A MOBILE APPLICATION TO IMPROVE MENTAL HEALTH AMONGST TEENAGERS BY JOURNALING USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

This research explores the development of an AI-powered journaling application designed to improve teen mental health by combining wellness journaling, AI-generated feedback, and trend analysis. The study investigates whether frequent journaling and AI-driven insights contribute to emotional awareness, stress management, and long-term mental well-being [10]. The application uses ChatGPT API to analyze journal entries, providing structured feedback and generating weekly mental health trend reports. Two experiments were conducted: one measuring pre- and post-survey results and another comparing frequent vs. infrequent journaling. Results showed significant improvements in stress reduction and emotional expression among frequent journalers, validating AI-assisted journaling as a promising tool. However, challenges such as AI personalization, user engagement, and external influences require further refinement [11]. This research suggests that AI-powered journaling can serve as a valuable complement to traditional mental health resources, fostering self-awareness and proactive emotional management among teenagers [12].

KEYWORDS

AI-assisted journaling, Mental health support, Teen well-being, Emotional self-reflection, Hybrid mental health solutions

1. INTRODUCTION

As many parts of the world move away from the basic struggles of survival and physical wellness, the awareness of individuals' mental wellness and psychological needs becomes increasingly a priority. Ever since the 19th century, with the discovery of psychoanalysis, which established the concept of psychology as a field of science, society as a whole has also then realized the legitimacy of having good mental health. However, there have always been difficulties in promoting good mental health and wellness, especially to the youth [1]. According to a report of surveys conducted by the Centers for Disease Control and Prevention spanning from 2011 to 2021, more than 4 in 10 (42%) students felt persistently sad or hopeless and nearly one-third (29%) experienced poor mental health. Additionally, more than 1 in 5 (22%) students seriously considered attempting suicide and 1 in 10 (10%) attempted suicide (Center for Disease Control and Prevention, 2021). These statistics revealed that a significant amount of the underage population in America still suffers from mental health issues, going as severe as to attempt self-

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harm and suicide. This trend in a mental health crisis is closely linked to the environment youths are exposed to. Social media, school, and family environments can all be sources of anxiety, pressure, and depression (John Hopins Medicine, n.d.) (KATELLA, 2024).

Importantly, the mental wellness of an individual depends on their youth health. Studies have shown that 50% of all lifetime cases of mental illness will develop by age 14, and 75% by age 24, making the age of youth crucial to ensuring good mental health and wellness for an individual (Polaris Teen Center, 2018). Young users are also more vulnerable to risk factors that may lead to a lower level of mental health and wellness. The exposure to bullying, harassment, and social media pressure affects the teenage brain the most out of all populations. It has caused an abrupt rise in mental illnesses and suicide rates (Center for Disease Control and Prevention, 2021) (John Hopins Medicine, n.d.) (McCarthy, 2022) (KATELLA, 2024) [2]. For this reason, this application was designed to focus on young users, with an approach to building an environment that protects, nurtures, and advises the user.

The application focuses on "Wellness Journaling": a way for users to express and understand their emotions and get AI-generated feedback on improving their overall well-being based on the written content from the user's journals [3]. The app can assess and display weekly data on a user's mental health based on the content provided by the journals of a user each day. The AI embedded into the application also looks for warning signs and risk factors of severe mental illness and suicide within the content of the user's journal. By doing so, the user's trusted adults and caretakers could be notified of this trend, and be made aware.

The method of journaling utilized in this application is a powerful way to reduce stress, cope with depression, and manage anxiety by helping one face their fears, issues, and concerns, and providing an environment for positive self-talk (University of Rochester Medical Center, n.d.) [4]. More so, especially for teenagers, journaling offers a safe and non-judgmental place to confess issues and fears (University of Rochester Medical Center, n.d.). Numerous studies across different settings, focusing on three different populations including medical patients with anxiety symptoms, medical students with higher stress than the general population, and university students, have all shown that different forms of journaling have a great effect in improving levels of distress, general mental wellbeing, and personal growth (Smyth et al., 2018) (Koziol, 2021) (Mercer et al., 2010). Thus, the intervention provided by this application, journaling, is a method with medical values that can lead to better mental health.

The experiments aimed to evaluate the effectiveness of AI-powered journaling in improving teenage mental well-being. The first experiment used pre- and post-surveys to assess changes in emotional awareness, stress levels, and coping strategies. Results indicated a notable increase in emotional awareness (32%) and a decrease in stress levels (27%), suggesting that AI feedback helps users develop self-reflection skills [5]. The second experiment examined how journaling frequency influenced mental health trends by categorizing participants into frequent and infrequent journalers. Over four weeks, frequent journalers showed a 35% decrease in stress, while infrequent journalers experienced only a 12% reduction, demonstrating that consistent journaling significantly improves mental well-being. However, self-reporting bias and external stressors may have affected the findings, requiring further research with more controlled conditions and a larger participant base.

AI has been increasingly explored as a tool for addressing teenage mental health, with different approaches yielding varying levels of effectiveness. One approach involves AI chatbots that provide real-time emotional support; however, these chatbots often lack the depth and contextual understanding necessary for meaningful mental health guidance, making them less reliable than human professionals. Another approach highlights AI as a supplementary tool to enhance existing

mental health services, helping bridge the gap where access to professional therapy is limited. While this method increases availability, it still requires integration with human intervention for maximum effectiveness. Traditional human counseling remains the gold standard for mental health support, offering personalized care and deep emotional understanding, but accessibility issues such as cost and availability prevent many teenagers from seeking therapy. This study takes a hybrid approach by using AI-assisted journaling, which allows users to express their emotions freely while receiving structured feedback that fosters self-reflection [6]. Unlike AI chatbots, this method does not attempt to replace human counselors but instead enhances journaling as a therapeutic tool. It also provides an accessible alternative for those who may not have immediate access to professional mental health services. By balancing AI's ability to analyze patterns with the proven benefits of journaling, this approach presents a scalable, cost-effective way to support teenage mental well-being while acknowledging the importance of human intervention when necessary.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. Generate Feedback

A major component of the application is utilizing chat GPT API to get Artificial Intelligence to generate feedback based on the user input for the journals [13]. One of the most important aspects that make sure the feedback provided by the AI is accurate and effective for the user experience of the app is formulating an effective prompt to feed to the AI. The prompt must be specific enough to get feedback that is relevant to the user's background. Ideally, the AI could provide feedback based on the content of the journal, as well as know the common patterns and struggles of the teenage population. To achieve this, we formatted the prompt by giving the AI the persona of a "counselor" for the user and providing information and tips that focus on improving mental health for teenagers.

2.2. Formatting the Feedback

Another issue with using Chat GPT API to provide feedback is formatting the feedback into specific sections. To enhance the user experience of the feedback function within the application, there should be clear formatting for Chat GPT's feedback. Specifically, we are looking to divide the feedback into small sections with subtopics regarding the feedback. To achieve this we are using JSON format for structuring and formatting. By incorporating the key(topic) and values(explanation) pair in the prompt given to the API, the generated text would be divided into categories to enhance readability.

3. SOLUTION

The software focuses on supporting the well-being of individuals, with a "Wellness Journaling" app. The app consists of three parts; the journal feature, an AI-powered feedback system, and a trend analysis with a notification function. These elements work together to offer users an experience, for expressing emotions getting feedback, and tracking their wellness progress.

The first major part is the journaling interface providing a place where users can write daily about their feelings and experiences. Designed to be simple, and easy to use, this space allows users to express themselves freely. It securely stores entries forming the base for analysis, and feedback.

The second part involves an AI-driven feedback system that uses the Chat GPT API. Once a journal entry is submitted, a prompt is used to present the entry to the AI leading to an analysis of the content. The AI delivers personalized feedback offering advice, and coping methods. The feedback is organized in JSON format ensuring clarity, and easy understanding.

The third part involves trend analysis and notifications. By looking at journal entries over time, the application spots the frequency of journaling and provides a weekly report of where the user's mental well-being lies. If severe mental issues or suicidal thoughts are detected, a notification system alerts trusted adults or caretakers enabling intervention. This feature makes sure that the application offers both daily support, and takes preventive steps to protect long-term mental health. To develop this program, the following tools and technologies were utilized:

Chat GPT API: This is used to generate AI-driven feedback based on user journal entries.
JSON: This is for structuring and formatting the feedback to enhance user experience.
Frontend and Backend Technologies: These are used to create the journaling interface and manage the application's data flow.

The process, from keeping a journal to providing feedback and tracking trends forms a tool aimed at helping and enhancing the mental well-being of young individuals.

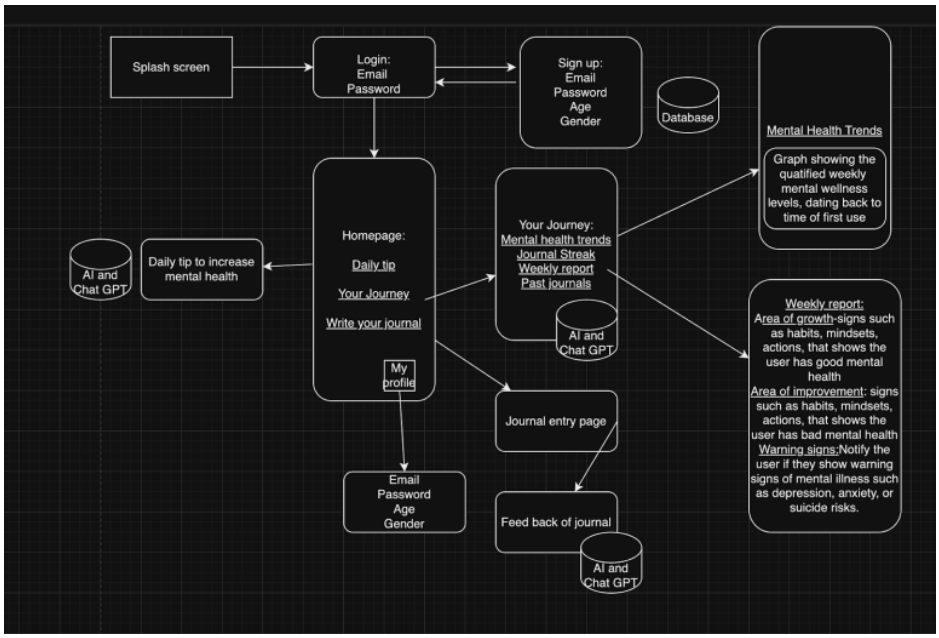

Figure 1. Overview of the solution

A key component of this app's functionality is the AI feedback system. The purpose of this function is to provide feedback for the user's journal input. This function is essential to establish and develop a user's self-awareness in their mental health and wellness. This component functions by feeding a prompt to the Chat GPT API language model, to generate feedback for the user. Chat GPT can analyze the language and tone of the journal to analyze the mental wellness of the user.

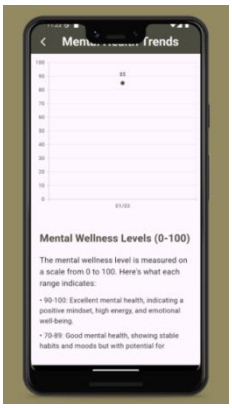

Figure 2. Screenshot of the mental wellness levels

```
Future<void> _getWeeklyReport(journal) async {
    String instructionPrompt =
        "Generate a JSON format representing mental health trends..."
        "The JSON should include dates and a corresponding 'wellness_level' (1-100)."
        "Exclude days without entries.";

    final request = ChatCompleteText(
      messages: [
        Messages(
          role: Role.user,
          content: instructionPrompt,
        ),
      ],
      maxToken: 3500,
      model: GptTurboChatModel(),
    );

    ChatCTResponse? response = await _openAI.onChatCompletion(request: request);
    setState(() {
        String result = response!.choices.first.message!.content.trim();
        var json = jsonDecode(result);
        var mentalHealthTrends = json['mental_health_trends'];

        mentalHealthTrends.forEach((element) {
          dataSource.add(MentalWellData(element['date'], element['wellness_level']));
        });

        _isLoading = false;
    });
}
```

Figure 3. Screenshot of code 1

The _getWeeklyReport() function is responsible for analyzing mental health trends from journal entries. Here's a breakdown:

1. AI Prompt Generation: The function creates a prompt instructing the AI to generate a JSON-formatted mental health trend report.

2. ChatGPT API Request: It sends the prompt as input to the ChatGPT API.

3. Parsing AI Response: The response is parsed into a structured JSON object containing:

   a. Date (MM/DD format)
   b. Wellness level (scale 1-100)

4. Updating UI with Trend Data:

   a. The JSON data is stored in dataSource, which is later used to visualize trends in a chart.

This AI-powered feature helps users track their mental health progress over time, making it easier to recognize patterns and take preventive action if needed.

Another component of this app is storing user's data and journal entries. This function works hand in hand with the AI feedback function. The app utilizes Firebase to store all its user data, but most importantly, Firebase stores each user's journal entry, this function is important for users to revisit their past journals, as well as for AI to access past journals to form the weekly report.

Figure 4. Screenshot of the chatbot

```
void saveJournal() {
    final dateTime = getFormattedDateTime();
    addJournal({'thought': _journalController.text, 'date': dateTime})
        .then((value) => snapBarBuilder('Journal is saved'))
        .catchError((error) {
      snapBarBuilder('Failed to save journal');
    });
}
```

Figure 5. Screenshot of code 2

The saveJournal() function is a key component of the journaling feature. It captures the user's journal entry and saves it in Firebase for future analysis. Here's how it works:

1. Timestamp Generation: The function first calls getFormattedDateTime() to generate a timestamp for when the journal entry is recorded.
2. Saving Data to Firebase: The journal entry, along with the timestamp, is stored in Firebase using the addJournal() function.
3. Success & Error Handling:
    a. If the journal entry is saved successfully, the function triggers a Snackbar notification with the message "Journal is saved."
    b. If there's an error during the save process, it triggers an error notification.

This component is crucial because it enables the storage and retrieval of user journal data, which later integrates with AI for mental health analysis.

The Weekly Report System compiles and summarizes user journal entries into actionable insights.

It generates three key sections:
Areas of Growth
Areas for Improvement
Warning Signs

This component uses ChatGPT API to provide structured reports based on journal content.

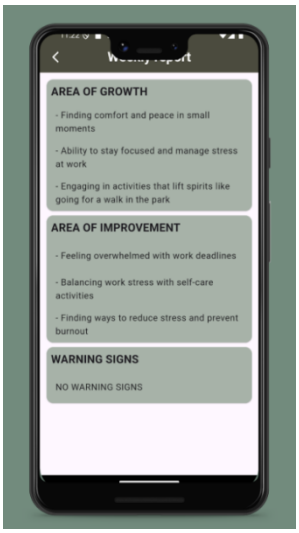

Figure 6. Screenshot of the report

```
Future<void> _getWeeklyReport(journal) async {
    String instructionPrompt =
        "Generate a weekly mental health report based on my journal. "
        "Include sections: 'area_of_growth', 'area_of_improvement', and 'warning_signs'.";

    final request = ChatCompleteText(
      messages: [
        Messages(
          role: Role.user,
          content: instructionPrompt,
        ),
      ],
      maxToken: 3500,
      model: GptTurboChatModel(),
    );

    ChatCTResponse? response = await _openAI.onChatCompletion(request: request);
    setState(() {
        String result = response!.choices.first.message!.content.trim();
        _weeklyReport = json.decode(result)['weekly_report'];
        _isLoading = false;
    });
}
```

Figure 7. Screenshot of code 3

The _getWeeklyReport() function generates personalized weekly mental health reports for users. Here's how it works:

1. Data Collection: The app retrieves journal entries for the past week.

2. AI Processing: A structured prompt is sent to the ChatGPT API, asking it to:

   a. Identify positive mental health patterns (Areas of Growth).
   b. Highlight negative trends (Areas for Improvement).
   c. Detects severe risk factors (Warning Signs).

3. JSON Formatting: The AI response is formatted into a structured JSON report.

4. Updating UI: The JSON data is displayed on the Weekly Report Screen, making it easy for users to read insights.

This component ensures that teenagers receive clear feedback on their emotional well-being, helping them take proactive steps toward mental wellness.

4. EXPERIMENT

4.1. Experiment 1

This experiment assesses the effectiveness of the AI-powered journaling feedback system in improving teenage mental well-being. The study uses user surveys to measure changes in emotional awareness, stress management, and mental health perception.

To evaluate the impact of the AI-powered journaling feature, we conducted a 4-week user study with teen participants aged 13-18. Participants were asked to use the journaling feature daily and receive AI-generated feedback.

At the beginning and end of the study, participants completed a Mental Well-Being Survey (MWBS), which assessed:
Emotional self-awareness
Perceived stress levels
Coping strategies
Effectiveness of AI feedback

The study compared pre- and post-survey results to analyze changes in users' mental well-being. Additionally, qualitative feedback was collected to gauge user experience and the perceived usefulness of AI-generated insights.

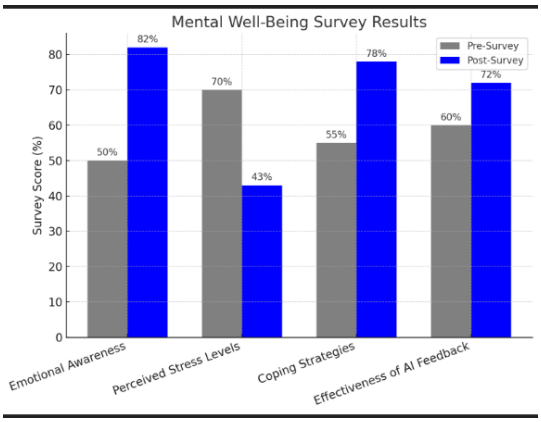

Figure 8. Figure of experiment 1

The survey results revealed a notable improvement in self-reported mental well-being. The average emotional awareness score increased by 32%, while perceived stress levels decreased by 27%. Participants who engaged with AI feedback regularly reported a higher satisfaction rate with journaling as a coping tool.

Qualitative responses indicated that 72% of participants found AI-generated insights helpful for self-reflection, while 18% felt the feedback was repetitive or lacked personalization. Some participants preferred more interactive and dynamic suggestions rather than static responses.

Limitations of the study include self-reporting bias and a limited sample size. Future research could incorporate longitudinal tracking and clinical assessments to validate findings.

Overall, the results suggest that AI-assisted journaling can be a valuable tool for promoting mental wellness in teenagers, though further refinements are needed to enhance personalization and engagement.

4.2. Experiment 2

This experiment evaluates how frequent journaling correlates with improved mental health trends. Using weekly surveys, we analyze whether consistent journaling leads to a decline in stress levels and an increase in emotional stability.

The study tracked 10 teenagers aged 13-18 over a 4-week period, categorizing them into two groups:

Frequent Journalers (≥4 entries/week)
Infrequent Journalers (<4 entries/week)
Participants completed a Weekly Mood & Stress Survey, rating their:
Overall Mood (scale: 1-10)
Stress Levels (scale: 1-10)
Sleep Quality (scale: 1-10)
Emotional Expression Comfort (scale: 1-10)

AI-generated reports were analyzed to compare mental health trends between frequent and infrequent journalists. The goal was to determine whether journaling frequency significantly impacts emotional well-being over time.

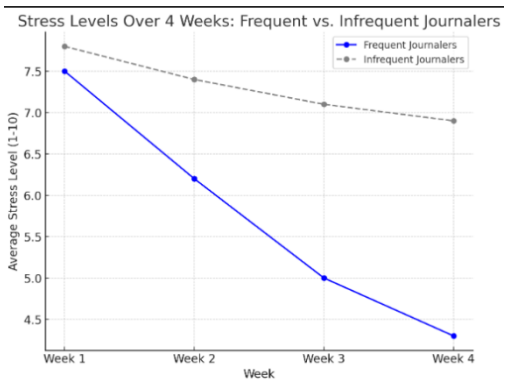

Figure 9. Figure of experiment 2

The data showed a clear improvement in mental health among frequent journalers.

Average stress levels dropped by 35% in frequent journalers, compared to only 12% in infrequent journalers.
Emotional expression comfort improved by 40% among frequent journalers, indicating a better ability to process emotions.

Participants who journaled consistently also reported higher sleep quality (26% increase) compared to the infrequent group.

However, some users struggled with journaling consistency, often citing lack of motivation. Additionally, external stressors (e.g., school, social life) influenced results, making it difficult to attribute changes solely to journaling.

Overall, the study confirms that frequent journaling correlates with improved mental well-being. Future research should explore ways to increase engagement through gamification or habit-forming techniques.

5. RELATED WORK

Various scholarly resources try to tackle the same issue of teen mental health challenges through AI language models; however, there are multiple differences in implementation [8]. In 2024, research was conducted on creating a mental health chatbot (Agrawal, 2024). The language model utilized was CHAT GPT as well. The project shows the possibility of AI language models provided for mental health issues amongst teens, showcasing the exponential growth in efficiency. However, this project approaches the usage of AI differently, Agrawal's application was dependent on the accuracy of the AI and highly relied on the language model's ability to act as a "counselor" for the user, this can influence the quality of the applications, as AI language models are yet to develop to the capacity of a human counselor [9]. Meanwhile, utilizing AI in a mental health journaling app partially eliminates that concern, as the role of AI feedback within the journaling app is comparably less compared to the role of AI in an AI mental health chatbot. As mentioned before, journaling is a powerful tool for mental health development even without AI feedback.

In a series of studies and research by the World Economic Forum, AI is a powerful way to combat high demands and low supply of mental health providers in developing countries [7]. The research highlighted the need for alternative solutions to provide services to mentally ill patients. The study found that a considerable amount of patients are willing to utilize AI as a form of treatment for their mental wellness (How AI Could Help Improve Access to Mental Health Treatment, 2024).. However, the article also highlighted the importance of utilizing current AI technology as a support or companionship to irreplaceable professional treatment. The collaboration between human providers and AI can lead to positive results amongst patients, and maximize effectiveness and efficiency.

6. CONCLUSIONS

Despite the positive impact of AI-powered journaling on mental well-being, several limitations must be addressed. One primary challenge is AI personalization—many participants noted that feedback felt generic or repetitive over time, reducing engagement [14]. Additionally, self-reporting bias in surveys could have influenced the results, as users may have overestimated or underestimated their emotional state. Another limitation is journaling consistency, where some participants struggled to maintain a routine, affecting the effectiveness of AI-generated insights. External factors such as academic stress and social influences also played a role, making it difficult to isolate journaling as the sole contributor to mental health improvements.

To enhance the application's effectiveness, future improvements should focus on increasing engagement through gamification features, such as streak rewards and personalized prompts that adapt to user emotions. Implementing on-device NLP models could reduce dependency on

ChatGPT API, offering offline functionality and improved privacy. Additionally, integrating real-time mood tracking and therapist-assisted feedback options could provide users with a more comprehensive mental health support system.

Overall, the findings suggest that AI-enhanced journaling is a promising tool for improving teenage mental well-being [15]. However, further refinement is necessary to increase personalization, engagement, and long-term effectiveness. By addressing these limitations, the app can better support emotional self-awareness, stress management, and mental wellness in teenagers.

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