![תמונה שמכילה גופן, טקסט, לוגו, גרפיקה

התיאור נוצר באופן אוטומטי](data:image/jpeg;base64,/9j/4AAQSkZJRgABAQEAYABgAAD/4RD0RXhpZgAATU0AKgAAAAgABAE7AAIAAAAUAAAISodpAAQAAAABAAAIXpydAAEAAAAWAAAQ1uocAAcAAAgMAAAAPgAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAANeQ15XXqNeZ16og15PXnteR15UAAAWQAwACAAAAFAAAEKyQBAACAAAAFAAAEMCSkQACAAAAAzM1AACSkgACAAAAAzM1AADqHAAHAAAIDAAACKAAAAAAHOoAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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 
Capstone Project Phase A

**BrainBuddy-Task Management Solution for ADHD Users**

**PROJECT CODE:**

25-1-D-16

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<https://github.com/skyboak/BrainBuddy.git>

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# Abstract

This project presents the development of BrainBuddy, a mobile application designed to assist individuals with ADHD in managing their time effectively. The application aims to provide personalized solutions for organizing tasks, managing schedules, and enhancing focus through user-friendly and adaptive interfaces.

The core functionalities of the app include task creation with attributes such as urgency, difficulty, and recurrence; schedule generation that offers three optimized daily plans based on user preferences and available free time; and a notification system to ensure timely reminders. Additionally, a task timer facilitates focus by tracking progress and providing completion feedback.

The app leverages React Native and Expo for a seamless cross-platform experience, while Firebase serves as the backend for real-time database management, notification handling, and authentication. A robust algorithm prioritizes tasks based on user-defined parameters, including deadlines, complexity, and urgency, to create practical and personalized schedules. The project emphasizes accessibility and usability, particularly for ADHD users, through a clean and distraction-free interface. Testing encompasses functional, integration, and edge-case scenarios to ensure reliability, scalability, and user satisfaction.

By addressing the unique challenges faced by ADHD individuals, BrainBuddy aspires to enhance productivity and improve time management skills in a supportive and engaging manner.

# Introduction

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental condition that continues to impact the lives of many individuals well into adulthood, with one of the most prominent challenges being a persistent lack of order and organization in daily life 18, 7. Adults with ADHD experience significant difficulties in managing even simple tasks, such as organizing their workspace, paying bills on time, or adhering to a schedule for basic chores and responsibilities. These difficulties stem from deficits in executive functioning, a core feature of ADHD, which includes the ability to plan, prioritize, and complete tasks in a structured and timely manner ]18, 7[. Research shows that working memory impairments exacerbate these challenges by reducing the ability to keep track of multiple tasks simultaneously, leading to frequent errors, incomplete responsibilities, and forgotten commitments [15]. These deficits often create a cycle of frustration and stress, as individuals find themselves unable to meet their obligations or maintain a sense of order, further reinforcing a perception of chaos in their lives [7, 15].

Adults with ADHD also struggle with time management, another critical component of executive functioning, which contributes to their inability to structure their day effectively or allocate sufficient time to complete tasks. This results in missed deadlines, procrastination, and an overwhelming backlog of unaddressed tasks [7]. Unlike neurotypical individuals who can intuitively prioritize and transition between tasks, people with ADHD often require explicit strategies and tools to manage their time effectively. Without this support, their daily routines can become disorganized and fragmented, reducing their productivity and quality of life. This difficulty is not limited to complex or professional tasks; even simple responsibilities, such as remembering to attend appointments or preparing meals, can become overwhelming due to the absence of a structured approach [18, 7].

Research underscores the critical need for interventions that address these organizational and time management deficits. Traditional therapeutic approaches, while effective in managing core symptoms of ADHD such as inattention and impulsivity, often fail to provide practical, hands-on solutions to help individuals tackle the daily challenges of managing their responsibilities [6]. Digital tools, such as mobile applications, have emerged as a promising avenue for addressing these deficits. Studies have shown that apps tailored for individuals with ADHD can effectively improve time management, task organization, and adherence to schedules, especially for post-secondary students who face heightened demands in balancing academic and personal responsibilities [19]. These apps often incorporate features such as reminders, task prioritization, and visual aids, which align closely with the executive functioning needs of individuals with ADHD [19, 5]. For instance, evidence-based interventions such as Organizational Skills Training (OST) and task segmentation have been shown to significantly improve task completion rates and reduce stress by breaking down responsibilities into manageable steps [18, 15]. These findings emphasize the importance of providing individuals with ADHD a system to plan, organize, and manage their time in a way that aligns with their specific cognitive needs.

To address this gap, our approach involves developing a sophisticated algorithm grounded in scientific research and mathematical principles to craft daily routines tailored to individual needs. Research indicates that maintaining an effective and consistent routine can significantly enhance executive functioning, helping individuals plan, prioritize, and complete tasks more efficiently [15]. By focusing on the development of good habits and fostering a sense of organization, this solution aims not only to improve day-to-day functionality, but also to mitigate core ADHD symptoms over time [15, 5]. By leveraging advanced technology and evidence-based strategies, we aspire to create a transformative tool that empowers users to take control of their schedules and navigate their responsibilities with greater ease.

This work will include a comprehensive literature review on ADHD and its associated challenges in section 2, followed by an exploration of expected achievements through the development of our solution, in section 3. Additionally, in section 4, the project will detail the engineering process, including the design and implementation stages of the proposed mobile application. Finally, in section 5 we will present a full testing plan to ensure its effectiveness and user satisfaction.

# Literature review

## ADHD Definition

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder defined by persistent patterns of inattention, hyperactivity, and impulsivity that are inconsistent with an individual's developmental stage. These symptoms must cause significant functional impairments in multiple settings, such as academic, occupational, or social environments. Historically, ADHD was considered a childhood disorder, but it is now recognized as a condition that often persists into adulthood, with changes in symptom expression over time. The disorder is thought to result from a combination of genetic, environmental, and neurobiological factors [1].

## The Evolution of ADHD Understanding

The understanding of ADHD has evolved significantly over the years. In 1845, Heinrich Hoffmann wrote a children’s book, *Struwwelpeter*, which described behaviors similar to ADHD, like being overly active or easily distracted. In 1902, George Frederick Still suggested that such behaviors stemmed from "defects in moral control" caused by brain injuries. By the early 20th century, ADHD-like symptoms were linked to brain dysfunction, particularly in the frontal lobe. Terms such as "minimal brain damage" and "organic restlessness" were used, but by the 1970s, these were replaced by "minimal cerebral dysfunction" due to lack of evidence of physical brain injuries. In the 1960s, researchers began focusing on attention deficits alongside hyperactivity. Today, ADHD is understood as involving a mix of attentional and motivational issues, tied to dysfunctions in the prefrontal cortex and reward systems [2].

## Physiological and Neurological Foundations of ADHD

ADHD has several physiological and neurological aspects that help explain its symptoms. Dysfunction in the prefrontal cortex, responsible for executive functions such as planning, decision-making, self-regulation, and focus, often leads to difficulties with task organization, impulse control, and sustained attention [3].

The dopamine system, which regulates motivation and reward, is another key system affected in ADHD. Disruptions in dopamine signaling, particularly in areas like the ventral striatum (including the nucleus accumbens), are linked to challenges in staying motivated for tasks, especially those without immediate rewards [2].

Other affected regions include the parietal lobe and the anterior cingulate cortex [ACC]. The parietal lobe helps process sensory information and maintain focus, while the ACC monitors conflicts, detects errors, and allocates attention. Impairments in these areas contribute to distractibility and difficulty staying on task [4].

Additionally, gender differences in ADHD also extend to neurological functioning. Research suggests that women with ADHD may experience more internalized symptoms, such as anxiety and depression, which can complicate diagnosis and treatment. Men, on the other hand, are more likely to exhibit externalized symptoms like hyperactivity and impulsivity, often leading to greater occupational disruptions and social consequences [13].

Studies using EEG and fMRI have provided additional insights. Signals such as contingent negative variation (CNV) and P3 wave amplitudes, which reflect preparation, attention, and response control, are often diminished in ADHD. These findings underscore challenges in preparing for and executing goal-directed actions [2].

## Core Symptoms of ADHD

ADHD is defined by three core symptoms: inattention, hyperactivity, and impulsivity, which manifest differently across individuals and age groups. Inattention includes difficulty sustaining focus, organizing tasks, and following through on activities, often leading to forgetfulness and distractibility. Hyperactivity is characterized by excessive movement or restlessness, particularly in situations requiring stillness. Impulsivity involves acting without forethought, difficulty delaying gratification, and making hasty decisions without considering consequences. These symptoms must occur in multiple contexts (e.g., school, work, or home) and cause significant impairments [1,2].

Tools like the Continuous Performance Test (CPT) have highlighted how core symptoms relate to brain activity. Errors of omission (reflecting inattention) and commission (reflecting impulsivity) reveal deficits in sustained attention and response control. These findings align with theories that attribute ADHD to impairments in executive functions, such as working memory and behavioral regulation, tied to dysfunctions in prefrontal-striatal and other brain circuits [3, 4]. Motivational theories suggest that impulsivity and hyperactivity may also stem from altered reward processing in dopamine-related regions like the ventral striatum [2,4].

## Statistics of Symptoms of ADHD in Adults and Children:

ADHD is a prevalent neurodevelopmental condition affecting approximately 5% of children [5]. Research indicates that about two-thirds of children diagnosed with ADHD continue to experience symptoms into adulthood [6], with an estimated prevalence of 4.4% in the US adult population [5]. In a comprehensive study of 971 children aged 3-11 years, 85.8% reported having been diagnosed with ADHD at some point, with 84.2% maintaining a current diagnosis. Of those with current diagnoses, 71.8% were taking medication for ADHD, while 27.2% were receiving non-medication treatments. The condition frequently co-occurs with other disorders, as demonstrated by high comorbidity rates - 53.8% of individuals with ADHD reported at least one anxiety disorder, and 42.9% reported at least one mood disorder. The impact of ADHD extends beyond individual health outcomes, being associated with substantial economic costs and reduced life expectancy [6].

## Executive Function Deficits in ADHD:

The manifestation of ADHD presents unique challenges across development, from childhood through adulthood. While ADHD is diagnosed based on persistent patterns of inattention, impulsiveness, and hyperactivity, research indicates that executive functioning (EF) deficits play a significant role in both children and adults [14]. In children, greater deficits are found in tests of nonverbal working memory compared to verbal working memory abilities [7]. As these individuals transition to adulthood, they face significant occupational challenges - adults with ADHD rank significantly lower in occupational status, receive worse job performance ratings from employers, and are more likely to be fired compared to control groups. Interestingly, while traditional EF tests show deficits in only 35-50% of ADHD cases across age groups, behavioral rating scales reveal that 89-94% of ADHD adults demonstrate significant impairment in daily life activities [7]. This suggests that the impact of ADHD on real-world functioning may be more pervasive than what can be captured by standard neuropsychological testing. The developmental trajectory is further complicated by the genetic basis of ADHD, with twin studies showing heritability estimates of approximately 0.8, varying between 0.6 and 0.9 across age groups [14].

Adults with ADHD face significant challenges in occupational functioning and workplace performance. Research shows they are more likely to be unemployed, impulsively quit jobs, use more sick leave, have workplace accidents, and experience chronic employment problems. When employed, adults with ADHD have significantly more days of reduced productivity and more than twice the risk of workplace accidents compared to other workers, with an estimated increased cost of $4,336 per ADHD worker annually [7].

The impairments extend beyond just work life into daily executive functioning capabilities. Studies indicate that 89-98% of adults with ADHD demonstrate significant deficits in executive functions needed for daily life activities, particularly in areas of self-management of time, self-organization, problem-solving, self-discipline, and self-motivation. These executive function deficits make it extraordinarily difficult for individuals with ADHD to consistently anticipate, plan, enact, and maintain goal-directed actions, which affects their ability to organize materials, track assignments, recall due dates, and manage basic supplies and responsibilities [15].

## Diagnosis of ADHD

The diagnosis of Attention-Deficit Hyperactivity Disorder (ADHD) relies on a comprehensive evaluation process that integrates clinical interviews, standardized rating scales, and behavioral assessments to ensure accuracy and consistency. ADHD is characterized by persistent symptoms of inattention, hyperactivity, and impulsivity that interfere with functioning in multiple settings, such as school, work, or home. For a diagnosis, symptoms must have been present before the age of 12 and cause significant impairments in daily activities [9, 17].

For children, the evaluation process typically involves gathering input from multiple sources, such as parents, teachers, and caregivers, using standardized questionnaires designed to measure the severity of symptoms and identify consistent behaviors across different settings like home and school [16]. These tools provide a clearer picture of the child’s challenges and ensure consistency in symptom presentation. Additionally, structured clinical interviews with parents and children play a critical role in identifying developmental patterns, determining the onset of symptoms, and exploring how these behaviors impact daily functioning [8].

In adults, ADHD diagnosis poses unique challenges, as it often requires retrospective assessment of childhood symptoms alongside current impairments. Tools like the Wender Utah Rating Scale (WURS) are used to capture childhood ADHD symptoms based on adult recollections [17]. Meanwhile, standardized self-report questionnaires, such as the Adult ADHD Self-Report Scale (ASRS), help evaluate current symptoms and their effects on daily life and productivity [9]. Clinical interviews are especially important in differentiating ADHD from other psychiatric conditions, such as mood disorders, anxiety disorders, or personality disorders, which can share overlapping symptoms [9,8].

To ensure a reliable diagnosis, clinicians often adopt a multimodal approach that combines behavioral observations, structured assessments, and clinical judgment.

## Behavioral Tools for Daily Life Management

Behavioral interventions play a critical role in helping individuals with ADHD manage their symptoms effectively in daily life. Unlike pharmacological treatments, which target neurochemical imbalances, behavioral strategies focus on modifying environments and habits to support positive behaviors and reduce challenges. The core of behavioral management is teaching skills that promote self-regulation and organization, particularly through the implementation of structured environments [16]. Structured routines provide predictability and consistency, which are essential for individuals with ADHD to stay organized and manage tasks efficiently. Establishing daily schedules with clear expectations helps reduce forgetfulness and procrastination. Reinforcement systems, such as rewards for completing tasks, foster motivation and encourage goal-oriented behavior. Positive reinforcement, particularly when applied consistently, has been shown to improve task compliance and reduce impulsivity. The guidelines emphasize the importance of personalized rewards that align with the individual’s interests to sustain motivation and engagement [16,8]. For example, small rewards for short-term tasks and larger incentives for long-term achievements can gradually build better habits.

However, behavioral strategies are not without limitations. While structured routines and reinforcement systems are effective, they often require consistent effort and involvement from caregivers, teachers, or supervisors, which can be challenging to sustain over time. For instance, not all teachers or parents may have the time, patience, or resources to implement these strategies effectively, leading to inconsistent application and reduced benefits. Additionally, reliance on external rewards for motivation may limit the development of intrinsic motivation, as individuals may struggle to perform tasks without immediate incentives.

Additionally, parental and teacher involvement are emphasized as a cornerstone of effective behavioral management. Collaboration with caregivers ensures that children and adolescents with ADHD receive consistent support across home and school settings. This includes implementing tools like visual reminders, timers, and task checklists to help with task initiation and completion. Educating parents and teachers on behavioral techniques enables them to implement appropriate discipline, reduce negative reinforcement, and encourage positive behaviors effectively [16]. Environmental modifications, such as creating distraction-free workspaces, further enable individuals to maintain focus and manage inattention challenges [8]. However, achieving this level of collaboration can be difficult, as some teachers may be unwilling or unable to accommodate the additional needs of students with ADHD. Similarly, parents may experience stress, frustration, or lack the necessary training to implement these techniques effectively.

Environmental modifications, such as creating distraction-free workspaces, further enable individuals to maintain focus and manage inattention challenges [8]. Yet, these adjustments may not always be feasible in certain settings, such as overcrowded classrooms, noisy households, or workplaces with open office layouts. This can limit the effectiveness of behavioral interventions in real-world environments.

Overall, behavioral tools provide practical, non-pharmacological methods to address ADHD-related impairments in executive functioning and daily life activities. When combined with other interventions, they offer sustainable solutions to support long-term success and well-being by empowering individuals with ADHD to develop habits that facilitate daily task management [8, 16] .  However, their success relies heavily on consistent application, collaboration among stakeholders, and adaptable environments, which may not always be achievable.

## Advantages of ADHD: Creativity and Innovation

Despite being categorized as a neurodevelopmental disorder, individuals with ADHD often demonstrate heightened creativity and innovative thinking, exhibit higher levels of creativity compared to their non-ADHD peers. This advantage is particularly prominent in settings that value divergent thinking, multitasking, and rapid ideation. The study highlights that individuals with ADHD have a reduced inhibitory control, which may allow for more unusual associations and ideas to emerge - key components of creative thinking. Furthermore, adults with ADHD and those with higher educational levels tend to showcase stronger creative abilities, suggesting that the right environmental conditions can foster these strengths and mitigate the challenges of ADHD symptoms. Given their unique ability to think outside the box, individuals with ADHD may excel in fields requiring innovation, problem-solving, and adaptability [10].

## Treatment and Future Directions

Medications like methylphenidate (Ritalin) improve ADHD symptoms by increasing dopamine availability, thereby restoring balance in affected neural networks. This often results in better focus, impulse control, and task performance [4]. However, pharmacological interventions are most effective when combined with behavioral strategies and psychoeducational support [16]. A multimodal approach that integrates medication, behavioral therapy, and educational interventions is recommended to achieve the best outcomes for individuals with ADHD.

The guidelines underscore the importance of monitoring treatment progress over time, adjusting interventions as needed to address specific challenges, such as attention deficits, impulsiveness, or hyperactivity. Future research may further elucidate the interactions between cognitive and motivational pathways, helping refine both pharmacological and behavioral interventions. This includes exploring how non-stimulant medications, like atomoxetine, and novel therapies could complement existing treatment methods to address individual variability in ADHD symptoms.

Advancements in technology, including mobile health (mHealth) applications, provide an additional avenue for delivering behavioral interventions. Digital tools designed for ADHD management can offer features like task reminders, goal tracking, and progress feedback, aligning with the structured and supportive approaches highlighted in behavioral therapies. By integrating such tools into daily routines, individuals with ADHD may benefit from accessible, personalized solutions that support long-term behavioral improvements [16,8].

## Existing Tools

Mobile applications have emerged as valuable tools for supporting individuals with ADHD, particularly in addressing challenges with personal situations, study habits, motivation, and course-related self-efficacy. Studies show that while medications are often a first-line treatment, apps can provide flexible alternatives and complementary support for managing ADHD symptoms [6].

The WHAAM application creates a virtual network enabling comprehensive ADHD behavior monitoring. Through this network, caregivers can collect real-time behavioral data, visualize patterns, and assess intervention effectiveness. The app particularly excels at allowing multiple caregivers to coordinate and track progress systematically. However, it lacks features for direct interaction with mental health professionals, which could enhance its therapeutic value [11]. Another notable example is the ADHD Trainer, which uses the Tajima Cognitive Method to enhance cognitive skills including attention, working memory, processing speed, and visual-motor coordination. In one case study, the app helped reduce video game addiction and improve academic performance, though its primary limitation is the lack of personalization features to adapt to individual user needs [6]. The Inflow app provides cognitive behavioral therapy (CBT) principles through a self-help program, offering users tools to manage symptoms and connect with others facing similar challenges. While users reported positive usability experiences, the app focuses primarily on CBT principles without integrating other essential aspects of ADHD management like organization tools or attention training [6].

These applications demonstrate how mobile technology can support ADHD management through various approaches, from behavior monitoring to cognitive training and CBT-based interventions. However, a significant limitation across most apps is their tendency to focus on single aspects of ADHD management rather than providing comprehensive support that addresses multiple dimensions of the condition [12]. Additionally, the general lack of rigorous clinical validation and professional medical oversight highlights an area for future development [5]. These limitations suggest a need for more holistic applications that can address the diverse challenges faced by individuals with ADHD while maintaining clinical credibility and professional oversight.

# Expected achievements-

The main objective of this project is to develop a mobile application tailored to assist individuals with ADHD in managing their time, tasks, and daily routines effectively. The app aims to address the unique challenges individuals with ADHD face, such as difficulties in organization, prioritization, and maintaining productivity, by offering a structured and user-friendly tool that promotes consistency and reduces overwhelm.

The application will feature a personalized daily schedule generator, powered by an intelligent algorithm that creates customized routines based on user-defined tasks, priorities, and time availability. Alongside this, the app will include adaptive reminders and notifications that alert users to upcoming tasks or deadlines, helping them maintain focus and mitigate procrastination.

The algorithm will function by first collecting input from users, including tasks, deadlines, priorities, and their available time. It will also accommodate recurring tasks by allowing them to be scheduled automatically. Once the data is collected, the algorithm will employ a priority-ranking system to sort tasks based on urgency, importance, and the estimated time needed for completion. Using this prioritized list, the system will generate an optimal schedule that balances high-priority tasks with necessary breaks and lower-priority activities, ensuring a manageable and structured routine. Furthermore, the schedule will be dynamic, meaning it will automatically adjust if tasks are marked as incomplete, rescheduled, or updated, thereby providing users with flexibility while maintaining productivity.

The app’s user-friendly interface will incorporate intuitive visual aids, including color-coded task categories, to simplify task organization and minimize cognitive overload, ensuring an engaging and accessible experience for users. The mobile application will be developed using React Native with Expo, enabling efficient development, seamless user experience, and compatibility across both operating systems.

The success of this project will be measured through several key criteria. These include the app’s usability, which will be evaluated Based on feedback from users, primarily those diagnosed with ADHD and others experiencing similar symptoms.

Additionally, the app’s effectiveness will be assessed through user engagement levels, reflected in consistent usage patterns, and qualitative feedback demonstrating a reduction in stress and overwhelm caused by disorganization. Finally, the app’s customization effectiveness will be evaluated by determining whether the personalized schedules, reminders, and adaptive suggestions align with the specific needs of users and lead to improved daily functioning.

By achieving these objectives, the project aims to deliver a transformative solution that empowers individuals with ADHD to take control of their schedules, develop productive habits, and overcome the persistent challenges associated with task management and time organization.

# Engineering Process

## **Process**

Our development process began with comprehensive research into ADHD, its manifestations, and evidence-based interventions. This research phase was crucial in establishing a strong foundation for our application design and ensuring that our solution would effectively address the specific needs of individuals with ADHD.

### Development Approach

Our development approach unfolded through several interconnected phases, beginning with a thorough understanding of user needs. We conducted an in-depth literature review on ADHD, examining symptoms, executive function deficits, and challenges in daily life organization. This analysis of existing tools and methods used for ADHD management helped us identify critical gaps and opportunities for improvement, highlighting the need for a solution addressing real-world challenges in organization, time management, and routine adherence.

Our investigation into digital intervention effectiveness yielded promising results. The literature review demonstrated that mobile applications can effectively support ADHD management, particularly when incorporating clear visual organization, consistent reminder systems, adaptive scheduling capabilities, and immediate feedback mechanisms. These findings directly informed our development approach.

The problem definition and objectives phase followed, where we identified the core challenge: a lack of tools that effectively help individuals with ADHD manage their time and tasks while accommodating their unique cognitive needs. This understanding led to the establishment of clear project objectives, including the development of a mobile application featuring personalized scheduling, adaptive reminders, and a user-friendly interface.

System design is forming the next crucial phase of our approach. We are designing a modular architecture to support flexibility and future scalability, carefully planning key features such as dynamic scheduling, visual aids, and adaptive reminders. The technical stack selection process is leading us to choose React Native with Expo for cross-platform development, ensuring broad accessibility and consistent performance.

The algorithm development phase is focusing on creating an intelligent scheduling system that prioritizes tasks based on urgency, importance, and user preferences. We are incorporating mechanisms for recurring tasks and real-time adjustments, ensuring the system maintains flexibility and adaptability to meet varying user needs.

### Motivation

The motivation for our approach stems from the unique challenges faced by individuals with ADHD, including difficulties with time management, organization, and task prioritization. Our aim is to design a solution that simplifies these processes, making daily task management more accessible and effective. By leveraging evidence-based strategies and modern technology, we seek to create a tool that enhances users' productivity and quality of life, enabling them to meet their goals with greater ease and confidence.

### Development Plan

Our development plan will structure the implementation into distinct phases, beginning with initial setup. This phase will encompass project initialization using React Native with Expo and the establishment of the basic architecture, including screens, components, and navigation systems.

The design phase will follow, focusing on creating an intuitive and accessible user experience. This will include the development of wireframes and prototypes for key app screens, implementation of ADHD-friendly accessibility considerations, and the establishment of a consistent design system for colors, fonts, and components.

Core feature development will constitute the next phase, during which we will implement comprehensive task management capabilities, develop dynamic scheduling algorithms, integrate reminder and notification systems, and add extensive user customization options. Each feature will be developed with careful consideration of our target users' needs and preferences.

The testing phase will incorporate both usability and performance testing, with particular attention to gathering and implementing user feedback. This iterative process will allow us to refine the application based on real-world usage patterns and user experiences across different devices and platforms.

### Constraints

Our development process will need to address several significant constraints. The diverse nature of ADHD manifestations will require us to create highly customizable features that can accommodate varying levels of impairment and executive functioning challenges. This variability in user needs will necessitate a flexible and adaptable design approach.

Technical challenges will present another significant constraint, particularly in ensuring compatibility across multiple devices and operating systems while managing React Native dependencies. Maintaining consistent performance standards across platforms will require careful consideration throughout the development process.

User engagement will emerge as a critical constraint, requiring us to balance functionality with accessibility. The interface will need to be both intuitive and engaging while minimizing potential distractions, a particular challenge given our target user group's characteristics.

Data privacy and security considerations will form our final major constraint. We will need to implement robust encryption methods and ensure compliance with data protection regulations, recognizing that building and maintaining user trust through secure data handling will be paramount to the project's success.

### Interview Questions

As part of the process, we conducted interviews with individuals diagnosed with ADHD as part of the preliminary stages of developing our development plan. The goal was to gain a deeper understanding of their daily challenges, specifically in task and time management. These insights are crucial for designing an app that addresses their unique needs and provides meaningful support in their day-to-day lives.

1. How does ADHD affect your daily life?
2. What is the most challenging aspect of managing tasks or responsibilities?
3. How do you approach starting, focusing on, and finishing tasks?
4. Do you struggle with remembering appointments or important dates? If so, how do you handle it?
5. How do distractions or external stimuli impact your ability to concentrate?
6. What methods or tools have you used for time or task management, and what worked or didn’t work for you?
7. What would you like to see in an app to help you manage your tasks and time more effectively?
8. How important is personalization, such as choosing your most productive times or receiving tailored reminders?
9. What kind of design or interface do you find easiest and most comfortable to use?
10. If you could try BrainBuddy now, what type of task would you want to test first?
11. Is there anything else you consider essential in an app for ADHD management?

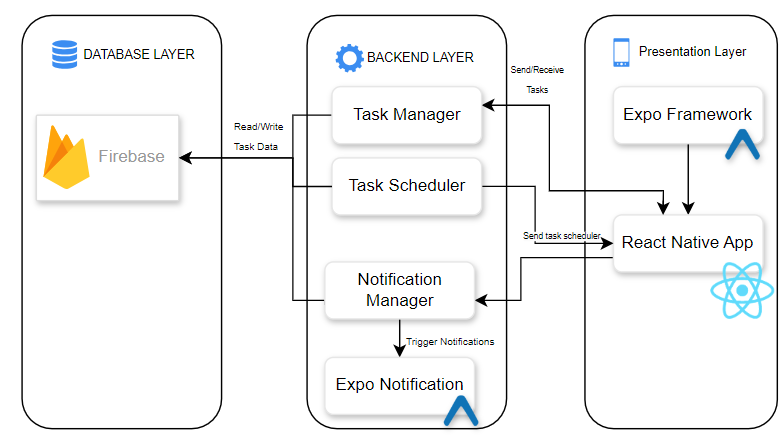
Participants highlighted significant challenges with focus, organization, and time management, often feeling overwhelmed by multiple responsibilities. They described difficulties in starting tasks, maintaining focus, and completing them, as well as frequent issues with forgetting appointments or deadlines. Traditional tools and apps were perceived as either too complex or lacking essential ADHD-specific features, such as adaptive reminders or effective prioritization. Distractions, such as noise or clutter, were noted as major barriers to productivity. Both participants emphasized the importance of personalization, requesting features that align with their unique habits and productivity patterns, along with a simple, minimalistic interface with visual aids to reduce cognitive overload. They expressed interest in testing the app with small, everyday tasks, like reminders for routine activities, to assess its effectiveness. Additionally, they suggested including positive feedback or rewards to boost motivation and ensure the app feels supportive rather than burdensome.

We chose these questions to gain a clear understanding of the unique challenges individuals with ADHD face in managing their time and tasks. The questions explore both general experiences and specific difficulties, such as starting tasks, dealing with distractions, and remembering important details. This helps us identify the pain points that an app like BrainBuddy should address.

We also included questions about tools they currently use and their feedback on what works or doesn’t. This allows us to improve upon existing solutions. Furthermore, questions about personalization and interface design ensure that the app aligns with users’ preferences and cognitive needs, making it not only effective but also enjoyable to use.

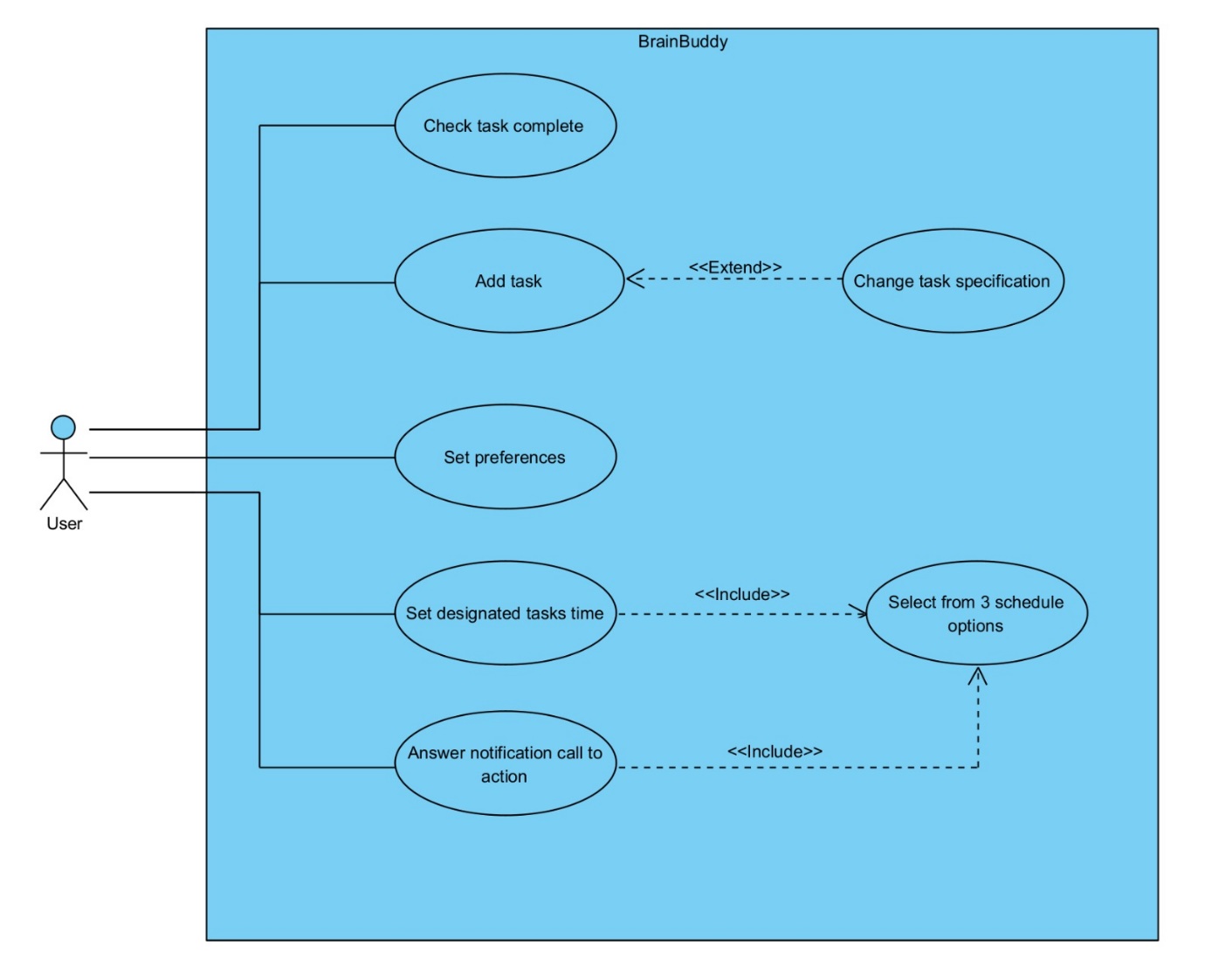
## Product

### Project Architecture



The mobile application will leverage Firebase as the backend to provide efficient storage and real-time database functionalities for secure user data management. Built using React Native, the app will ensure seamless cross-platform compatibility for Android and iOS devices. Additionally, the Expo SDK will be utilized to streamline the development process and offer built-in modules for features such as notifications, date and time handling, and Firebase integration. The application's architecture, as illustrated in the accompanying diagram, includes three main layers: the Database Layer, managed by Firebase; the Backend Layer, which consists of components like the Task Manager, Task Scheduler, and Notification Manager; and the Presentation Layer, built using the Expo Framework and React Native. Expo’s simplified workflow will enable rapid prototyping, testing, and deployment, ensuring a user-friendly experience. This combination of tools and architecture will provide a scalable, efficient solution that meets the unique organizational and time-management needs of individuals with ADHD.

### Use Case Diagram



The diagram illustrates the use cases of the BrainBuddy application, which helps users with ADHD manage their time and tasks effectively. The primary actor is the User, who interacts with the system to perform several key actions.

**Check Task Complete:**

The user can mark tasks as completed, enabling the application to update the task's status and maintain an accurate progress record.

**Add Task:**

Users can add new tasks to their schedule. This use case is extended by the option to Change Task Specification, allowing users to modify details like task duration, priority, or description after the task has been added.

**Set Preferences:**

The user configures their general application preferences, such as notification settings or default scheduling behavior. These preferences customize the app experience to meet the user's needs.

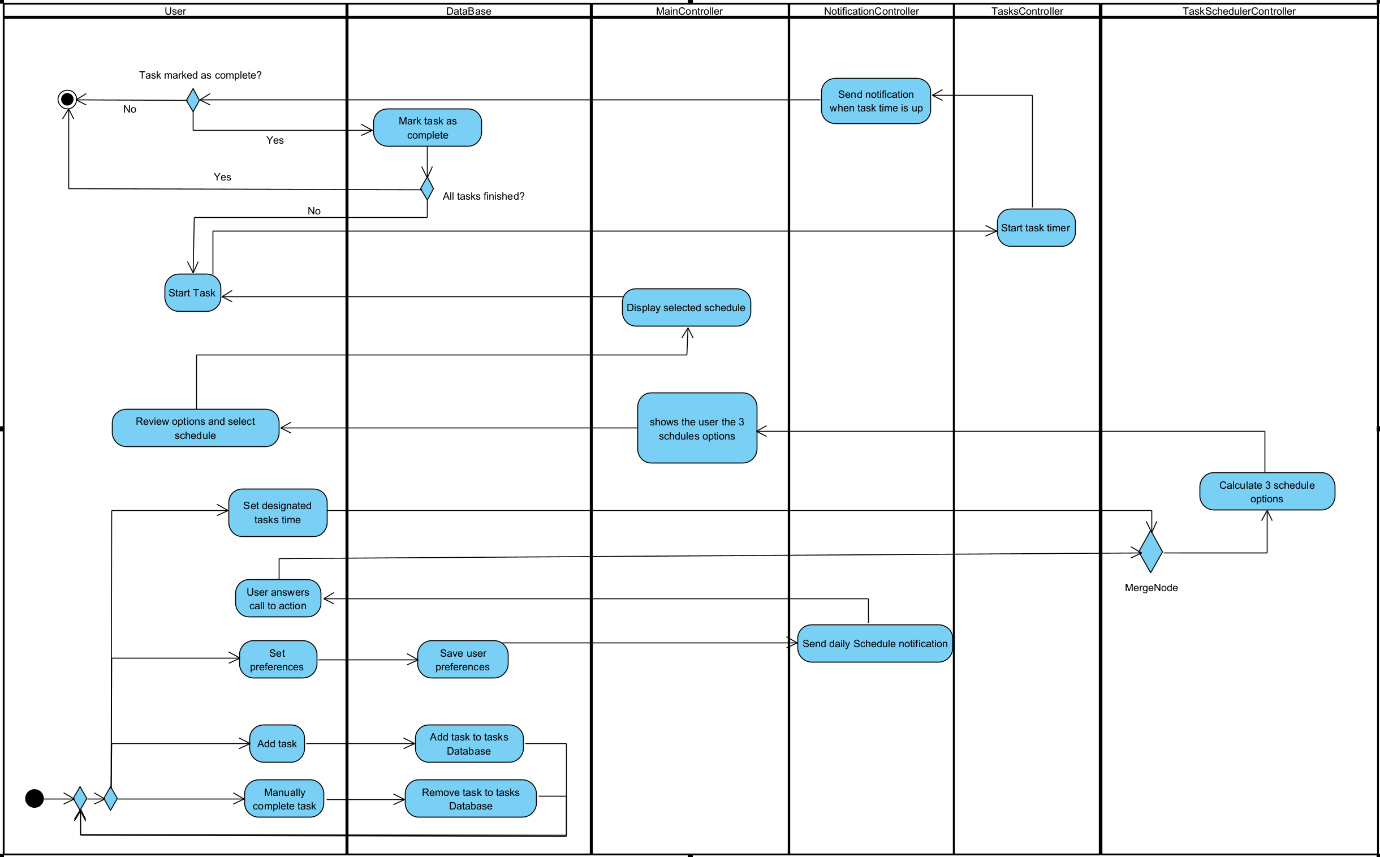
**Set Designated Tasks Time:**

Users define their available time for tasks, specifying when they are most productive or free. This use case includes the process of Selecting from 3 Schedule Options, where the app provides tailored task schedules based on user preferences.

**Answer Notification Call to Action:**

Users respond to notifications sent by the app, prompting them to begin tasks or take specific actions. This use case is linked to the Select from 3 Schedule Options use case, as notifications  guide the user to choose or update a schedule.

### Activity Diagram



The activity diagram illustrates the workflow of the ADHD time management application, highlighting the interactions between the User, Database, and various controllers within the system.

**Key Elements and Flow:**

**Start Point**: The process begins when the user interacts with the app, either by setting up tasks, preferences, or responding to notifications.

**Task Management**: The user can add a new task, which is stored in the Database via the MainController. If the user manually completes a task, it triggers an update to the Database, removing the task from the active list.

**Preferences and Schedule**: The user sets their designated task time (morning, afternoon, evening), preferences, and other configurations.  
These preferences are saved to the Database via the MainController.

**Daily Schedule Notification**: The NotificationController sends a daily reminder to the user, prompting them to review their tasks.  
The TaskSchedulerController calculates three task options based on the user’s free time and priorities.  
The MainController displays these options to the user, allowing them to select a schedule.

**Task Execution**:  
Once a schedule is selected, the user starts a task. The TaskController initializes a timer.  
When the task timer ends, the NotificationController sends a notification asking if the task is complete.  
If the user marks the task as complete, the MainController updates the status in the Database. If not, the task remains in the queue.

**Decision Points**:  
**"Task marked as complete?"**: This decision point determines whether the task should be marked as completed or left unfinished.  
**"All tasks finished?"**: This evaluates if the user has completed all the tasks in their schedule for the current session.

**User**: Interacts with the app by adding tasks, setting preferences, starting tasks, and marking tasks as complete.

**Database**: Stores tasks, preferences, and user configurations. It also removes completed tasks.

**MainController**: Handles communication between the user and the database, as well as displaying options and schedules.

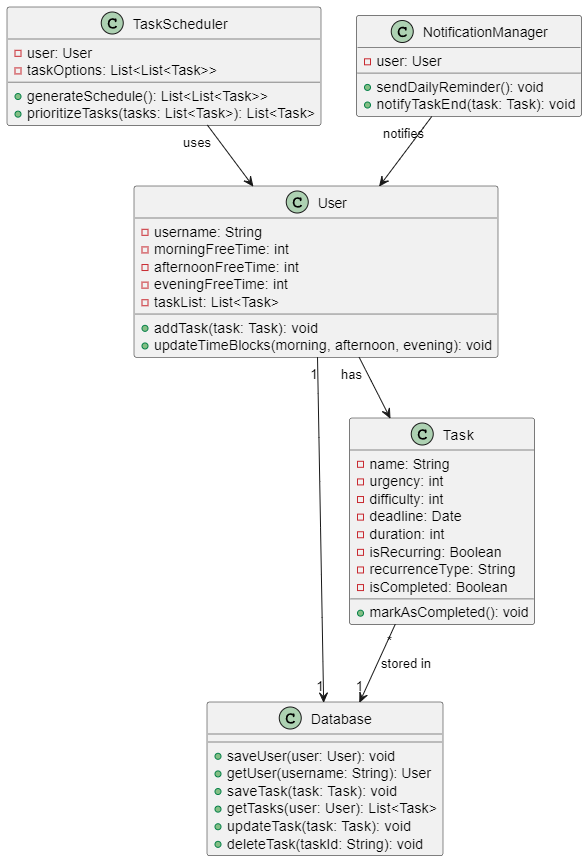
**NotificationController**: Sends reminders and notifications at the appropriate times.

**TaskSchedulerController**: Generates three task options based on user inputs and preferences.

**TaskController**: Manages task timers and transitions between tasks.

**End Points:** The process ends after a task is completed or removed, ensuring the app remains updated with the user's progress.

### Project Class & Data



### Task Score Algorithm Methodology

As part of our research and development process, we designed the Task Score Algorithm to address the unique challenges faced by users, particularly those with ADHD. This algorithm is an original concept, developed to ensure tasks are prioritized effectively based on a combination of urgency, cognitive effort, and timing. By tailoring the scoring system to individual needs, our goal is to provide a novel and user-centric approach to task management that is not currently available in existing solutions.

Urgency Quantification

Urgency plays a pivotal role in the prioritization process, contributing 45% of the total score. Tasks are assigned an urgency rating on a standardized scale from 1 to 5, with higher values indicating greater importance. This component ensures that tasks requiring immediate attention are appropriately prioritized.

Cognitive-Temporal Alignment

Cognitive-temporal alignment accounts for 35% of the total score, focusing on the compatibility of task difficulty with the user’s optimal execution timing. This component leverages user-specific factors, such as the MorningComplexFactor and EveningComplexFactor, which represent the user’s ability to handle complex tasks at different times of the day. Task difficulty (rated from 1 to 5) is multiplied by the relevant complexity factor. This mechanism adjusts scores positively for tasks that are well-timed and penalizes those that are not, ensuring alignment between the user’s cognitive capacity and task demands.

Deadline Proximity Assessment

The proximity of a task's deadline contributes 20% to the total score. Tasks receive more points as their deadlines draw near, reflecting the natural increase in urgency that occurs as completion time becomes limited. The exact score is calculated using the equation , where hoursUntilDeadline represents the number of hours remaining until the task is due. The decay constant of 0.01 is carefully chosen to ensure tasks due within 24 hours maintain high urgency scores, while tasks with more distant deadlines receive progressively lower scores. This approach helps teams prioritize time-sensitive work while maintaining a balanced view of upcoming tasks.

Score Normalization

To maintain consistency and comparability, the total score is normalized within a range of 0 to 100. This final step ensures that all tasks are evaluated on an equal scale, regardless of their individual characteristics or temporal context

### Task Allocation Algorithm Methodology

The Task Allocation Algorithm optimizes task scheduling by assigning tasks to specific time blocks while maximizing overall utility. The algorithm ensures that the user’s time is utilized effectively by considering both task priority and practical constraints.

**Initial Prioritization**

The algorithm begins by sorting tasks based on their Task Scores, calculated using the Task Score Algorithm. This preliminary sorting establishes a hierarchy, ensuring that the most critical tasks are given priority in the allocation process.

**Combinatorial Generation of Task Groupings**

The algorithm employs a combinatorial approach to generate all possible combinations of tasks that fit within the specified time block. Each combination adheres to constraints such as:

The duration of each task and the total time available within the block.

Potential task interdependencies to avoid conflicts.

A balance of task categories to maintain diversity within the schedule.

**Combination Evaluation**

Once combinations are generated, each grouping undergoes evaluation based on multiple criteria:

**Cumulative Task Score**: The sum of Task Scores for all tasks within the combination, reflecting the overall importance of the group.

**Time Utilization Efficiency**: The degree to which the time block is effectively utilized without exceeding its limits.

**Category Diversity Bonus**: A scoring adjustment that encourages a variety of task types within the block to reduce monotony.

**Task Quantity Optimization**: A preference for combinations that include a higher number of tasks, maximizing productivity.

**Optimization and Selection**

The algorithm evaluates all combinations using a multi-criteria scoring system. The combination with the highest cumulative score, efficient time utilization, and balanced task diversity is selected as the optimal schedule for the time block. This ensures that the user’s schedule is both effective and achievable, aligning with their goals and available time

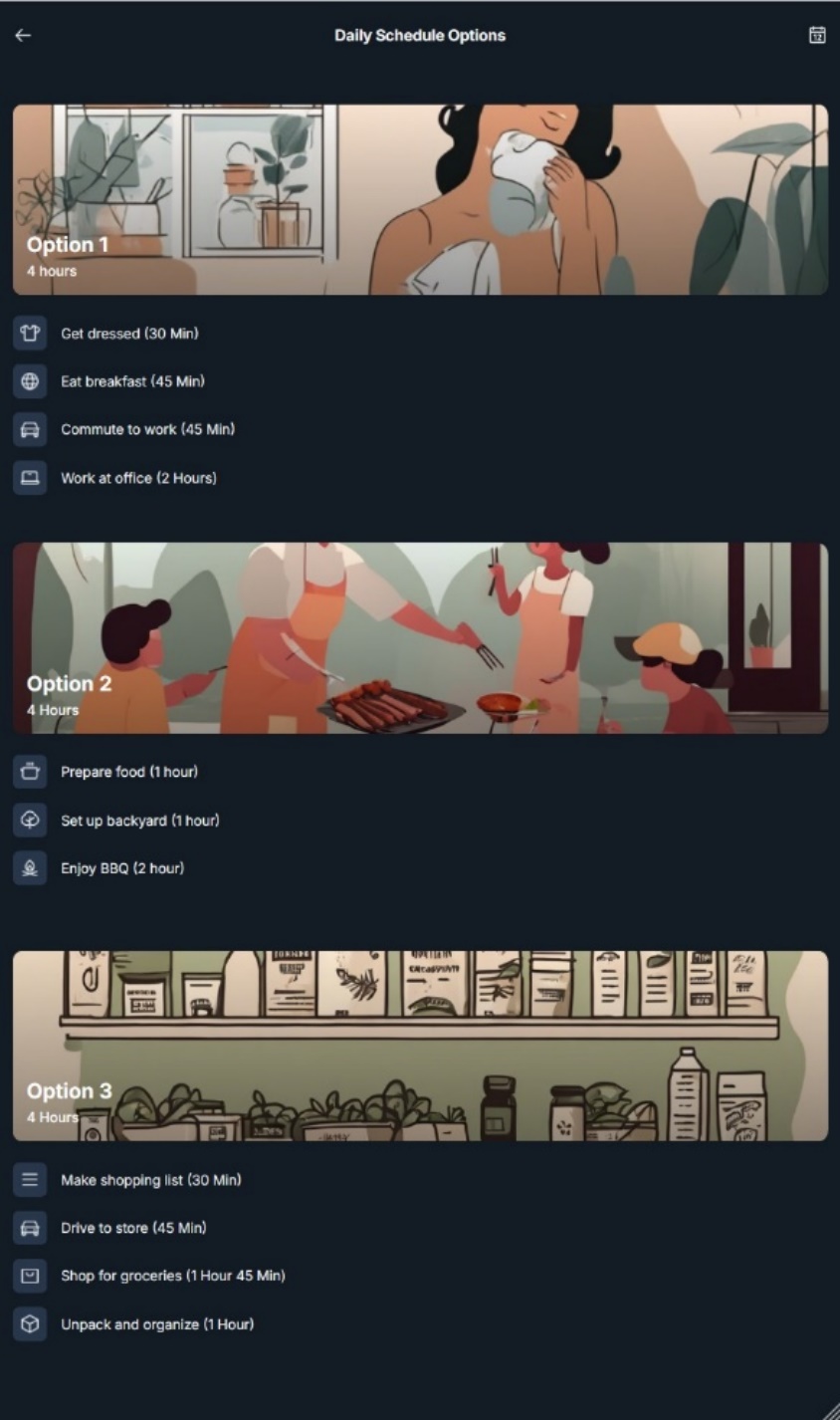
**Integrated Workflow**

This methodology produces multiple viable scheduling options, ranked by their overall effectiveness score, allowing for flexible implementation based on user preferences and contextual requirements.

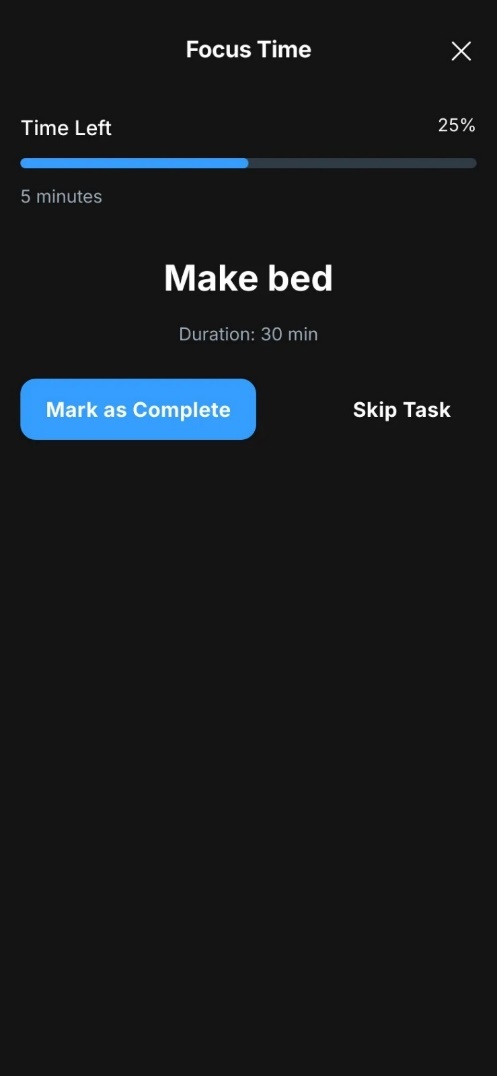
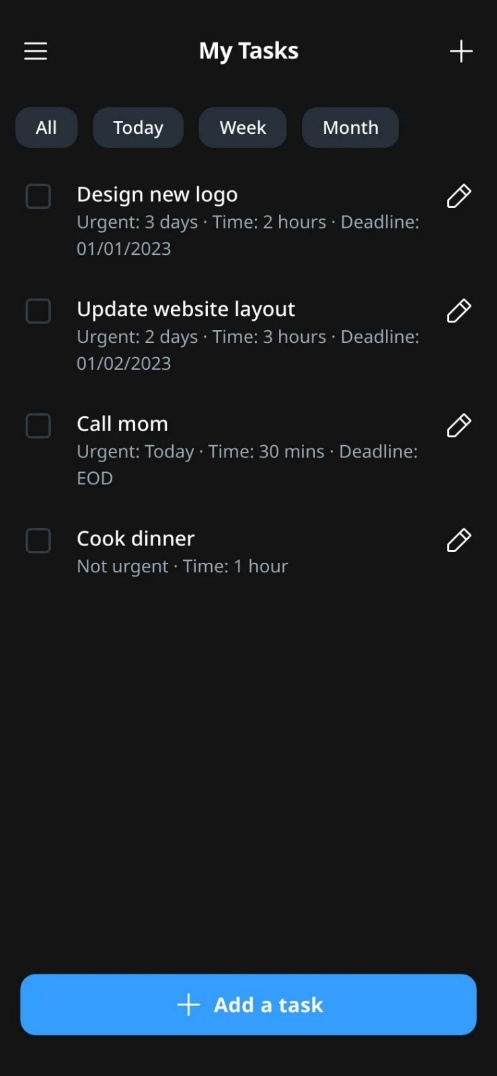
The combined implementation of these algorithms creates a sophisticated task management system that balances multiple competing priorities while maintaining user-specific preferences and constraints. The system's ability to generate multiple viable options rather than a single solution acknowledges the complexity of real-world scheduling and the importance of user agency in final decision-making.

This algorithmic approach draws from principles in operations research and cognitive psychology, particularly in its consideration of cognitive load distribution and temporal optimization. The implementation demonstrates particular sensitivity to the specific needs of individuals with ADHD, as evidenced by its incorporation of time-of-day cognitive factors and task complexity considerations.

### User Interface



* The screen presents three options for task lists within a specific time frame. Each option includes a curated set of tasks, designed to fit the available time based on the user's defined schedule. These tasks are carefully selected from a predefined backlog of tasks provided earlier.

A screenshot of a phone

Description automatically generated

* The left screen shows "My Tasks," which is the main dashboard where you can view all your tasks. It displays each task's priority, timing, and deadlines, with options to filter tasks by different time periods at the top.
* The middle screen is a "Focus Time" feature that helps you concentrate on completing a specific task - in this case making the bed. It includes a progress bar showing you have 5 minutes left (25% of the time remaining) out of a 30-minute duration.
* The right screen is for creating a "New Task" where you can set up all the details of your task. You can specify everything from the task name and how urgent it is, to how long it will take and whether it needs to repeat. It's essentially a form that lets you customize exactly how you want to track your new task.

### Requirements

**Functional Requirements:**

* The application must allow users to input tasks.
* The application will enable users to mark tasks as complete or leave them pending.
* The application must update the status of tasks and remove completed tasks from the active list.
* The application must calculate and present three task schedule options tailored to the user’s preferences.
* The application must prioritize tasks based on urgency, cognitive alignment, and deadline proximity.
* The application must send daily reminders prompting the user to review tasks and select a schedule.
* The application must allow users to set preferences.

**Non-Functional Requirements:**

* The tasks can be inserted with attributes such as name, urgency, difficulty, deadline, duration, and recurrence type (daily, weekly, or monthly).
* Preferences will be set for attributes such as notification times and their available time blocks.
* The system will be built with a modular and well-documented codebase to facilitate updates and future enhancements.
* The system must accommodate an increasing number of tasks or users as needed.
* The system must be compatible across multiple platforms and devices.
* The system will offer an ADHD-friendly interface with clear, intuitive navigation and features such as large buttons and readable fonts.
* The system will reduce cognitive load through visual aids.
* The system will generate schedules within a reasonable timeframe, even when managing a significant number of tasks.
* The system will ensure timely delivery of notifications and consistent saving and retrieval of task data.

# Verification plan

Our testing plan will focus on four primary components of the application: Task Management, Notification System, Schedule Generation, and User Interface (UI).

**Task Management:** We will conduct tests to ensure the accurate addition, editing, and deletion of tasks, including attributes like urgency, difficulty, recurrence, and deadlines. These tests will be carried out manually through user interactions in the application and validated against the Firebase database.

**Notification System:** The notification functionality will be evaluated to verify that reminders are sent at the correct times and include accurate task details. These tests will utilize both manual interaction and Firebase Cloud Messaging (FCM) simulation.

**Schedule Generation:** We will assess the schedule generation algorithm to confirm that it creates three distinct task schedules based on user preferences, free time, and task prioritization. The evaluation will involve testing various scenarios and ensuring the generated schedules adhere to user-defined constraints.

**User Interface (UI):** The UI will be tested for accessibility, responsiveness, and smooth navigation across screens. We will use manual testing and automation tools to validate proper screen transitions, error handling, and data input functionality.

These tests will ensure that all critical components of the application work seamlessly and provide a user-friendly experience. If necessary, adjustments will be made based on the results to enhance the system's reliability and usability.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **Test ID** | | |  | | --- | | **Module** | | |  | | --- | | **Tested Function** | | |  | | --- | | **Expected Result** | |
| 1 | Task input | Add a new task with all attributes (name, urgency, difficulty, etc.) | Task is successfully saved in the database. |
| 2 | Task input | Set recurrence (daily, weekly, monthly) | Task recurrence is saved correctly and displayed. |
| 3 | Schedule Generator | Generate 3 task schedule options based on user input | Three distinct schedules are displayed to the user. |
| 4 | Notification Manager | Send a daily schedule notification | User receives a notification at the scheduled time. |
| 5 | Notification Manager | Notify user at the end of a task timer | User receives a notification to confirm task completion. |
| 6 | Task Manager | |  | | --- | | Mark a task as complete |  |  | | --- | |  | | |  | | --- | |  |   Task status is updated in the database. |
| 7 | Task Manager | |  | | --- | | Edit task attributes (e.g., name, urgency, deadline) |  |  | | --- | |  | | Updated task information is saved in the database. |
| 8 | Task Manager | Filter tasks by urgency and deadline   |  | | --- | |  | | Filtered task list is displayed correctly. |
| 9 | Task Timer | |  | | --- | | Start and track a task timer |  |  | | --- | |  | | Timer begins and counts down correctly. |
| 10 | Database Integration | |  | | --- | | Save and retrieve tasks from Firebase |  |  | | --- | |  | | Task data is stored and retrieved without errors. |
| 11 | UI/UX | |  | | --- | | Navigate between screens |  |  | | --- | |  | | User transitions smoothly between app screens. |
| 12 | Task Input | User tries to add a task without providing a name | Error message: "Task name is required" appears, and the task is not saved. |
| 13 | Task Input | User tries to set a task duration with an invalid value (e.g., negative or non-numeric) | Error message: "Invalid duration. Please enter a positive number." appears, and the task is not saved. |
| 14 | Notification Manager | User does not allow notification permissions | Error message: "Notifications are disabled. Please enable them in settings for reminders to work." is displayed. |

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# Appendix

## Interview with Itamar and Lee

**אופיר" :** היי איתמר, תודה רבה שאתה משתתף בשיחה הזו! אנחנו עובדים על אפליקציה בשם BrainBuddy שמיועדת לעזור לאנשים עם ADHD לנהל את הזמן והמשימות שלהם בצורה טובה יותר. אשמח לשמוע ממך על החוויות שלך ומה הכי עוזר או מקשה עליך ביום-יום."

**איתמר:** "בכיף, אני שמח לעזור. זה נושא שקרוב אליי."

**אופיר":** אז ספר לי קצת על איך ADHD משפיע על היומיום שלך. מה הדברים שהכי מאתגרים אותך?"

**איתמר":** זה בעיקר חוסר ריכוז ופיזור דעת. לפעמים אני מתחיל משהו ושוכח שאני באמצע, או שמתחיל הרבה דברים בבת אחת ולא מסיים כלום."

**אופיר":** איך אתה מתמודד עם ניהול משימות? יש לך שיטה או כלי שאתה משתמש בהם? ואם כן, מה עובד לך ומה פחות?"

**איתמר:** "אני משתמש ברשימות לפעמים, אבל זה לא תמיד עוזר. אם אני לא רואה את זה מול העיניים באותו רגע, זה פשוט נשכח."

**אופיר":** אני רוצה להבין יותר לעומק את הקשיים שאתה חווה. למשל, מה הכי קשה לך לעשות: להתחיל משימות, להתרכז באמצע, או לסיים אותן?"

**איתמר:** "התחלה זה הכי קשה. אני יושב ומרגיש שהכל מבלבל אותי ולא יודע מאיפה להתחיל. ואם כבר התחלתי, קשה לי להחזיק ריכוז לאורך זמן."

**אופיר:** " ומה לגבי דברים כמו לזכור פגישות או תאריכים חשובים?"

**איתמר:** "זה סיוט. אם אין לי תזכורות, אני פשוט לא זוכר."

**אופיר":** איך אתה מתמודד עם עמידה בזמנים? נגיד, להגיע בזמן לפגישות או לעמוד בדדליינים?"

**איתמר":** אני תמיד מאחר או עושה דברים ברגע האחרון. זה כאילו אני צריך את הלחץ הזה כדי להתחיל לפעול."

**אופיר":** כמה משפיעים עליך דברים כמו רעש או גירויים חיצוניים כשאתה מנסה לעבוד?"

**איתמר":** זה משגע אותי. אם יש רעש או יותר מדי דברים מסביב, אני פשוט לא יכול להתרכז."

**אופיר":** איך אתה שומר על סדר, אם בכלל? נגיד, שולחן עבודה או לוח זמנים?"

**איתמר:** " הכול אצלי מבולגן. אני מנסה לסדר, אבל זה מחזיק אולי יום ואז חוזר להיות בלגן."

**אופיר:** "אז אם נחזור רגע לאפליקציה שלנו – היא נועדה לעזור עם דברים כמו דירוג משימות, תזכורות מותאמות אישית ולוחות זמנים דינמיים. נשמע כמו משהו שיכול לעזור לך?"

**איתמר:** "כן, אם זה יכול לעשות סדר ולתעדף בשבילי מה חשוב, זה יהיה מעולה."

**אופיר:** "כמה חשוב לך שהאפליקציה תהיה מותאמת אישית? נגיד, לבחור מתי אתה הכי פרודוקטיבי או לקבל תזכורות שמתאימות לך?"

**איתמר":** זה קריטי. אם התזכורות לא מגיעות בזמן שנוח לי, הן פשוט לא יעזרו."

**אופיר:** "ומה עם העיצוב? אתה מעדיף אפליקציה מינימליסטית או מפורטת?"

**איתמר:** "מינימליסטית. משהו פשוט ובלי יותר מדי עומס."

**אופיר:** "אם היית יכול לנסות את BrainBuddy עכשיו, מה הדבר הראשון שהיית רוצה לבדוק?"

**איתמר:** "איך זה מדרג משימות ואיך זה מזכיר לי דברים. אני רוצה לדעת שזה באמת עוזר לי להתרכז."

**אופיר:** "יש עוד משהו שחשוב לך כשמדובר באפליקציה לניהול זמן?"

**איתמר":** כן, שהכול יהיה נגיש ושאני לא אתקע באמצע בגלל שזה מסובך."

**אופיר":** תודה רבה לך על הזמן והשיתוף. הדברים שאמרת ממש עוזרים לנו להבין איך לשפר את BrainBuddy ולהתאים אותה לאנשים עם ADHD. אנחנו נשמח לעדכן אותך בהתקדמות!"

**איתמר:** "בשמחה, תודה לכם!"

**אלון:** "היי לי, תודה רבה שהקדשת זמן לדבר איתי! אנחנו מפתחים אפליקציה בשם BrainBuddy שמטרתה לעזור לאנשים עם ADHD לנהל את המשימות והזמן שלהם בצורה טובה יותר. אשמח לשמוע קצת על החוויות שלך ומה יכול לעזור לך."

**לי**" **:**בכיף!."

**אלון: "**אז תספרי לי, מה הדבר שהכי מאתגר אותך בהתמודדות עם ADHD ביום-יום?"

**לי:** "אני חושבת שהכי קשה לי זה פשוט לזכור הכול. יש לי רשימות, תזכורות, ואני עדיין מוצאת את עצמי שוכחת דברים חשובים."

**אלון"** :איך את מרגישה שזה משפיע על היכולת שלך לעבוד או ללמוד? נגיד, כשאת צריכה לשבת ולבצע משימות מורכבות."

**לי":** זה ממש קשה לי. אני מתחילה להתעסק בדברים לא קשורים, כאילו כל רעש קטן מסיח את דעתי. לפעמים אני פשוט לא מצליחה להתחיל בכלל."

**אלון":** כשאת כן מצליחה להתחיל משימה, איך את מרגישה לגבי סיום שלה? יש אתגר גם בזה?"

**לי:** "כן, בהחלט. אני מתעייפת מהר ומתחילה להרגיש שהמשימה לא נגמרת לעולם. זה פשוט גורם לי לדחות את ההמשך שוב ושוב."

**אלון:** "מה לגבי דברים שאת צריכה לעשות כל יום, כמו מטלות בית או שגרת בוקר? את מרגישה שקשה לך להתמיד בשגרה מסוימת?"

**לי ":** מאוד. אני מנסה כל פעם לבנות לעצמי שגרה, אבל זה מחזיק מעמד אולי יומיים ואז אני חוזרת לבלגן."

**אלון:** "תספרי לי קצת על חוויות שלך עם אפליקציות או כלים אחרים שניסית בעבר לניהול זמן. מה עבד ומה פחות?"

**לי:** "האמת, ניסיתי כל מיני אפליקציות כמו רשימות ותזכורות, אבל לרוב הן מסובכות מדי או שהן שולחות לי יותר מדי התראות ואני פשוט מתעלמת מהן."

**אלון:** "מה היית רוצה לראות באפליקציה שתהיה שונה? נגיד, משהו שיכול באמת לעזור לך להתמיד ולשפר את הניהול שלך."

**לי:** "אני חושבת שמשהו שיגיד לי בדיוק מה לעשות, בזמן הנכון. לא יותר מדי אופציות, רק מה שדחוף ומה שאני מסוגלת לעשות עכשיו."

**אלון:** "כמה חשוב לך שהאפליקציה תהיה גמישה ותתאים את עצמה למצב רוח שלך או לזמנים ביום שאת מרגישה יותר פרודוקטיבית?"

**לי":** זה ממש חשוב. בבוקר אני הרבה יותר מרוכזת, אבל אחרי הצהריים זה כמעט בלתי אפשרי בשבילי לעשות דברים."

**אלון:** "האם יש דברים שאת מרגישה שיכולים לעזור לך להתרכז יותר? נגיד, תזכורות בצורה מסוימת או עיצוב מיוחד?"

**לי:** "כן, אני חושבת שתזכורות עם תמונות או צבעים ברורים יכולות לעזור לי יותר מטקסט רגיל. וגם חשוב לי שהכול יהיה מסודר בצורה ברורה ומינימליסטית."

**אלון:** "אם היית יכולה להשתמש ב-BrainBuddy עכשיו, איזה סוג משימה היית רוצה לנסות להכניס קודם?"

**לי:** "משהו פשוט, כמו להכניס תזכורת לקחת תרופה או לסדר את השולחן שלי. אני רוצה לראות שזה באמת עוזר לי לזכור ולעשות את זה."

**אלון: "**יש עוד משהו שחשוב לך כשמדובר באפליקציה כזו?"

**לי":** אני חושבת שזה חשוב שהיא תהיה כיפית ולא תרגיש כמו עוד מטלה. אולי להוסיף איזשהו פידבק חיובי אחרי שמסיימים משימה."

**אלון":** זה רעיון מעולה! תודה רבה לך על השיתוף והזמן שלך. זה ממש עוזר לנו להבין איך לשפר את BrainBuddy ולהפוך אותה למשהו שבאמת יעזור."

**לי**: "בשמחה!"