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The Impact of Gamified Instruction on Students' Academic Achievement, Learning Engagement, and Psychological Distress in Japanese Language Teaching

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Article

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Abstract

Based on the current demand in foreign language teaching to enhance student learning motivation and alleviate psychological distress, this study investigates the effectiveness of applying gamified instruction in Japanese language learning. First-year Japanese majors at University X participated in a 16-week experiment. The experimental group received gamified instruction designed based on the Analysis, Design, Development, Implementation, Evaluation (ADDIE) model, while the control group utilized traditional teaching methods. Data on students' Japanese academic achievement, learning engagement scale scores, and psychological distress scale scores are collected, and pre- and post-test comparative analyses are conducted using statistical methods. The results clearly show that gamified instruction significantly boosts students' Japanese academic performance. The experimental group's post-test mean score for academic achievement rises to 85.31, a notable increase from their pre-test mean of 72.77. This improvement is markedly higher than the control group's more modest gain (from 71.63 to 74.11) and is statistically significant at the 1% level. Learning engagement improves considerably, as evidenced by the experimental group mean total score from 49.42 to 78.81, a 59.5% increase. The control group improves marginally by 7.24%. A t-test comparison confirms post-test vigor, dedication, and absorption scores in the experimental group are significantly greater than those achieved by the control group ($P < 0.001$). In terms of psychological distress, the total score of the experimental group decreased significantly from 57.62 to 36 ($P < 0.001$). In contrast, the control group showed little change, with no significant difference between the pre-test and post-test results ($P = 0.902$). These findings indicate that gamified instruction effectively improves students' academic achievement, significantly enhances their learning engagement and attentional focus, and contributes to alleviating psychological distress. The study provides empirical evidence for the integration of gamification in Japanese language learning as well as more general foreign language learning contexts, pointing to its amenability to varied learning contexts.

Introduction

Gamified instruction has been seen as a pedagogy of learning that boosts interest, motivation, and engagement in learning. Evolution in education technology has rendered it eligible for inclusion across diverse areas of education, and language learning is one of the pioneering fields where the dynamic and interactive aspects of the same assist in facilitating both the process of learning and cumulative performance in terms of academics (Szabó & Kopinska, 2023; Thurairasu, 2022). Compared to traditional pedagogical models that make use of direct instruction and norm-referenced tests, gamified learning applies points, rewards, leaderboards, and real-time feedback to activate intrinsic motivation and sustain high participation rates (Li et al., 2024; Mohzana, 2023; Shortt et al., 2023). Other than individual drive, gamified learning also stimulates group interactions between learners and instructors, fostering social skills as well as motivating improved academic achievement (Dehghanzadeh et al., 2021; Pingmuang & Koraneekij, 2022; Zhao & McClure, 2024). Compared to mainstream foreign languages like English, Japanese language acquisition presents unique challenges. Its complex honorific system, the interplay of Kanji and Kana, and a high threshold for listening and speaking proficiency often lead learners in

traditional teacher-centered classrooms to experience a lack of control and evaluation anxiety (Ghafar, 2023; Ghaleb, 2024). Existing research indicates that authoritarian teaching, characterized by teacher dominance and insufficient interaction, can contribute to anxiety, burnout, and decreased motivation among university students studying Japanese, subsequently harming their academic achievement while increasing psychological distress (Akhtar et al., 2024; Park et al., 2023). However, current empirical studies systematically integrating gamified strategies into Japanese language classrooms and quantifying their dual benefits on learning engagement and psychological distress remain limited. Longitudinal evidence specifically addressing core competencies such as Kanji memorization, grammar mastery, and oral expression is particularly scarce.

To address the identified gap, this study adopts Self-Determination Theory (SDT) as the theoretical framework. It also integrates SDT with the Analysis, Design, Development, Implementation, Evaluation (ADDIE) instructional design model to construct a gamified teaching framework for Japanese language learning. SDT emphasizes three basic psychological needs underlying human intrinsic motivation: autonomy, competence, and relatedness. Satisfying these needs stimulates learners' intrinsic motivation, thereby improving learning performance and reducing psychological distress (Grenie et al., 2024). In gamified instruction, elements such as points, rewards, and feedback enhance students' sense of autonomy and competence. Meanwhile, cooperative tasks and interactive mechanisms strengthen their sense of relatedness, thus promoting learning motivation. ADDIE is widely recognized in the field of systematic instructional design, providing a closed-loop process from objectives to strategies to evaluation. This ensures a high match between game elements and course objectives and supports multi-dimensional data collection and iterative optimization. Based on this model, various gamified instruction strategies are designed, incorporating platforms such as Quizizz, to enhance student learning experience and interactivity. Finally, a controlled experiment is conducted to compare students' academic achievement, learning engagement, and psychological distress under different instructional models.

In addition to addressing the research gap in gamified instruction for Japanese language learning, the study also aims to provide empirical evidence for its efficacy. The findings aim to make contributions to innovative pedagogies, offering practical insights for Japanese language instructors who are attempting to implement gamification in larger foreign language learning settings.

Literature Review

In recent years, the application of gamified instruction in language learning has become increasingly widespread. Research indicates that gamified instruction stimulates student learning motivation while demonstrating positive effects on enhancing academic performance and relieving psychological distress. Huseinović (2024) explored the application of gamification in English language teaching at universities in Bosnia and Herzegovina, finding that game elements significantly improved students' learning motivation and academic achievement. Tursunbayevich (2024), further building upon flow theory and self-determination theory, confirmed that point systems and cooperative challenge

mechanisms could effectively enhance the motivation and performance of English language learners. Ge (2024), through a 50-day competitive vocabulary game experiment, discovered that gamification in a completely anonymous environment was most effective in promoting learning engagement and ultimate learning outcomes. Beyond learning motivation and performance, gamified instruction also showed potential in terms of learner psychological distress. Gkintoni et al. (2024) indicated that interactive gamified platforms helped improve emotional regulation, physical participation, and healthy eating behaviors in children and adolescents. Aslanyan-rad (2024) found that educational games based on a multi-dimensional planning model significantly reduced anxiety levels in undergraduates and improved self-help functions, with particularly significant effects in ameliorating compulsions, fears, and social sensitivity.

Regarding the application of gamified instruction in Japanese language learning, existing research has begun to explore its practical pathways. Mitchell and Shachter (2021), through an experimental study on the Quizlet Match game, found that gamified instruction improved students' vocabulary scores. Although its effect on boosting learning motivation was limited, the use of feedback mechanisms such as leaderboards enhanced student learning engagement. Chen et al. (2023) developed a game-based Japanese learning system using the Octalysis gamification framework and found through empirical research that this system significantly improved the learning motivation and performance of in-service learners. Hussin and Abdullah (2024) employed a quasi-experimental design to investigate the impact of a scavenger hunt game on improving students' Japanese vocabulary retention and learning motivation. They found that the experimental group's vocabulary retention increased by 20%, significantly higher than the control group's 8%, and experimental group students exhibited greater autonomy, competence, and relatedness. Game-based learning was shown to effectively enhance vocabulary retention and student motivation, creating a more appealing and inclusive environment for language learning. Tripon et al. (2023) analyzed the impact of educational interactions on student well-being and learning outcomes in a sustainable education environment. They pointed out that a positive teaching environment and strong teacher-student interaction were crucial factors for improving learning motivation and psychological distress.

Despite existing research affirming the positive impact of gamified instruction on language learning outcomes and psychological distress, studies specifically targeting university Japanese language learners remain relatively limited within the field of Japanese language teaching. Most research has focused on vocabulary memorization and motivation enhancement, with fewer systematic evaluations of the comprehensive impact of gamified instruction on learning engagement and psychological distress. Furthermore, a substantial portion of current research employs descriptive or case study methods, lacking the support of comparative experimental designs and systematic instructional intervention frameworks. Therefore, this study attempts to fill this gap by constructing a systematic gamified instruction plan based on the ADDIE instructional design model and conducting empirical interventions using the Quizizz platform. This study comprehensively evaluates the specific effects of gamified instruction in university Japanese language learning across three dimensions: academic achievement,

learning engagement, and psychological distress, providing actionable empirical support and theoretical contributions to Japanese language teaching.

Theoretical Foundation and Research Hypotheses

SDT is a theoretical framework concerning human motivation and personality development. At its core are three basic psychological needs—autonomy, competence, and relatedness—whose fulfillment is essential for fostering intrinsic motivation and psychological distress. Autonomy refers to the sense of freedom and self-control individuals experience in their actions. Competence reflects the perception of one's ability and effectiveness when facing challenges. Relatedness denotes the need to establish positive and supportive connections with others. According to SDT, the fulfillment of these basic psychological needs in learning and daily life strengthens intrinsic motivation, enhances learning outcomes, and reduces negative emotions such as anxiety and depression (Behzadnia & FatahModares, 2023).

In educational contexts, SDT provides a powerful framework for understanding how gamified instruction influences learners' academic achievement, learning engagement, and psychological distress. Specifically, reward mechanisms, leaderboards, and instant feedback in gamified instruction strengthen students' sense of competence by allowing them to perceive improvements in their abilities during the learning process. Cooperative tasks, interactive activities, and social competition effectively meet students' need for relatedness, enhancing their connection with others and fostering a sense of community. Finally, the incorporation of choice and challenge enhances students' sense of autonomy, enabling them to experience greater freedom and control in learning. By fulfilling these basic psychological needs, gamified instruction not only stimulates intrinsic motivation but also improves learners' psychological distress by alleviating anxiety and depressive emotions during the learning process.

According to the framework of SDT, competence is a key driver of academic achievement. SDT posits that when students perceive improvements in their learning abilities, their intrinsic motivation is significantly enhanced (Osei & Bjorklund, 2024). In gamified instruction, mechanisms such as points, instant feedback, and leaderboards continuously demonstrate students' progress and ability growth, thereby strengthening their sense of competence. This heightened competence motivates students to engage more deeply in learning, which in turn improves academic achievement. Therefore, this study hypothesizes that gamified instruction significantly enhances students' Japanese academic performance by reinforcing their sense of competence.

SDT also emphasizes that the fulfillment of the three psychological needs—autonomy, competence, and relatedness—is central to improving students' learning engagement (Nguyen-Viet & Nguyen-Viet, 2025). Learning tasks that are challenging and combined with feedback mechanisms encourage active participation and sustained learning. In a gamified learning environment, students experience the challenge of tasks, the immediacy of feedback, and a sense of achievement derived from points and reward systems, which collectively increase learning motivation and engagement. Accordingly, this study

hypothesizes that gamified instruction significantly enhances students' learning engagement by satisfying their basic psychological needs.

Finally, SDT highlights that when students' basic psychological needs are fulfilled, their psychological distress is typically reduced (Liu et al., 2025). Learning tasks designed to reduce anxiety, depression, and other negative emotions can effectively alleviate psychological distress. By fostering autonomy, competence, and relatedness, gamified instruction creates a more positive learning experience and reduces psychological distress such as anxiety and depression during the learning process. Therefore, this study hypothesizes that gamified instruction not only enhances learning motivation but also effectively improves students' psychological distress.

In summary, based on SDT, the following hypotheses are proposed:

H1: Gamified instruction significantly enhances students' academic performance in Japanese.

H2: Gamified instruction significantly increases students' learning engagement.

H3: Gamified instruction effectively alleviates students' psychological distress.

Gamified Instruction Design for Japanese Language Learning

Within the context of Japanese language teaching, this study employs the ADDIE instructional design model to construct a systematic and effective framework for gamified instruction. The ADDIE model, a popular approach in education and training, consists of five distinct phases: Analysis, Design, Development, Implementation, and Evaluation. These phases provide an orderly and scientific method for designing, developing, and testing instructional interventions (Abuhassna et al., 2024; Li & Abidin, 2024; Spatioti et al., 2022). The proposed framework for gamification of Japanese language teaching, based on this model, is shown in Figure 1.

Analysis Phase

In the initial stage of gamified instruction design, it is essential to conduct an in-depth analysis of the existing issues in Japanese language teaching, learner characteristics, instructional content, and learning environment. This process should be combined with the actual needs of the target learners. In addition, a learning needs analysis should be implemented through questionnaires and interviews to enhance the scientific rigor and adaptability of the instructional design.

1. Analysis of Issues in Japanese Language Teaching: Traditional Japanese language teaching methods predominantly rely on teacher-centered approaches, which result in limited learning engagement and interaction. This lack of student involvement hinders the overall learning experience (Gayevska & Kravtsov, 2022; Leung et al., 2023). Additionally, the complexity of Japanese grammar and the combined use of Kanji and Kana pose significant challenges for learners. A lack of interaction and engagement suppresses students' sense of autonomy and belonging, thereby weakening their intrinsic motivation (Li

et al., 2024). Gamified instruction, through mechanisms such as points, rewards, competition, and collaboration, effectively stimulates students' learning interest and enriches their learning experience. In this process, learners experience greater freedom of choice and a stronger sense of control, which enhances their autonomy. At the same time, interaction and competition with peers strengthen their sense of belonging, leading to deeper engagement in learning.

2. The study focuses on university students, a group exhibiting strong cognitive abilities and potential for autonomous learning, yet demonstrating considerable variability in learning motivation and social needs. When confronted with complex language knowledge, they are prone to experiencing frustration (Davidovitch & Dorot, 2023; Dizon et al., 2022). When students face challenging tasks and perceive an enhancement of their competence along with timely feedback, their intrinsic motivation increases significantly (Malecka & Boud, 2023). To ensure that the gamified instruction design effectively addresses learners' needs, a systematic learning needs analysis is conducted based on literature review. Data are collected using a combination of questionnaires and semi-structured interviews. The questionnaire covers dimensions such as learning motivation, classroom interaction preferences, habits in using digital tools, and receptiveness to gamified elements. A total of 53 questionnaires were distributed and all were returned as valid responses. Additionally, 10 students were randomly selected for in-depth interviews to further explore their primary difficulties in learning Japanese, preferred learning strategies, and expectations for gamified classroom design.

The needs analysis revealed that 78.3% of students considered traditional classroom interactions insufficient and lacking in interest, making it difficult to maintain focus. Approximately 65.1% of students expressed a desire for classroom activities that incorporate competition and reward mechanisms to enhance their sense of achievement and engagement. Notably, 70.7% of students experienced significant difficulties in oral expression and kanji memorization, while around 41.5% reported boredom when learning complex grammar. According to SDT, competence is a critical source of students' learning motivation; when students perceive progress and improvements in their abilities, they are more likely to maintain high levels of engagement (Jeno et al., 2023). Accordingly, task-based challenges and instant feedback mechanisms in gamified instruction help students develop a sense of competence, thereby increasing their learning motivation. The survey also indicated that 88.6% of students regularly use online learning tools, over 60% have experience with online games, and they expressed clear acceptance of gamified elements such as leaderboards, badges, and task unlocking. These elements can directly enhance students' autonomy and sense of relatedness, further supporting engagement in learning.

Based on these results, the instructional design incorporates leaderboards, instant feedback, point-based rewards, and team collaboration mechanisms to meet students' needs for achievement and competition. To address challenges in oral expression, role-playing tasks are emphasized, while vocabulary and kanji memorization difficulties are tackled through task-based challenges and the "Sharp Eye" error-correction activity. A Japanese cultural exploration storyline is also combined with task unlocking mechanisms to enhance interest and immersion in learning. Furthermore, these needs are consistent with findings from existing studies, which demonstrate that gamified elements such as point-

based rewards, leaderboards, and team collaboration significantly enhance learners' engagement and sustained motivation (Luo et al., 2023; Pan & Mow, 2023; Schmidt-Fajlik, 2023). Accordingly, this study fully integrates these mechanisms into its design to maintain learning motivation and promote academic achievement.

3. Instructional Content Analysis: The curriculum emphasizes the four fundamental language skills: reading, writing, speaking, and listening. The design of learning activities should enhance students' sense of competence and also provide appropriate challenges and feedback to sustain their intrinsic motivation. Gamified instructional strategies facilitate speaking proficiency through role play, vocabulary retention through vocabulary games, and reading comprehension through task-based reading games. Integration of Japanese cultural elements, such as history, anime, and literature, with gamified activities enhances students' cultural consciousness and appreciation.

4. Learning Environment Analysis: Modern educational technology provides strong support for gamified instruction. This study employs Quizizz as the primary game-based learning platform, which offers advantages such as instant feedback, automatic grading, real-time leaderboard generation, and compatibility with diverse teaching scenarios. These features effectively enhance students' sense of participation and learning motivation. Combined with multimedia teaching equipment, this creates a blended gamified instructional model that integrates both online and offline environments.

Design and Development Phase

Based on the learning needs analysis, SDT, and the ADDIE instructional design model, a gamified instruction framework centered on "Japanese learning + cultural exploration" is developed. The framework seeks to improve university students' Japanese language proficiency and learning engagement by integrating contextualized tasks, collaborative activities, and real-time feedback mechanisms. This design framework incorporates various gamified elements, including storylines, leaderboards, experience points (XP), badges, level challenges, instant feedback, and role-playing mechanisms, ensuring the teaching process is both goal-oriented and engaging. Table 1 illustrates the relationship between the gamified design elements and the basic psychological needs identified by SDT.

Table 1 Mapping of Gamified Design Elements to SDT Psychological Needs.

Gamified Design Element	Corresponding SDT Psychological Need	Expected Psychological Effect
Points, Leaderboards, Badges	Competence	Perception of skill improvement; visualization of learning progress
Task Difficulty Choice	Autonomy	Increased sense of control and engagement; reduced feeling of coercion
Team Challenges, Role-Playing	Relatedness	Strengthened peer connection and willingness to collaborate
Narrative Context, Cultural Exploration	Autonomy, Relatedness	Enhanced situational immersion and cultural identification

This design framework incorporates various gamified elements, including storylines, leaderboards, XP, badges, level challenges, instant feedback, and role-playing mechanisms, ensuring that the teaching process remains both goal-oriented and engaging. In selecting a gamified instruction platform, this study adopts Quizizz as the primary tool. Quizizz offers a wide range of gamified elements that effectively stimulate students' learning motivation, aligning closely with the objectives of this study. The platform also features a high degree of interactivity and customizability, enabling instructors to flexibly design diverse Japanese language tasks that address the contextual needs of language learning. Moreover, Quizizz supports data tracking and learning analytics, allowing researchers to monitor student performance in real time and providing reliable evidence for subsequent effectiveness evaluations. Its user-friendly interface and mobile accessibility lower barriers to use, ensuring seamless participation both inside and outside the classroom. Therefore, the choice of Quizizz is based on both its technological features that support gamified instruction and its strong compatibility with the ADDIE model framework. This tool ensures that the instructional activities are engaging and feasible.

To enhance the immersive experience of gamified instruction, "Japanese Cultural Exploration" is designed as the main storyline for the course. Students assume the role of cultural explorers, progressively unlocking Japanese regions on a virtual map (e.g., Hokkaido, Kansai, Kyushu) by completing language tasks. Each region represents a learning unit, such as "Honorific Expressions," "Kanji Memory Techniques," or "Daily Conversations." Upon completing tasks, students earn XP and unlock new areas, with the ultimate goal of earning the "King" or "Cultural Master" title. The Quizizz platform is used for task execution and feedback, and the system instantly generates leaderboards, displaying students' current score rankings to enhance competition and a sense of achievement. Regarding the badge system, students can earn virtual honor badges for completing specific learning behaviors, such as "Grammar Master," "Spelling Champion," or "Cultural Ambassador." These badges provide positive reinforcement while serving as an important reference for the comprehensive final evaluation.

The design of gamified instruction activities integrates core language skills from the university-level Japanese course, promoting students' language application abilities through diverse task formats. The following teaching activities are developed:

1. Eagle Eye: This vocabulary recall and language awareness exercise aims at common Japanese writing errors such as wrong Kanji strokes and wrong particle use. Twice a week, the instructor presents Japanese expressions containing errors, and students correct the mistakes and submit their answers and analyses within 90 seconds. They earn base points, speed points, and logic bonus points based on submission time, correctness, and analytical reasoning. The leaderboard updates instantly, encouraging active student participation. The activity utilizes the Quizizz platform to provide feedback and review incorrect answers, reinforcing knowledge mastery.

2. Role Play: This module emulates actual communication situations to develop speaking skills and language use in day-to-day life. Bi-weekly, groups write and record situational scripts using specified grammar. They earn 100–300 XP based on linguistic accuracy, fluency, and creativity, with winning productions displayed on the class homepage. Groups that achieve excellent productions three times are awarded the "Cultural Ambassador" badge and receive additional academic credit at the end of the semester. This segment emphasizes collaborative learning and social interaction, serving as a key practical form integrating gamification mechanisms with language proficiency.

3. Task Challenges: Tasks are categorized into four levels: beginner, intermediate, advanced, and expert, covering listening, speaking, reading, and writing skills. Students can freely choose task challenges based on their ability; the more difficult the task, the higher the points. Completing all tasks within a certain level unlocks a "Cultural Easter Egg," granting additional XP and the "Academic Explorer" badge, further stimulating learning motivation.

To enhance learners' sense of participation and competitive awareness, a points ranking system is designed for both individuals and teams. At the end of each class, the points ranking is announced, and individuals or teams with outstanding performance are rewarded. The specific XP point rules for each activity are outlined in Table 2:

Table 2 Gamified Learning Challenge Task Points Rules.

Task Type	Points Rule	Reward Range (XP)
Class Interaction	Actively answer questions, with scores based on answer quality and difficulty	1-3
Knowledge Testing	Scored based on accuracy, promoting pre-class preparation and post-class review	1-10
Classroom Discipline	Adhere to classroom rules and actively engage in course activities	1
Homework	Submit on time and meet standards, with scores based on completion	1-20
Eagle Eye	Correct spelling errors and provide logically clear error analysis	50-100
Role Play	Scored based on language accuracy, fluency, and situational creativity	100-300
Task Challenges	Task levels (beginner → expert), with higher difficulty tasks earning more points	50-400
Speed Rewards	Additional rewards for the top three finishers in spelling challenges	20-50
Progress Rewards	Complete all tasks within the same difficulty level to unlock "cultural Easter eggs" and earn rewards	100
Team Competition	Best role-play group wins the "Best Collaboration Award"	200/group

Implementation Phase

In the implementation phase of gamified instruction, the instructor must ensure clarity regarding the game rules, task objectives, and scoring criteria so students fully understand the learning expectations. It is essential that the instructor actively monitors student progress throughout the teaching process, providing personalized guidance and feedback tailored to individual needs. Additionally, supplementary learning resources—such as instructional videos, reading materials, and practice tests—should be provided to reinforce key concepts, optimize learning strategies, and support students in overcoming challenges.

Evaluation Phase

The evaluation phase is seamlessly integrated into the entire teaching process to assess the effectiveness of the gamified instruction approach. Initial evaluation focuses on ensuring that the game elements align with the course objectives and support the intended learning outcomes. During the teaching process, the instructor continuously monitors student learning progress through classroom observations and data analysis, tracking engagement, task completion, and overall performance. Following the course, a comprehensive post-course evaluation is conducted to assess students'

knowledge retention, learning attitudes, teamwork, and autonomous learning abilities. This evaluation provides valuable insights, offering a foundation for refining and optimizing future instructional designs to enhance the effectiveness of gamified instruction strategies.

Methodology

Experimental Subjects and Experimental Design

The subjects of this study are first-year Japanese major students at X University. Two classes were selected for the research sample. To ensure randomness and representativeness, a whole-class random assignment method is used to divide the two parallel classes into an experimental group (n=26) and a control group (n=27). Table 3 presents the basic demographic and background information of the experimental and control groups, along with the results of statistical analyses:

Table 3 Descriptive Statistics of Experimental and Control Group Samples

Variable	Experimental Group (n = 26)	Control Group (n = 27)	t/X^2 Valuev	P Value	Note
Gender (Male/Female)	12 / 14	13 / 14	0.0204	0.88	No significant difference in gender
Mean Age (M ± SD)	18.7**±**0.6	18.5**±**0.8	0.734	0.465	No significant difference
Pre-test Academic Score (M ± SD)	72.77**±**5.67	71.63**±**3.94	0.847	0.402	No significant difference

As shown in Table 3, there are no significant differences between the experimental and control groups in terms of pre-test academic scores, age, or gender. Additionally, survey results indicate that none of the participants had previously received systematic gamified instruction in Japanese. These factors ensure the validity of the experimental results. The study employed convenience sampling with a total of 53 participants. While this facilitates controlled experimentation, it inevitably limits the generalizability of the findings. The experimental period lasts 16 weeks, with 3 class hours per week.

The experimental group implements gamified instruction designed based on the ADDIE model: (1) Quizizz is used for in-class quizzes and immediate feedback; (2) points, leaderboards, and team challenges are set up; and (3) situational activities like role-playing and task challenges are designed. The control group, conversely, adopts a traditional teaching model, including teacher-led lectures, textbook exercises, and periodic tests, without using any gamified elements. The two groups maintain consistent course objectives, textbook content, and class hour allocation, differing only in teaching methods and evaluation approaches. Table 4 provides a comparison of the teaching activities, evaluation methods, and feedback mechanisms for both groups.

Table 4 Comparison of Teaching Methods Between Experimental and Control Groups

Category	Experimental Group (Gamified Instruction)	Control Group (Traditional Instruction)
Teaching Activities	Real-time competitive quizzes and in-class mini-tests using Quizizz; designed level tasks and team challenges; introduced situational simulations and role-playing; established an in-course "virtual reward system"	Teacher-led lecturing of course content; primarily paper-based exercises and translation practice; oral or blackboard responses to questions; fixed homework assignments and workbook exercises after class
Evaluation Methods	Scores from staged tasks; Quizizz quiz points; in-class interaction points; cumulative points from team challenges; unit post-test scores	Periodic mini-tests; homework scores; attendance and in-class performance records; unit post-test scores
Feedback Mechanisms	Quizizz real-time feedback on answer accuracy and leaderboards; teacher weekly announcements of total group points; reward badges and in-class leaderboard incentives; encouraged peer feedback and discussion	Teacher grading of homework after class; unified review of test questions after mini-tests; no immediate feedback or ranking mechanism; primarily teacher verbal commentary

In the experimental design, the Japanese language teaching method serves as the independent variable, with the experimental group employing a gamified instruction approach and the control group using a traditional teaching approach. The dependent variables are academic achievement, learning engagement, and psychological distress.

Data Collection and Measurement

To evaluate the impact of gamified instruction on students' learning outcomes, data on academic performance, learning engagement, and psychological distress were collected and measured before and after the instructional experiment. Academic performance is assessed based on students' Japanese test scores, providing an objective measure of their proficiency in Japanese language skills.

Learning engagement is measured using a modified version of the "Student Learning Engagement Scale" developed by Schaufeli and Bakker (Schaufeli, & Bakker, 2003). This scale encompasses three dimensions: vigor, dedication, and absorption, which comprehensively evaluate university students' behavioral, emotional, and cognitive engagement. Vigor includes 7 items, reflecting students' energy, persistence, and proactivity in the learning process, which falls under behavioral engagement. Dedication consists of 9 items, measuring students' passion, sense of responsibility, and goal orientation towards learning tasks, corresponding to emotional engagement. Absorption comprises 4 items, indicating whether students can immerse themselves and concentrate during learning, representing cognitive engagement. This structure aligns with current educational psychology's three-dimensional definition of

learning engagement and comprehensively covers students' learning states, making it widely applied in higher education research. Given its good cross-cultural adaptability, reliability, and validity, this scale is selected as the measurement tool for learning engagement in this study. In this study, psychological distress is assessed through the concept of psychological distress. Psychological distress encompasses negative emotions and mental symptoms that students may experience during Japanese language learning, including anxiety, depression, stress, and emotional exhaustion. These negative emotions directly affect both learning performance and overall mental state. To comprehensively evaluate the potential psychological distress experienced during learning, the simplified Chinese version of the Symptom Checklist 90 (SCL-90) developed by Derogatis (Derogatis & Unger, 2010) was employed. This version covers eight dimensions: somatization, compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, and psychological fatigue. Each dimension includes four items, totaling 32 items, designed to capture a range of negative emotions and psychological responses that students may experience during learning. Unlike scales that focus on a single emotional state, the SCL-90 provides a comprehensive, multidimensional assessment of students' psychological symptoms. This scale enables researchers to monitor changes in students' psychological distress during Japanese language learning, particularly regarding anxiety, depression, and emotional exhaustion. It is also widely used for psychological screening in educational settings, demonstrating good cross-situational applicability. Both scales employ a Likert 5-point scale, with the following response options: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always. Higher scores on these scales correspond to higher levels of learning engagement and greater psychological distress.

Data analysis is conducted using SPSS 26.0 statistical software. Reliability of the questionnaires is tested using Cronbach's alpha. The overall alpha coefficients for the modified Learning Engagement Scale and the simplified SCL-90 are 0.957 and 0.918, respectively. Validity is tested using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. The KMO values for the two scales are 0.902 and 0.879, with $P < 0.05$, indicating that both scales passed the reliability and validity tests, demonstrating high reliability and validity.

Data analysis also includes descriptive statistical analysis and t-tests to compare differences between the experimental and control groups. To further evaluate the practical impact of the intervention, Cohen's d value is calculated as an effect size. At the same time, it is ensured that there are no significant differences between the experimental and control groups in terms of gender, age, and pre-test scores ($p>0.05$), controlling for major confounding variables.

To complement the quantitative data and enhance the depth and breadth of the research findings, semi-structured interviews are conducted with 8 students from the experimental group after the experiment. To gain deep insights, semi-structured interviews are conducted with eight randomly sampled students from the experimental group, ensuring representation across genders and Japanese proficiency levels. Each interview lasted approximately 20 minutes, is audio-recorded and transcribed. The interview data is then processed using a six-step thematic analysis: familiarizing with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. The

interviews focus on five key areas: overall feelings about the gamified instruction experience, changes in learning motivation, perceived classroom participation, changes in psychological state, and comparisons with traditional teaching methods.

Initial coding, assisted by Nvivo software, yields 37 open codes such as "felt relaxed," "wanted to score points," "more willing to participate," and "no longer afraid of making mistakes." These codes are then categorized and aggregated to identify recurring patterns. Through iterative comparison and theme saturation testing, three stable core themes emerge:

1) Significantly Enhanced Learning Motivation: Most interviewed students report that game mechanics like points, leaderboards, and task achievement systems stimulate their learning interest and willingness to participate, fostering continuous learning. One student remark, "Every time I complete a task and see my points increase, I feel a great sense of accomplishment and want to learn even better."

2) More Active Classroom Participation: Students generally report feeling more confident to speak and express themselves in the gamified classroom. They are also more willing to engage in collaborative tasks and maintain better focus. One interviewee note, "Before, I barely spoke in class, but now, buzz-in quizzes are quite fun, and everyone has become more active."

3) Noticeable Alleviation of Learning Pressure: Several students in the interviews indicate that gamified instruction creates a more relaxed and enjoyable classroom atmosphere, reducing feelings of learning anxiety and depression. A student shared, "It is not as rigid as before; now I look forward to class and it no longer feels like a burden."

Additionally, some students offer suggestions for gamified instruction, such as "hoping for richer reward mechanisms" and "it would be best to rotate members during group collaboration." This feedback provides valuable insights for future instructional optimization. Overall, the interview analysis further supports the quantitative research findings, subjectively confirming the positive impact of gamified instruction on students' academic performance, learning engagement, and psychological distress.

Results analysis

Analysis of Academic Performance

A comparison of the pre-test and post-test mean scores and standard deviations (SD) for the Japanese test is conducted for both the experimental and control groups. The results are shown in Figure 2.

The results in Figure 2 show that gamified instruction positively impacts students' Japanese learning outcomes. The experimental group shows significant improvement, with the average post-test score rising to 85.31, compared to a pre-test score of 72.77. In contrast, the control group exhibits only a modest increase, from 71.63 to 74.11, a much smaller improvement than observed in the experimental

group. Overall, gamified instruction is more effective than traditional teaching in enhancing university students' Japanese scores, while maintaining stability within the learning group.

A t-test is conducted to compare the pre-test and post-test scores for both groups. The t-values and p-values are shown in Figure 3.

The t-test results in Figure 3 indicate that there is no significant difference in the pre-test scores between the experimental and control groups ($t = 0.847$, $p = 0.402 > 0.05$), suggesting that the initial levels of the two groups are comparable. However, after the intervention, the post-test scores of the two groups differ significantly ($t = 9.188$, $p < 0.001$), showing that the experimental group's score improvement is significantly greater than that of the control group. Furthermore, the difference in the experimental group's scores between the pre-test and post-test is statistically significant at the 1% level ($t = -8.303$, $p < 0.001$), while the control group shows a smaller improvement ($t = -2.462$, $p = 0.017$). Moreover, Cohen's d analysis reveals that the effect size for the pre-test to post-test change in the experimental group is 2.65, indicating a very large effect. In contrast, the control group exhibits an effect size of 0.56, which is a medium effect. Additionally, the Cohen's d value for the post-test scores between the two groups is 1.65, signifying that gamified instruction is significantly more effective than traditional teaching in enhancing students' academic performance. In conclusion, gamified instruction significantly improves students' Japanese academic performance, with superior results compared to traditional teaching, thus confirming Hypothesis H1.

Analysis of Learning Engagement

A comparison of the learning engagement measurement results for the experimental and control groups is conducted. Descriptive statistics for the three dimensions of learning engagement—vigor, dedication, and absorption—are presented in Figure 4.

The results in Figure 4 indicate that the experimental group experiences a significant increase in learning engagement following the gamified instruction intervention. Before the intervention, the mean scores for vigor, dedication, and absorption are 16.81, 22.50, and 10.12, respectively, with a total mean score of 49.42. After the intervention, these mean scores rise to 26.77, 36.19, and 15.85, respectively, with the total mean score reaching 78.81, reflecting a 59.5% improvement. In contrast, the control group exhibits only a slight change in learning engagement after traditional teaching. The total mean score for learning engagement in the pre-test is 46.56, which increases to 49.93 in the post-test, showing only a 7.24% improvement. These results suggest that traditional teaching has a limited impact on enhancing students' learning engagement, while gamified instruction significantly improves students' vigor, dedication, and absorption, fostering more active participation in Japanese language learning.

A t-test is performed to further analyze the impact of gamified instruction on learning engagement, and the t-values and p-values are presented in Figure 5.

The results in Figure 5 show that gamified instruction significantly enhances learning engagement. There is no significant difference in learning engagement between the experimental and control groups in the pre-test ($t = 1.713$, $p = 0.093$). However, in the post-test, the difference between the two groups is highly significant ($t = 15.88$, $p < 0.001$), with the experimental group demonstrating significantly higher learning engagement than the control group. Additionally, the difference in the experimental group's scores between the pre-test and post-test is extremely significant ($t = -15.02$, $p < 0.001$), while the control group exhibits a smaller improvement ($t = -2.205$, $p = 0.032$). These findings indicate that gamified instruction effectively enhances students' vigor, dedication, and absorption, making them more engaged in Japanese language learning, whereas traditional teaching shows limited effects.

The t-test results for each dimension of learning engagement are presented in Table 5.

Table 5 t-test Results for Each Dimension of Learning Engagement.

Dimension	Group Comparison	t-value	p-value
Vigor	Pre-test Comparison between Groups	1.405	0.166
	Post-test Comparison between Groups	14.89	0.000
	Experimental Group Pre-test vs Post-test	-13.92	0.000
	Control Group Pre-test vs Post-test	-2.773	0.008
Dedication	Pre-test Comparison between Groups	1.899	0.063
	Post-test Comparison between Groups	18.08	0.000
	Experimental Group Pre-test vs Post-test	-16.82	0.000
	Control Group Pre-test vs Post-test	-1.378	0.174
Absorption	Pre-test Comparison between Groups	1.470	0.148
	Post-test Comparison between Groups	12.71	0.000
	Experimental Group Pre-test vs Post-test	-12.72	0.000
	Control Group Pre-test vs Post-test	-2.436	0.018

Table 5 demonstrates that gamified instruction has a significant positive impact on all dimensions of learning engagement. In the pre-test, there are no significant differences between the experimental and control groups in vigor, dedication, and absorption ($p > 0.05$). However, in the post-test, the experimental group shows significantly higher scores in vigor, dedication, and absorption compared to the control group, with p-values < 0.001. Additionally, the differences in the experimental group's pre-test and post-test scores are extremely significant ($p < 0.001$), while the control group shows a slight improvement in vigor and absorption, but no significant change in dedication. A further calculation of the effect size for

the change in learning engagement for both the experimental and control groups reveals compelling results. The Cohen's d value for the experimental group's pre-test to post-test change is 3.783, which falls within the range of a very large effect. This strongly indicates that gamified instruction plays a powerful role in significantly boosting student learning engagement. In contrast, the control group's pre-test to post-test Cohen's d value is 0.474, representing a medium effect, suggesting that traditional teaching methods have a limited impact on enhancing student learning engagement. The inter-group comparison of post-test learning engagement yields a Cohen's d value of 3.677, further underscoring that the experimental group's learning engagement is significantly superior to that of the control group. These results indicate that gamified instruction effectively enhances students' vigor, dedication, and absorption, thereby validating Hypothesis H2.

Analysis of Psychological Distress

The mean scores and SD of the psychological distress scale tests for the experimental group before and after the teaching experiment are presented in Figure 6.

Similarly, Figure 7 displays the mean scores and standard deviations for the control group's psychological distress scale tests.

A comparison of the psychological distress test results for the experimental and control groups in Figures 6 and 7 indicates that gamified instruction has a significant effect in alleviating students' psychological distress. In the experimental group, scores across all psychological distress dimensions decrease significantly in the post-test. The total mean score decreases from 57.62 to 36, indicating a substantial reduction in students' psychological stress and negative emotions. In contrast, the control group's scores remain almost unchanged between the pre- and post-tests, with the total mean score only slightly decreasing from 53.67 to 53.26, suggesting that traditional teaching does not effectively improve students' psychological states. This indicates that gamified instruction enhances learning motivation while helping alleviate anxiety, depression, and psychological fatigue, thereby improving students' overall psychological distress.

The t-test results of the psychological distress scale tests for the experimental and control groups are shown in Figure 8.

The t-test results presented in Figure 8 indicate that, after the experiment, there is a significant difference in psychological distress between the experimental and control groups ($t = -6.241$, $P < 0.001$). The experimental group shows a significant improvement in psychological distress ($t = 9.208$, $P < 0.001$), whereas no significant change is observed in the control group ($P = 0.902$). For psychological distress measurements, the Cohen's d value for the pre-test to post-test change in the experimental group is 2.751. This result indicates a very large effect, signifying that gamified instruction has a strong impact on improving students' psychological state by significantly reducing negative emotions such as anxiety, depression, and mental fatigue. In contrast, the control group's pre-test to post-test Cohen's d value is

only 0.060, a negligible effect, showing that traditional teaching has little impact on improving student psychological distress. For the post-test inter-group comparison, the Cohen's d value is 2.296, further confirming that the experimental group's significant improvement in psychological distress surpasses that of the control group. Gamified instruction effectively alleviates students' psychological stress, reduced anxiety, depression, and mental fatigue, and decreases hostility and fear. It also alleviates overall psychological distress and emotional regulation. These results validate Hypothesis H3, demonstrating that gamified instruction helps students develop a more positive psychological state, whereas traditional teaching does not produce similar effects.

Interview Results

The interview results reveal that most students believe gamified instruction stimulated their learning interest and motivation. Specifically, the point rewards and team challenges enhanced their sense of classroom participation. One student commented, "Seeing my scores on the leaderboard motivated me to keep improving; it is much more engaging than a traditional classroom." Furthermore, the majority of students reported that gamified instruction helped alleviate learning pressure and reduced feelings of anxiety. One student stated, "The tasks in the game made me focus on completing objectives instead of worrying about exam pressure; I felt much more mentally relaxed." Additionally, some students mentioned that instant feedback allowed them to identify and correct mistakes promptly, which improved their learning effectiveness. The interview findings qualitatively corroborate the significant increases in learning engagement and psychological distress observed in the quantitative data, supporting the conclusion that gamified instruction promotes active learning and psychological adjustment in students.

Discussion

The results of this study indicate that gamified instruction in Japanese learning significantly enhances students' academic performance and learning engagement while effectively alleviating psychological distress, consistent with previous research findings. The study first validates Hypothesis H1, which posits that gamified instruction can significantly improve students' academic achievement. Results show that the Japanese language scores of students in the experimental group significantly improved after gamified instruction and surpassed those of the traditional teaching group. Liu et al. (2024) established that gamified learning is more effective than traditional teaching in enhancing language proficiency and learning satisfaction. This study also confirms this finding, as the experimental group students achieved significant gains in academic performance, learning motivation, and psychological distress. The interview data from this study further supports this finding: several students mentioned, "Passing stage-based tests made learning feel challenging and fun," and "Seeing the leaderboard encouraged me to review diligently." This indicates that game mechanics played a positive role in stimulating self-directed learning and enhancing a sense of accomplishment. This result also aligns with the experimental findings of Chen et al. (2023), who developed a Japanese learning system using the

Octalysis framework, noting that game feedback mechanisms helped boost the learning motivation and performance of in-service learners. The significant improvement in academic performance can be explained by the mechanism of enhanced competence. Gamified elements such as real-time points, leaderboards, and badge reward systems provide students with clear feedback on their abilities and visualized progress, enabling them to continuously perceive their improvement and achievements. This ongoing positive feedback loop not only strengthens students' sense of efficacy but also further motivates them to set higher learning goals.

Regarding Hypothesis H2, the significant increase in learning engagement is also corroborated in this study. The experimental group scores higher than the control group across all three dimensions of vigor, dedication, and absorption, demonstrating that gamified instruction helps enhance learners' classroom participation and emotional investment. Meng et al. (2024) indicated that gamified points could increase online learners' skills, emotional connection, and learning engagement. This study, by incorporating task levels, points, and competition through the Quizizz platform, created an immersive learning environment for students. This allowed them to gradually develop a sense of engagement and self-efficacy through "learning by playing" and "learning by competing." Many students in the interviews express feedback such as, "Every class feels like a new level, and I look forward to participating," and "Challenging with my peers feels very rewarding." These statements further reflect how gamified instruction sparked learning enthusiasm and a sense of collective participation. This finding is also consistent with Ge's (2024) research on the positive relationship between engagement and achievement in vocabulary games, suggesting that positive emotions within a gamified environment contribute to increased behavioral engagement. The overall increase in learning engagement stems from the combined effects of gamified design on autonomy and relatedness. The tiered task system and self-directed learning pathways provide students with greater control, satisfying their need for autonomy. Meanwhile, collaborative activities such as team challenges and role-playing create a positively interdependent learning environment, enhancing students' sense of community and belonging. Within this supportive context, students are more willing to invest both emotional and cognitive resources, exhibiting higher levels of vigor, dedication, and absorption.

Finally, regarding Hypothesis H3, this study also finds that gamified instruction positively influences students' psychological distress. The experimental group showed a significant decrease in indicators for anxiety, depression, and mental fatigue. This reflects gamified instruction's potential to alleviate negative emotions and enhance emotional regulation. Otani et al. (2024) posited that gamification was a transformative method for promoting psychological distress, opening new possibilities for psychological care by boosting cognitive and emotional well-being. Interview data further supports this, with many students stating, "Classes became relaxed and fun, not as anxious," and "I was not afraid to make mistakes; the system encouraged trying." These subjective experiences reveal gamified instruction's unique role in improving the psychological learning environment. This also aligns with Aslanyan-rad's (2024) research on how games alleviate anxiety and improve self-function among university students. This study further supports the potential of educational games as an auxiliary tool for psychological intervention. The significant reduction in psychological distress can be attributed to the low-threat, highly

supportive environment created by gamified instruction. When students' needs for competence, autonomy, and relatedness are fully satisfied, their intrinsic motivation is enhanced, and anxiety related to failure or negative evaluation decreases. Features of the game design, such as allowing trial and error and providing instant feedback, help students shift their focus from "avoiding mistakes" to "achieving goals." Thereby, this design effectively alleviates symptoms of anxiety, depression, and other negative emotions.

From the perspective of teachers, gamified instruction helps improve the quality of classroom interaction, stimulates students' interest in learning, and reduces classroom management pressure to some extent. However, its implementation places higher demands on teachers' technical competence, curriculum design skills, and classroom organization, while also increasing preparation time and the burden of digital instruction. Professional development and technical training for teachers are therefore regarded as key factors for the sustainable promotion of gamified instruction. From the perspective of school administrators, adopting innovative instructional models such as gamification can enhance students' learning experiences, increase course satisfaction, and reduce dropout rates. This strategy also contributes positively to the evaluation of educational quality and the overall institutional reputation. Nevertheless, effective implementation relies on strong institutional support. This includes interdisciplinary teacher training, the development and maintenance of technological platforms, adequate resource allocation, and the incorporation of innovative teaching incentives into instructional assessment and performance evaluation. In summary, the promotion of gamified instruction represents both an innovation in classroom teaching strategies and a systemic reform at the level of the educational ecosystem. This requires comprehensive support from policies, resources, and institutional frameworks.

Considering both the quantitative and qualitative results, it is clear that gamified instruction meets students' cognitive needs and supports emotional and social interaction, creating a comprehensive and motivating learning ecosystem. Compared to traditional teaching, it optimizes the knowledge transfer process and enhances students' overall learning experience at motivational, behavioral, and psychological levels. In educational practice, teachers can leverage the ADDIE instructional design model, in conjunction with platforms like Quizizz, to thoughtfully integrate game mechanics such as point systems, group challenges, and situational simulations. This ensures that game elements serve pedagogical objectives, embodying the philosophy of "learning through play." At the school level, interdisciplinary collaboration among teachers should be encouraged to promote the widespread application of gamified instruction in Japanese and other language education, fostering a more interactive, immersive, and personalized learning environment. In summary, the effectiveness of gamified instruction in this study does not stem solely from its external game elements but is rooted in its systematic support of students' intrinsic psychological needs. By employing carefully designed mechanisms to enhance students' competence, autonomy, and relatedness, gamified instruction fosters more positive patterns of learning motivation. This strategy leads to comprehensive improvements in academic performance, learning behaviors, and emotional well-being.

Conclusion

This study investigates the effects of gamified instruction on academic achievement, learning engagement, and psychological distress in Japanese language acquisition. Comparative evaluation of academic achievement, learning engagement, and psychological distress between experimental and control groups yields the following outcomes.

(1) Gamified instruction significantly boosts students' Japanese language proficiency. The post-test scores of the experimental group students are significantly higher than their pre-test scores, whereas that of the control group showed comparatively limited improvement. This finding highlights a key advantage of gamified instruction to promote academic performance.

(2) Gamified instruction greatly enhances students' learning engagement with heightened motivation and participation. The scores across all three dimensions of vigor, dedication, and absorption are higher in the experimental group than in the control group. Conventional methods of instruction also do not yield significant improvements in learning involvement.

(3) In terms of psychological distress, gamified instruction leads to a significant reduction in psychological distress among students in the experimental group, with pre- and post-test scores showing a marked decline. This indicates that students experience substantial alleviation of psychological stress during the gamified learning process.

In summary, gamified instruction demonstrates significant effectiveness in enhancing academic performance, increasing learning engagement, and alleviating psychological distress. While this study validates the positive impact of gamified instruction on student academic achievement, learning engagement, and psychological distress, it is important to acknowledge its limitations. First, the small sample size, limited to first-year Japanese majors at a single university, may affect the external validity and generalizability of the findings. Because the sample comes from a specific academic context and language-learning cohort, the results may not fully reflect the learning responses and behavioral differences of students from other universities, grade levels, or language backgrounds. In addition, the study focuses exclusively on Japanese majors, lacking comparisons with students from other disciplines or language-learning contexts, which may limit the demonstration of gamified instruction’s effectiveness in other language learning domains. Future research should expand the sample size to include students from diverse universities, grade levels, and academic programs. Such efforts would enhance the generalizability of the findings and exploring the effectiveness of gamified instruction across varied contexts. They also would help validate the stability of the findings and provide more broadly applicable guidance for educational practice. Secondly, the study's duration of 16 weeks is relatively short, preventing an assessment of the long-term effects and sustained impact of gamified instruction. Future studies could employ a longitudinal design with delayed post-tests to investigate the retention of learning outcomes and the sustained changes in psychological distress. Additionally, this study does not use a blind assessment, meaning both teachers and students are aware of their group assignments (experimental or control). This might introduce subjective bias and affect the objectivity of

the results. Subsequent research should consider incorporating a third-party or anonymous grading mechanism to enhance internal validity. Finally, although both quantitative and qualitative data are collected, the number of interview participants is limited, and the teacher's perspective is not included. Future research could expand the range of interviewees to delve deep into the multi-dimensional impact mechanisms of gamified instruction. Overall, the systematic gamified instruction design based on the ADDIE model demonstrates positive effects in this study. Future research can further optimize teaching strategies by integrating more innovative technologies (such as virtual reality and AI tutoring) and diverse teaching scenarios. This effort will further enhance students' academic performance, learning engagement, and psychological distress, providing stronger empirical support for foreign language teaching reform.

Declarations

Data availability statement

The original datasets presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Author contributions

KLD designed the framework of this research. WCC analyzed the data. Both authors conducted investigation, wrote the manuscript, contributed to the article, and approved the submitted version.

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Ethics Approval and Informed Consent

This study rigorously adhered to relevant ethical guidelines. All participants were adult university students who were fully informed of the research purpose, data usage, and their voluntary participation before the study began. All participants signed written informed consent forms, confirming their understanding that they could withdraw from the study at any time. Furthermore, all research data underwent strict anonymization during processing to safeguard personal privacy and data security. As this study involved a minimal-risk educational intervention and utilized only standardized questionnaires and non-invasive interviews for assessment, it received an exemption from full ethical review by Academic Ethics and Moral Committee of Mudanjiang Normal University due to its low-risk classification.

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Figures

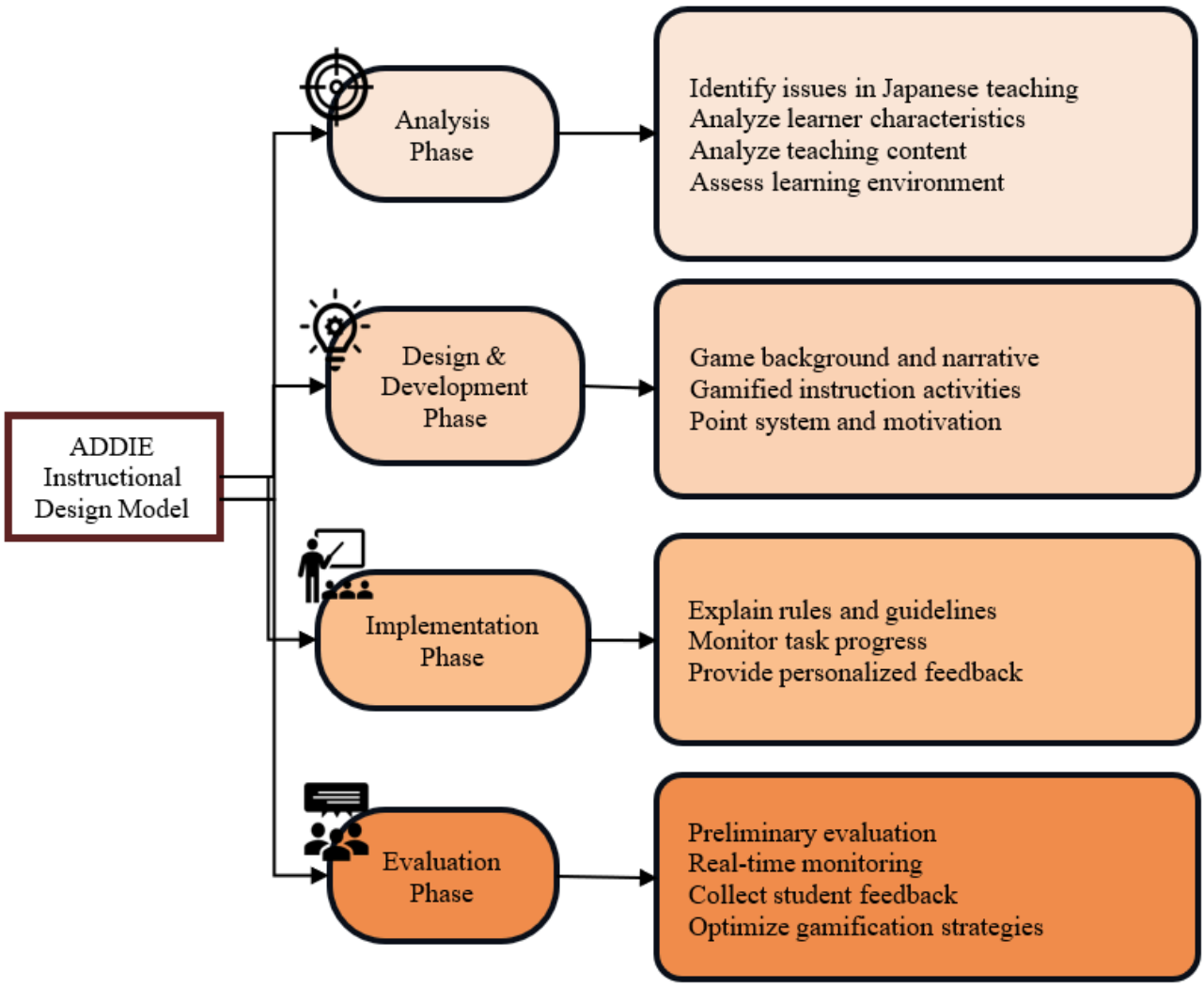


Figure 1

ADDIE-based Gamified Instruction Framework for Japanese Language Learning

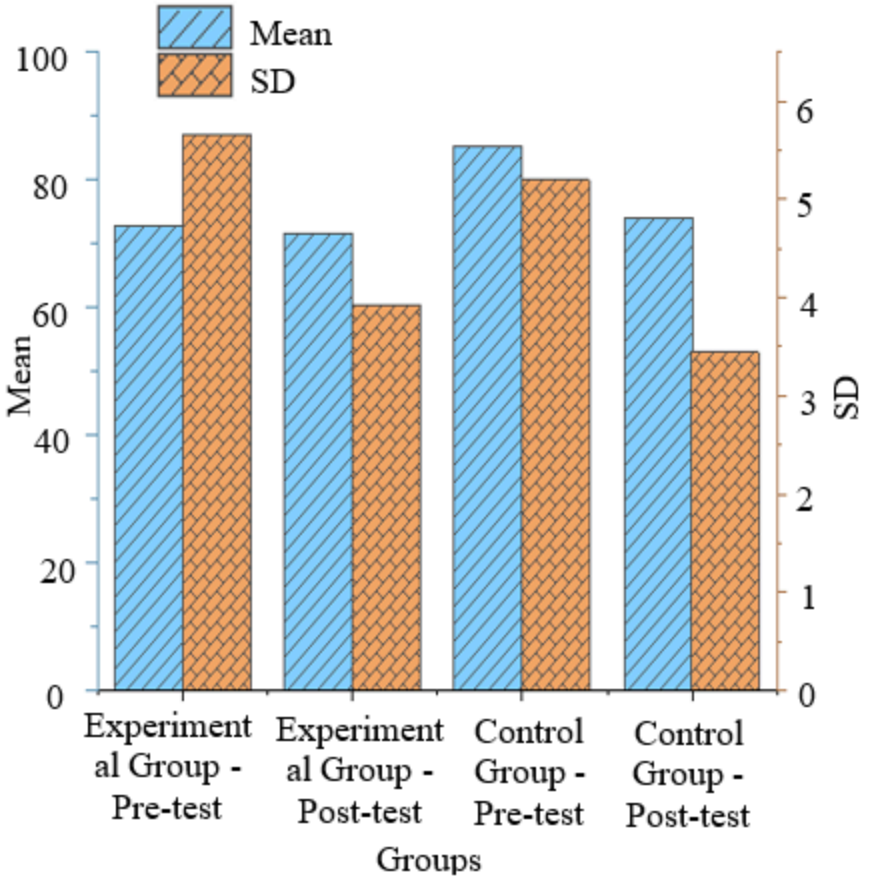


Figure 2

Descriptive Statistics of Pre-test and Post-test Academic Scores for the Experimental and Control Groups

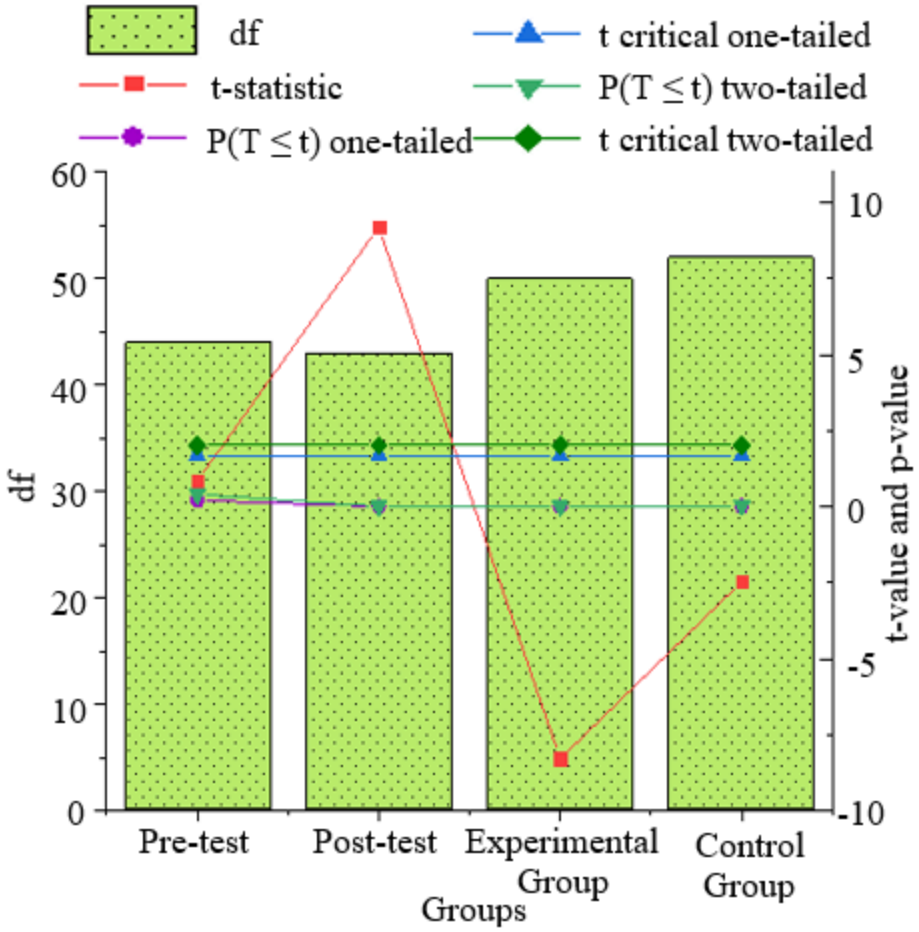


Figure 3

t-test Results for Pre-test and Post-test Academic Scores for the Experimental and Control Groups

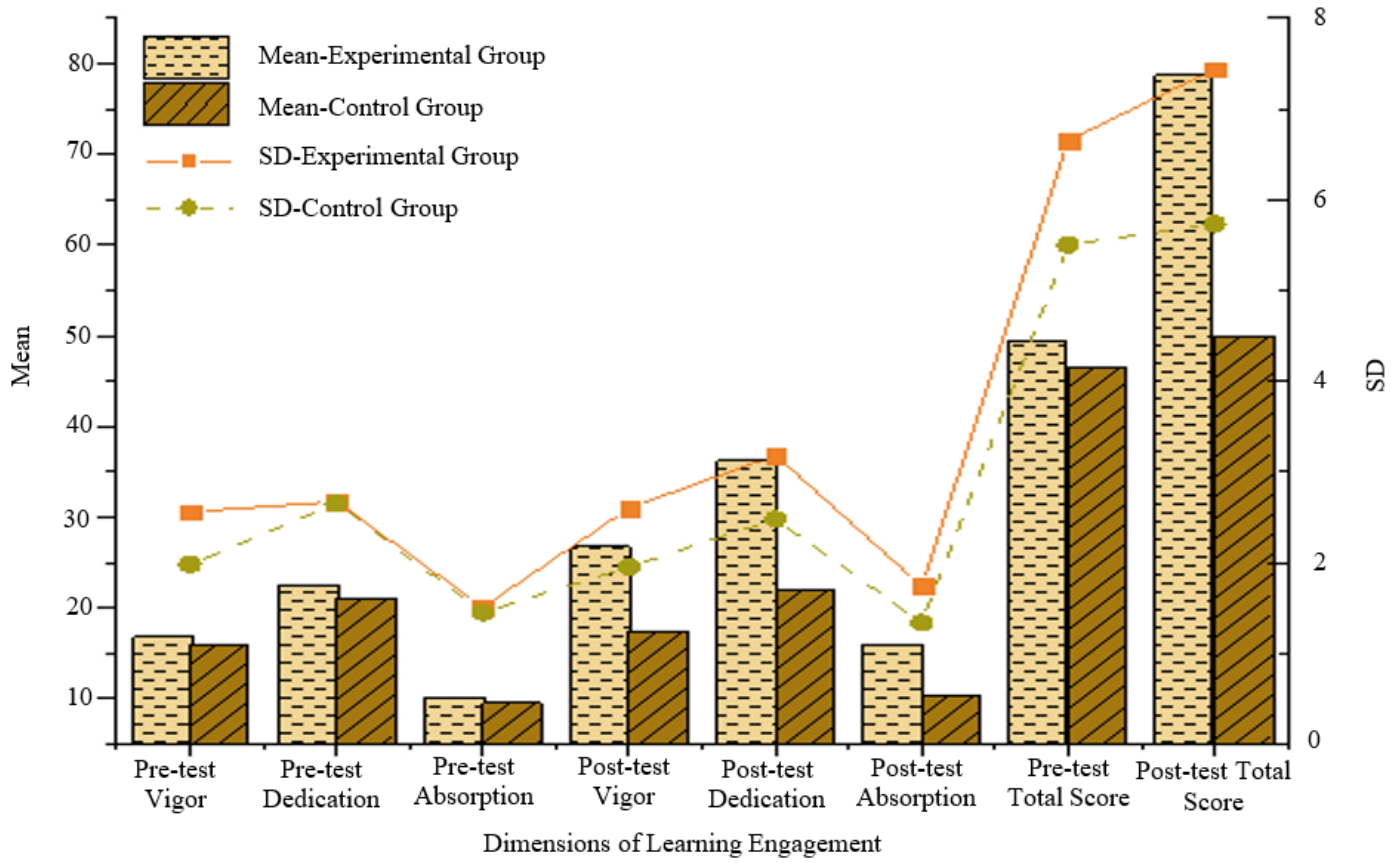


Figure 4

Descriptive Statistics of Learning Engagement for Both Groups

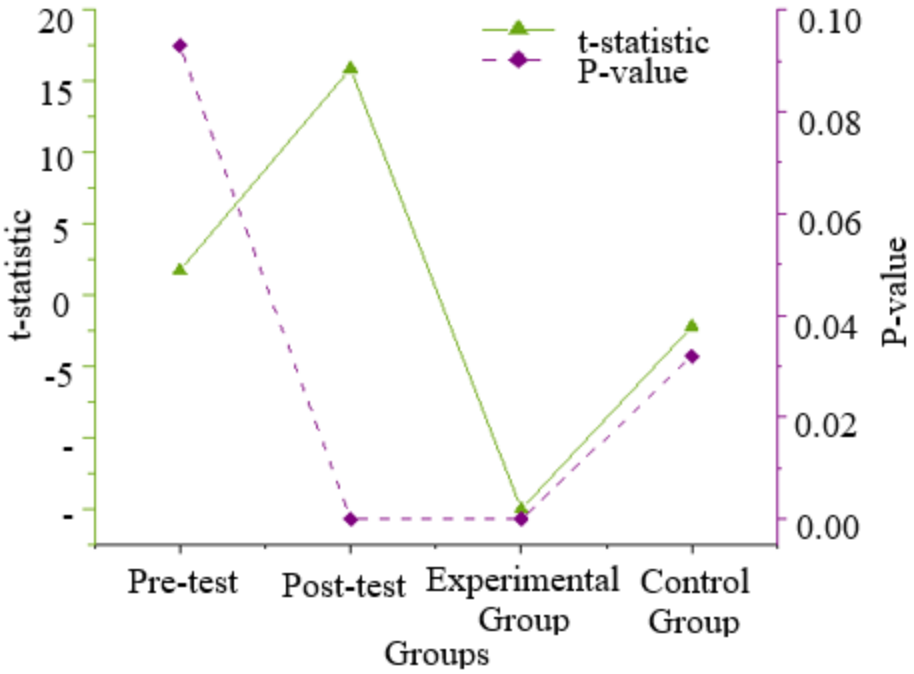


Figure 5

t-test Results for Learning Engagement in Pre-test and Post-test for the Experimental and Control Groups

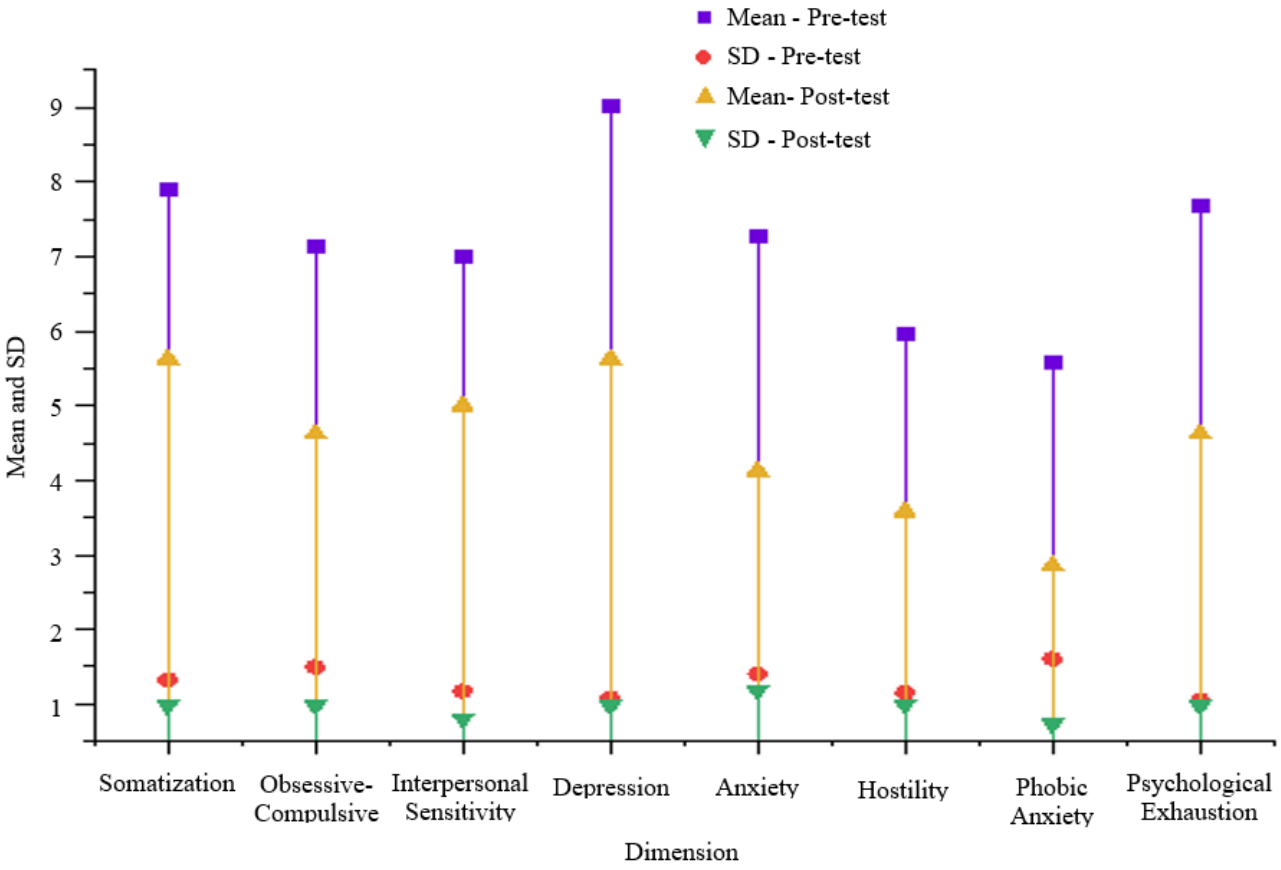


Figure 6

Descriptive Statistics of Psychological Distress for the Experimental Group (Pre- and Post-Test)

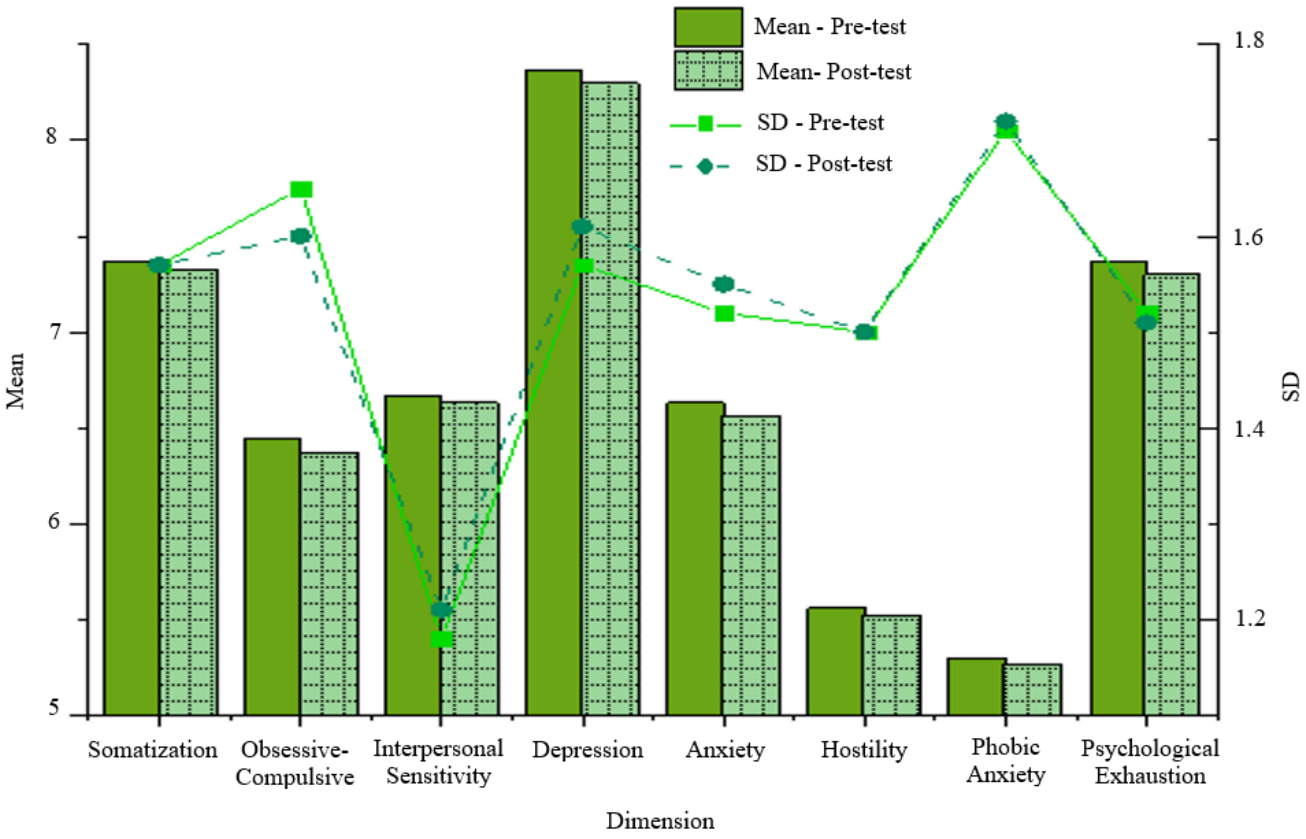


Figure 7

Descriptive Statistics of Psychological Distress for the Control Group

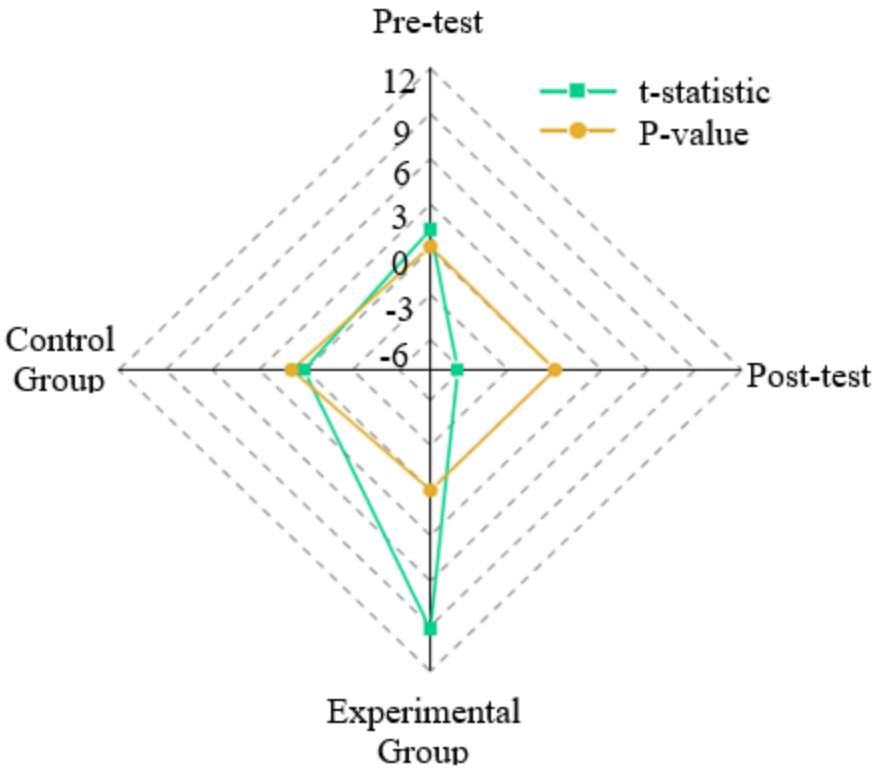


Figure 8

t-test Results for Psychological Distress Test between Experimental and Control Groups.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Appendix.docx