 5** Profile of Senior High School Learners in terms of Access to Technology

| Access to Technology                     | f   | %      | Rank |
|------------------------------------------|-----|--------|------|
| Personal Devices and Internet Connection | 88  | 47.83  | 1    |
| No Internet Access at home               | 9   | 4.89   | 3    |
| No Personal Devices at Home              | 6   | 3.26   | 4    |
| Unstable Internet Connection at Home     | 2   | 1.09   | 5    |
| Data Connection only (not unlimited)     | 79  | 42.93  | 2    |
| Others                                   | 0   | 0.00   | 6    |
| Total                                    | 184 | 100.00 |      |

Table 5 shows the profile of the learners in the Senior High School regarding their access to technology. This variable was added to establish the access of the digital devices and technological resources that the learners can use in academic and learning activities.

The results of the study by Alajmi (2022)<sup>11</sup> confirm the hypothesis that the issue of digital literacy was highlighted particularly during the pandemic transition, and the lack of access to devices and the unreliability of connections have become the most evident challenges to the effective application of technologies. Quraishi et al. (2024)<sup>12</sup> argue that structural barriers like constraints on infrastructure used to promote policy interventions like equitable distribution of resources among vocational students should be resolved to ensure that good digital worker competence is developed.

### 3.2. Summary of the Level of Digital Literacy and ICT Skills Summary

The level of digital literacy and ICT skills of Senior High School learners reflects their overall ability to use digital tools effectively across key areas. Students demonstrate varying degrees of proficiency in accessing and evaluating information, communicating and collaborating online, creating digital content, solving problems, and maintaining safety and ethical practices in digital environments. This comprehensive view highlights both their strengths and areas for further development, which are essential for academic success and readiness for technology-driven learning and workplaces.

**Table 6** Summary on the Level of Digital Literacy and ICT Skills of Senior High School Learners

| Evaluation Criteria               | Weighted Mean | Verbal Interpretation | Rank |
|-----------------------------------|---------------|-----------------------|------|
| 1.Information and Data Literacy   | 3.62          | HC                    | 3.5  |
| 2.Communication and Collaboration | 3.81          | HC                    | 2    |
| 3.Digital Content Creation        | 3.62          | HC                    | 3.5  |
| 4.Safety and Security             | 3.96          | HC                    | 1    |
| 5.Problem Solving                 | 3.60          | HC                    | 5    |
| Average                           | 3.72          | HC                    |      |

Table 6 illustrates that learners are particularly strong in online safety and interpersonal communication, but less proficient in problem-solving and higher-order content skills. The dominance of Safety and Security highlights the students' preparedness to operate responsibly in digital environments, a critical competence given the increasing prevalence of cyber threats in educational and workplace contexts. Conversely, the comparatively lower scores in Problem Solving and advanced content creation suggest that learners require structured interventions to enhance technical troubleshooting and critical assessment abilities. These observations are supported by Utama et al. (2024)<sup>13</sup>, who found strong correlations between digital literacy, productivity, and employability, emphasizing the importance of balanced digital competencies for workforce readiness. Tanucan et al. (2022)<sup>14</sup> further argue that achieving employability potential requires the development of digital literacy across multiple domains, while Perez and Bautista (2023) confirm that learners with strong digital skills have higher chances of employment in digitally advanced sectors, highlighting the practical implications of the balanced digital literacy profile.

### 3.3. Summary of the Barriers Encountered by the Learners

Learners face multiple challenges in developing digital literacy, including limited access to devices and reliable internet, insufficient digital skills, and lack of guidance in using technology effectively. Specifically, they struggle with Information and Data Literacy in locating and evaluating information, Communication and Collaboration in sharing ideas and working with others online, Digital Content Creation in producing and presenting digital work, Digital Safety in protecting personal information and avoiding online risks, and Problem Solving in applying digital tools to address challenges. These barriers collectively affect learners' ability to participate fully in digital learning and to build confidence in using technology for academic and personal purposes.

**Table 7** Summary on the Barriers Encountered by the Learners in Developing their Digital Literacy

| Evaluation Criteria               | Weighted Mean | Verbal Interpretation | Rank |
|-----------------------------------|---------------|-----------------------|------|
| 1.Information and Data Literacy   | 2.78          | Neutral               | 3.5  |
| 2.Communication and Collaboration | 2.79          | Neutral               | 2    |
| 3.Digital Content Creation        | 2.77          | Neutral               | 5    |
| 4.Safety and Security             | 2.84          | Neutral               | 1    |
| 5.Problem Solving                 | 2.78          | Neutral               | 3.5  |
| Average                           | 2.79          | Neutral               |      |

Table 7 presents an overview of the obstacles encountered by Senior High School learners in developing digital literacy across five core competency areas: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety and Security, and Problem Solving. The overall weighted mean of 2.79, verbally interpreted as Neutral, indicates that learners face moderate challenges in acquiring digital literacy skills. The barriers in individual domains were closely clustered, ranging from 2.77 to 2.84. Among these, Safety and Security recorded the highest mean (WM = 2.84), suggesting that learners experience comparatively greater difficulty in managing data privacy, protecting personal information, and exercising responsible online behavior.

These findings are consistent with Aquino and Santos (2022), who emphasize that systematic digital literacy frameworks in vocational education enhance teaching effectiveness and assessment practices. Similarly, Caramay et al. (2023) advocate for the integration of digital and media literacy into the curriculum to improve workforce readiness and national competitiveness.

### 3.4. Digital Literacy Enhancement Worksheet for TVL Learners

The intervention materials that were developed were informed by the study findings on the level of digital literacy and barriers faced by the learners in the Technical Vocational and Livelihood (TVL) track in Senior High School. As shown in Tables 7 to 18, the learners displayed different degrees of digital literacy in the five competency areas namely information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. Even though the general meaning of the barriers the learners face was evaluated as neutral, the results show that the learners still have some challenges when developing their digital literacy skills. These issues demonstrate that special learning resources are required to facilitate the process of building the necessary ICT skills among the learners.

The intervention sources were thus made on the basis of specific areas that were found during the study results. The worksheets are aligned to the five competencies of digital literacy under investigation in the study, so that the intervention specifically addresses the needs that were detected among the learners. The tasks contained in the worksheets are based on the practical and guided activities that enable learners to utilize the online skills of assessing online sources, being responsible in the online space, producing the digital content, exercising online safety, and solving the technological issues. The output aligns the intervention material with the areas of competencies which the study measures and hence, the learning activities proposed are sufficiently evidence based and aligned to the real needs of the learners regarding digital literacy.

Moreover, the proposed intervention resources are expected to facilitate the enhancement of the ICT skills of learners in a systematic and convenient way. The worksheets are designed with the active distractions of short informative directions and the task-oriented activity to encourage active learning, critical thinking, and safe utilization of digital technologies. With the help of the activities, the learners will become more confident in their use of digital tools, have better opportunities to assess and handle information, and will be more aware of safe and responsible digital behaviors. Finally, the interventional contents should be used to assist the TVL learners to increase their digital literacy and adequately equip them with skills to undertake academic work, vocational training, and future engagements in a workforce that is technology-driven.

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## 4. Conclusion

Based on the findings the following conclusions were drawn:

- Most Grade 12 TVL learners are male, aged 15–17, and enrolled in Automotive Servicing, with half owning personal devices and having reliable internet while others experience limited access, reflecting a digital divide, which shows that unequal access to technology may affect opportunities for developing ICT skills.
- Learners demonstrate a high level of digital literacy and ICT skills overall, excelling in Safety and Security and Communication and Collaboration, while Problem Solving is slightly lower, which reveals that they are confident in using digital tools but require further training in advanced problem-solving and content creation.
- The barriers to digital literacy are moderate across all domains, particularly in Safety and Security and Communication and Collaboration, indicating that challenges exist but are manageable through targeted interventions to improve learners' digital competencies.
- The DIGI-TVL Intervention Program, consisting of modular instruction, guided and collaborative practice, and reflective activities, is designed to address the learners' needs and reduce barriers, which suggests that applying the program can enhance digital skills, build confidence, promote safe technology use, and prepare learners for work-ready performance in vocational settings.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

I declare that I have no conflicts of interest related to this research. I have no personal or financial relationships that could influence my work.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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