NOVA SCHOOL OF
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Dot1: An Approach to Innovate Type 1 Diabetes Management

Esther Charlotte Klausmann: Strategic Positioning and Recommendations for a Future Marketing Campaign

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Abstract

This master's thesis presents an initial effort to address Type 1 Diabetes management challenges by integrating medical, psychosocial, and technical perspectives. Utilizing qualitative and quantitative research methods alongside a proof-of-concept approach, the study identifies key gaps in patient needs and existing management strategies. Predictive models were developed to provide personalized recommendations for self-management accompanied by a preliminary marketing strategy for future market entry. Findings highlight the need for innovative, user-centric solutions and accentuate extensive regulatory and ethical considerations. This serves as a foundational step in improving patient's quality of life necessitating further research and development for practical application.

Keywords: Type 1 Diabetes Management; Digital health innovation; Proof of concept; Business Model; Strategic Positioning; Healthcare Innovation; User-centric Design; Ecosystem Integration; Actionable Recommendations; Patient Innovation; Marketing Strategy

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Outline

List of Abbreviations

Type 1 Diabetes	T1D
Type 2 Diabetes	T2D
Continuous Glucose Monitor	CGM
Health-Related Quality of Life	HRQoL
Hemoglobin A1c value	HbA1c
Type 1	T1
Type 2	T2
Medical Device Regulation	MDR
Artificial Intelligence	AI
Serviceable Addressable Market	SAM
Compound Annual Growth Rate	CAGR
User-Generated Content	UGC
Engagement Rate	ER
Health Insurance Portability and Accountability Act	HIPAA
General Data Protection Regulation	GDPR
International Organisation for Standardization	ISO
Conformité Européenne	CE
Data Protection Impact Assessment	DPIA
Gross Domestic Product	GDP
SHapley Additive exPlanations	SHAP
Uniform Manifold Approximation and Projection	UMAP
Minimum Viable Product	MVP
Key Performance Indicators	KPI
Cost per Mill	CPM
Application Programming Interface	API
Segmentation Targeting Positioning	STP
Questions and Answers	Q&A

1 Introduction

When Esther Klausmann and Justin Deisler teamed up, they already shared a clear vision: to make a meaningful impact in the healthcare system. Justin's personal journey with Type 1 Diabetes (T1D), diagnosed at age 14, became the foundation of their project. For the past eight years, he has managed his condition with a Continuous Glucose Monitor (CGM), which eased the process but revealed untapped potential. This patient-centered innovation initiative is driven by Justin's firsthand insights and their shared determination to create change.

This approach reflects only the current stage of development, as full validation and process optimization require a multi-year effort. For our product, it is essential to meet certain regulatory requirements, such as data security and medical trials. At this stage, the primary focus is on validating the problem, understanding the market demand, and designing a potential solution. Testing its functionality and measuring its impact will follow in subsequent phases, which will require significant capital investment and additional funding.

The process emphasizes problem validation and identifying the necessary steps to address the target issue effectively.

2 Problem Analysis

Four different main issues were identified. The most critical aspect is that diabetics often experience **blood sugar fluctuations**, which significantly impact their quality of life and both their physiological and psychological well-being (Ashraf, Cheng and Robinson, 2024, pp. 1–4). As a result, they require frequent medical check-ups, typically every three months. However, these appointments are often **constrained by limited consultation times**, which usually leads to inadequate treatment (von dem Knesebeck *et al.*, 2019, pp. 1–2). Additionally, the systematic neglect of women in medical research, often referred to as the "Yentl Syndrome" (Healy, 1991), highlights the **disregard for gender-specific aspects** of diseases, such as the effects of hormonal cycles on certain conditions. This oversight is particularly significant for diabetes, where gender-related differences play a crucial role. As emphasized by Healy (1991), this

phenomenon underscores that women are at a greater risk of receiving suboptimal treatment due to insufficient data. Finally, it is essential to note that beyond health-related challenges, diabetes represents a significant **economic burden worldwide**, affecting global healthcare systems (Voeltz *et al.*, 2024a, pp. 1–12). Diabetes mellitus is differentiated into type 1 (T1) and type 2 (T2) and is considered one of the most common diseases worldwide, with an estimated prevalence of around 537 million people in 2021, which is expected to rise to 783 million by 2045 (Magliano and Boyko, 2021, pp. 15–18). Specifically for T1D, an alarming increase to 17.4 million is expected (Magliano and Boyko, 2021, pp. 25–30), which accounts for 5-10% of all cases. It often affects young people, requiring insulin therapy and constant blood glucose control (McGill *et al.*, 2024, pp. 1085–1098). This type is an autoimmune disease characterized by pancreatic dysfunction, leading to a lack of insulin production and inadequate utilization, which requires life-long continuous tracking of blood glucose levels and insulin therapy. While T2 is a metabolic disorder where insulin therapy only becomes necessary in cases of bad management (Yeh, Yeung and Mendelsohn Curanaj, 2021, pp. 1–9). Treatment of T1D is intensive, and studies show that 58-60% of patients require usually four or more injections per day. Research shows that up to 88% of patients need to monitor their blood glucose levels comprehensively using CGMs or other methods (Subramanian, Khan and Hirsch, 2024, pp. 1–5). This close management is critical to maintaining glycemic control and avoiding associated complications. According to scientific evidence, more than 60% of people regularly experience complications due to **low blood glucose levels**, while more than 95% struggle with **high blood glucose levels**. Problematic glycemic control was demonstrated in a cross-sectional study of 92 affected adolescents with frequent episodes of hypoglycemia and hyperglycemia, with 81.5% failing to achieve normal hemoglobin levels (Souza *et al.*, 2019, pp. 1–8). The study also points to the lowest Health Related Quality of Life (HRQoL) in the region and addresses the impact of the disease on daily life. This confirms the urgent need for more comprehensive support and

intervention strategies. Incorrect disease management can lead to long-term consequences such as cardiovascular disease, diabetic retinopathy, nephropathy, nerve disorders, and diabetic foot (Yang *et al.*, 2024, pp. 1–15). The disease also has significant psychological effects, including depression and anxiety, which harm hormone balance (Kautzky *et al.*, 2022, pp. 130–140) and further deteriorate the quality of life in the long term (Jacobson, Groot and Samson, 1997, pp. 130–140). T1D manifests quickly with symptoms such as constant thirst (polydipsia), increased urination (polyuria), unexplained weight loss, fatigue, and a characteristic sweet breath (Inzucchi, 2012, pp. S81–S90). These symptoms usually occur suddenly and clearly and signal that the body can no longer produce insulin. Due to structural problems within the healthcare system and excessive workloads, doctors currently have little time for their patients (Kajaria-Montag, Freeman and Scholtes, 2024, pp. 12–15).

A 2024 study investigates the anticipated per capita expenditure of T1 on patients versus non-diabetic individuals from 2010 to 2040. In 2010, T1 patients had per capita costs amounting to €4,285 for men and €4,889 for women. Non-diabetic men incurred per capita costs of €2,360, while non-diabetic women faced costs of €2,316. In 2040, for T1 patients in Germany, the estimated annual per capita costs were predicted to be 2.8 times higher for men and 3.2 times higher for women. Due to limited data, precise projections for per capita expenditures of non-diabetic individuals in 2040 are not available (Voeltz *et al.*, 2024b, pp. 1–12). However, based on OECD reports on healthcare spending trends, an annual growth rate of 3–5% is assumed, driven by factors such as inflation, demographic shifts, and advancements in medical technology (OECD, 2021, p. 11). In 2010, total costs exceeded €1 billion and could reach €2 to €4 billion by 2040. Germany was chosen as an example since it had the highest healthcare expenditure relative to its Gross Domestic Product (10.4% of GDP) in 2022 (Eurostat, 2024).

Alongside short-term healthcare expenses, both types incur significant long-term costs from complications like retinopathy, kidney failure, diabetic foot, and cardiovascular diseases. This

emphasizes the importance of prevention and treatment for individual well-being and the sustainable management of health resources in the future (Zhuo *et al.*, 2014, pp. 2557–2564).

2.1 Stakeholder Analysis

To further explore and address the problems outlined in the previous section, a total of eight stakeholders have been identified: **patients, doctors (endocrinologists), data scientists, medical and public regulatory experts (such as lawyers), health insurers, healthcare technology providers, official diabetes associations, and marketing experts**.

Most important are patients, as their needs must be identified precisely while they expect a credible and user-friendly solution in return. Doctors are considered equally important, especially endocrinologists, whose valuable input forms the basis for correct data analysis. In addition, they maintain direct contact with patients and can assess how communication can be improved. To ensure high quality in the development and application of advanced analytical tools, data scientists play an inevitable role. Their expertise in processing complex data sets and developing predictive models is crucial. To successfully bring the product to market, it is essential to engage experts in medical device classification and lawyers who help to comply with ongoing regulatory changes and regional nuances. Moreover, profitability hinges on fostering close collaboration with health insurers and healthcare technology providers to enhance affordability and distribution. Diabetes associations also play a critical role, not only by providing insights into the latest advancements in diabetes research but also by offering direct access to patient communities. To spread the solution, marketers offer a unique perspective on public communication and can support community building, educational efforts, and the promotion of broader awareness of diabetes-related initiatives. In addition to the outlined contributors, additional groups, such as policymakers, public health organizations, educational and research institutions, pharmaceutical companies, caregivers and family members, as well as private insurance companies and potential investors, may play a significant role in the future development and scalability of the project (Appendix 1).

2.2 Hypotheses

Building on previously identified insights gained from the stakeholder analysis and the literature revision conducted earlier, this section formulates key hypotheses (Table 1) that will guide the development and testing of the approach.

H1	H2	H3
There is a large enough demand for T1D mobile health applications. This belief will be confirmed if patients' desires for these mobile applications are expressed through the conducted methods.	Advanced data infrastructure systems with AI models will improve the individualized care of diabetic patients and the diagnostic accuracy of healthcare providers. This hypothesis is confirmed when patients report lower fluctuations in blood glucose levels using DOT1 and physicians show higher efficiency in diagnostics.	There is a demand for gender-specific feature integration and consideration of emotional states in health applications. This belief holds true when supported by the findings of the conducted research efforts.

Table 1: Hypotheses

3 Methodology

3.1 Affinity Map and Clustering of Ideas

During the early stages of the research process, a brainstorming session laid the groundwork for idea generation and how the solution could address all defined contextual problems. The identified key areas were medical factors, target group, competitor and patient challenges, regulatory trends, trends in T1D, market forces, macroeconomic forces, and industry forces. (Appendix 2).

3.2 Explorative Validation

The combination of Google search trends, discussion forums, and the "BeyondType1" app was chosen for **H3** due to their complementary strengths in exploring the emotional and gender-specific dimensions of diabetes management. Search trends provide a quantitative approach to identifying patient-driven demand for information on psychological and gender-specific health challenges. They use values from 0 to 100, where 100 represents the peak popularity of the search term within the selected region and timeframe, with all other values relative to this peak. To ensure relevance for the target market, these trends were systematically categorized into international trends (Appendix 3.1) and Germany-specific trends (Appendix 3.2). With over 10.000 downloads and a high user rating of 4.6 out of 5 (Google Play Store 2024),

BeyondType1 was analyzed as one of the leading social networks for the diabetes community (Appendix 4.1). Similarly, Facebook Discussion forums (Appendix 4.2) offer a qualitative lens, capturing authentic patient experiences by revealing lived experiences of stress, burnout, and gender-specific challenges, such as hormonal fluctuations or barriers in care.

3.3 Interviews

The interviews aimed to validate initial hypotheses, identify gaps in diabetes management solutions, and gather expert recommendations for Artificial intelligence (AI) based personalized interventions, with 12 questions covering current disease management, personal experiences, and tech-affinity (Appendix 5). In total, eighteen semi-structured interviews were conducted consisting of two primary groups: seven patients with T1D who actively used CGMs and eight experts (medical classification, regulatory professionals (law), data security, nutrition, endocrinologist, AI researcher, social media). The scripts were tailored to each expert, comprising a total of 10 to 15 questions (Appendix 6) with a duration between 45 to 60 minutes. “MS Teams” was the channel used with respective audio recordings of each session to ensure transcripts were subsequently created for analysis. A Miro board and Excel table (Appendix 7) were employed to obtain a comprehensive overview of observations and conclusions from the patient interviews. The outcomes of the expert interviews were summarized individually (Appendix 8).

3.4 Survey

In total, two surveys were conducted, with the only participation requirement being a T1D patient. Both were distributed through social media platforms (e.g., Instagram) and discussion forums (e.g., Beyond Type 1). The first one contained 27 questions in total (see Appendix 9). Current disease management, self-education, lifestyle factors, doctor-patient relationships, customization, and financial impact represented the six main topics covered by the questions.

In the second survey, a total of 48 questions were asked (Appendix 10). These questions were organized to address key areas of T1D management, integrated into six main themes. The

themes included demographic data, current diabetes management practices, challenges, perceived blood glucose variability, personal use of diabetes management tools, financial and insurance support. Lastly, participants were asked for additional feedback.

3.5 Data Analysis (Individual Part from Justin Deisler))

The AI models and algorithms were tested by creating a synthetic dataset based on expert-recommended values to ensure the predictions were accurate and reliable. The synthetic data was generated for 500 hypothetical patients, capturing 35 key factors, using "ChatGPT 4o" (ChatGPT, 2024). Missing values were intentionally introduced to replicate real-world scenarios and addressed through mean value imputation using Python, a method commonly recommended for its simplicity and efficiency in handling missing data (Little and Rubin, 2019, pp. 82–110). Following data preparation, a correlation matrix was employed as a standard method for analyzing inter-variable relationships in healthcare datasets, as described by Mukaka (2012, pp. 94–95). Clustering analysis was performed to group patients based on similar management patterns. The elbow method, a widely accepted technique for determining the optimal number of clusters, was utilized to identify meaningful groupings (Kashwan and Velu, 2013, pp. 3–5). Dimensionality reduction and visualization were achieved through the Uniform Manifold Approximation and Projection algorithm (UMAP) (McInnes, Healy and Melville, 2020, pp. 6–14), which has been validated as a robust tool for uncovering high-dimensional data structures and ensuring interpretable visualizations. UMAP parameters were tuned to balance the representation of local and global data structures, ensuring well-defined clusters. Building on these clusters, machine-learning models were developed to address specific aspects of diabetes management. A Random Forest Regressor was implemented to predict outcomes based on input variables. This algorithm was chosen for its robustness and ability to handle non-linear relationships (Hastie, Tibshirani and Friedman, 2017, pp. 587–603). Additionally, Gradient Boosting algorithms, including XGBoost and LightGBM, were employed to create a recommendation system for personalized activities. These algorithms are

recognized for their effectiveness in handling complex feature interactions and providing high accuracy, as detailed by (Ke *et al.*, 2017, pp. 3146–3154). Cross-validation and hyperparameter tuning were integral to optimizing the models' performance (Johnson, 2019, pp. 192–215).

4 Research Insights

4.1 Desk Research

Over 75 searches for "female hormones blood sugar effects" in the past year showed a constant demand for information on female hormones and blood sugar control. The community's awareness of mental health issues increased, with terms like "diabetes and depression," "Diabetes Burnout," and "anxiety management in T1D" fluctuating strongly, averaging 25 in the past year. In our survey, 35.7% preferred social media to learn about their disease, while 46.4% preferred internet forums. In an optional question, 27 of 56 respondents answered, with 25.93% naming the "BeyondType1" app as their main T1D resource. These findings led us to investigate Facebook groups and the Beyond Type1 app for patient engagement and information-seeking.

The largest T1D Facebook group, "Type 1 Diabetes Support Group (The One and Only Original)," has 80.761 members and 10+ daily posts, indicating a need for management support, mental support, and community. The findings suggest gender-specific and psychological diabetes solutions are needed.

4.2 Interviews

In total, five out of seven interviewed patients were female. As summarized in Figure 1, the most pressing concerns included emotional and **psychological factors (85.7%), educational gaps (85.7%),** and **technological needs (85.7%).** Other notable issues were **lifestyle shifts (71.4%), emergency situations (42.9%),** and **financial barriers (28.6%).**

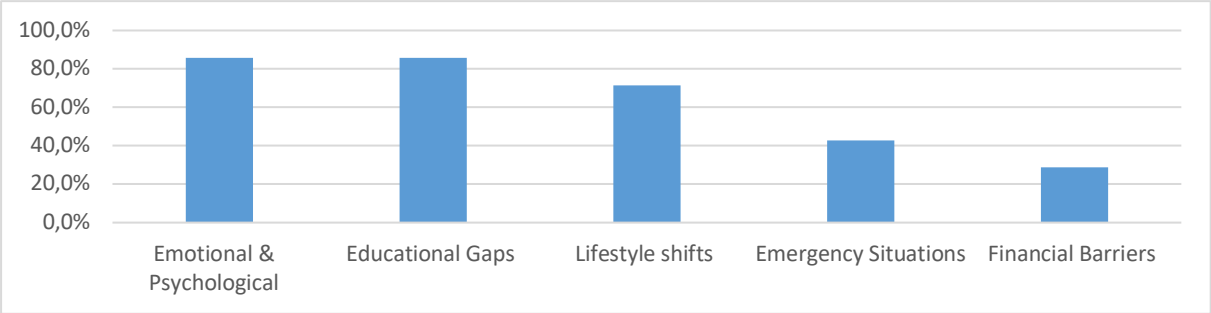

Figure 1: Main Challenges (in % of Participants)

Emotional and psychological challenges were significant. Over half (57.1%) of participants reported ongoing mental health issues like stress and anxiety. Furthermore, 42.9% highlighted the need for community support to alleviate isolation, but found a lack of resources for meaningful connections. One patient noted: "The hardest part for me was accepting the disease. Without a supportive community, you often feel alone with daily challenges, making it emotionally overwhelming" (Appendix 7). Suggested improvements included integrating forums, podcasts, and social-sharing features to diabetes management apps community-building.

Educational gaps were evident among female participants. All reported blood sugar fluctuations during menstruation, similar to those during infections. Two patients were concerned about managing diabetes in future pregnancies, while one noted the lack of guidance on sexual health. These findings indicate insufficient, gender-specific education on long-term and hormonal challenges T1D.

Technological limitations hindered diabetes management. While all participants relied on CGM systems, like Freestyle Libre and Dexcom, 85.7% reported unmet needs in diabetes apps. They highlighted missing features for tracking menstrual cycles, analyzing meal impacts, and identifying behavioral patterns affecting blood sugar. While 71.4% of patients used insulin pumps and tracking apps, only 14.3% used additional tools for carbohydrate counting or activity monitoring, indicating a need for more integrated, user-centered technology solutions. Furthermore, three participants (42,8%) shared that they only learned to respond to severe

episodes, such as numbness in the legs or an inability to eat, after experiencing them firsthand. Participants expressed concerns about lifestyle adjustments, seeking clear strategies on how daily habits affect blood sugar. They desired practical guidance on diet, exercise, and routines for better health. While some appreciated feedback from healthcare professionals, most preferred managing their health autonomously through personalized app features needs.

Financial barriers complicated T1D management. Patients from Brazil and Lebanon noted limited healthcare access. Furthermore, 42.9% of US participants faced insurance challenges, highlighting systemic inequities in healthcare access.

The first experts interviewed were Irina Lopes, specializing in medical and regulatory affairs, and Lucia Domingues, coordinator of Nova Clinical Research Unit (Appendix 8.1). They were asked about medical classification steps and primarily asserted the product's category must be clearly defined. Both noted that Class 2a status under the Medical Device Regulation (MDR) requires documentation, clinical trials, and International Organization for Standardization (ISO) compliance, implying performing regular checks (audits). They suggested starting as a lifestyle or Class 1 device to gather data before upgrading. Originating in Europe and following its conservative regulations, makes it easier to expand into other markets, so claim the experts. In this context, MDR for Europe and General Data Protection Regulation (GDPR) for privacy were the most important baselines. They explained that the MDR sets rigorous standards for medical device safety, efficacy, and post-market monitoring, protecting patients and ensuring product reliability in Europe. To protect personal data, the GDPR requires clear user consent, collecting relevant data, and keeping it secure. Strictly following GDPR helps build trust and allows legal use of the data in the market.

Furthermore, the product should meet EU standard 2024/1689, which prioritizes data accuracy, reliability, and ethics, as AI regulations are rapidly evolving (European Union, 2024b). Achieving Class 2a status typically requires at least two years and can incur costs of up to

700.000€. However, they recommended, that these expenses may be mitigated through strategic partnerships with academic institutions and manufacturers such as Dexcom or Abbott. Clinical trial studies with larger sample sizes and ethical approvals are needed to validate the solution's functionality, safety, and market entry. All things considered, starting as a lifestyle or Class 1 device allows startups to collect data in a cheaper way before moving to Class 2a (Appendix 8.1). Given the meticulous nature of initial regulatory steps, interviewees recommended working with medical device organizations like "MedTech Europe," which offers workshops to help newcomers meet standards. To gain market access and user trust, one must obtain certifications like Conformité Européenne (CE) marking, which confirms that a product meets all EU safety, health, and environmental standards. It serves as the final step in demonstrating adherence to EU standards, bridging the regulatory framework with market access. Lastly, as Irina stated, “A product needs to meet ISO standards, like ISO 13485 because it ensures quality management in areas like design, risk, and traceability”. During the interview, both said that addressing healthcare disparities requires accessibility and affordability, possibly through public funding or insurance.

Fundamental strategies for data security were examined with Marco Saias, a specialist in privacy and data protection, and Tiago Godinho, the director of the digital experience lab at Nova SBE (Appendix 8.2). Both reinforced the significance of encrypting data during transmission and at rest. Anonymization techniques, including pseudonymization, enhance security measures. "Anonymization is a procedure that irrevocably modifies personal data to prevent the identification of individuals, either directly or indirectly." Marco elucidates that once data is anonymized, the connection to the individual cannot be reinstated. Pseudonymization substitutes direct identifiers (e.g., names) with a unique code, diminishing identification risk while preserving the underlying link, thus enabling re-identification if the key is accessible (Appendix 8.2). Consequently, re-identification is feasible with

pseudonymization but not with anonymization (European Union, 2024, p. L119/5 & L119/33). Marco pointed out that AI models must utilize anonymized data sourced from reputable entities to safeguard privacy. Therefore, collaborating with CGM device manufacturers is essential and necessitates acquiring the proper licenses. Trust and compliance are accelerated by achieving ISO 27001 certification (ISO/IEC, 2022). Tiago mentioned, "A project like yours will need a data protection impact assessment" (DPIA), which is "required under the GDPR any time you begin a new project that is likely to involve a high risk to other people's personal information" (European Union, 2016). In the event of an incident, which according to him is likely to happen, a robust response strategy is imperative. This involves performing regular security assessments of cloud providers and executing DPIAs prior to a breach, which is anticipated to occur with a certainty of 100%. In the event of a data breach, the supervisory authority is required to be notified within 72 hours, detailing the nature of the incident. Additionally, affected users must be informed if the breach is deemed serious. In cases where medical devices are involved, the relevant cyber security authorities of the respective country must also be notified (European Union, 2016, p. L 119/51-53).

The main takeaways from interviews with Robby Barbaro, co-founder of *Mastering Diabetes*, and Marta Silvestre, an expert in nutrition and metabolism, highlighted the importance of aligning dietary habits, technology, and education to enable personalized approaches in diabetes management (Appendix 8.3). Robby underscored the role of nutrition, emphasizing that a low-fat, plant-based diet rich in fiber from foods like lentils and leafy greens is essential for stabilizing blood glucose levels. Building on this, Marta highlighted how CGM systems and digital tools enhance these dietary strategies by enabling real-time adjustments to treatment plans. These adjustments, combined with meal timing and pre-bolus insulin administration, maximize the benefits of a stable diet.

The experts agreed that AI models play a crucial role in improving outcomes by ensuring at

least 70% time in the target range. Effective use of AI requires tracking key indicators such as CGM data, Hemoglobin A1c value (HbA1c) levels, cholesterol, body weight, and energy levels, allowing treatment plans to be fine-tuned based on clinical results or patient input.

Robby further stressed the importance of education in empowering patients to make informed dietary choices and manage insulin therapy effectively. His company actively supports this effort by sharing educational content across platforms like Instagram, making knowledge accessible to a wide audience.

To strengthen the findings from a medical perspective, an interview was conducted with Carolina Neves, an endocrinologist at Associação Protectora dos Diabéticos de Portugal (APDP) in Lisbon (Appendix 8.4). Dr. Neves described the importance of CGM systems and insulin pumps, which offer real-time data to patients. From her experience “Patients show a strong interest in mobile self-management solutions especially alerts for hypo- or hyperglycemia are highly demanded”. Given that stress affects blood sugar levels in T1D management, she highlighted the need for integrating psychological support, such as mood-tracking features, diaries, and access to counseling in apps, to improve patient satisfaction. Access to comprehensive data, such as blood glucose trends, insulin usage, diet, exercise, and stress, enables healthcare providers to take a more personalized approach. She also stated that evidence shows that technology users have better glycemic control and adherence to treatment. Nonetheless, issues such as limited technological access, privacy concerns, and poor platform integration remain. In terms of the effects of psychological stress on blood glucose levels, it was noted that, in addition to the direct effects, it can make it difficult to comply with self-care measures. As the endocrinologist stated: “Hormonal fluctuations during a woman's menstrual cycle cause direct changes that affect the disease. Specifically, changes in estrogen and progesterone impact insulin sensitivity, leading to unpredictable levels. This requires careful monitoring and potentially adjusting the insulin dose during different phases of the cycle.”

Another expert delivering a valuable contribution to the validation of the product was Hugo Placido da Silva, a biomedical researcher (Appendix 8.5). He reaffirmed the relevance of AI's potential to transform healthcare, particularly in managing chronic illnesses like diabetes, alongside notable challenges. While he acknowledged the challenges posed by strict regulations and risks, he emphasized AI's opportunities for personalized care and data analysis. He pointed out the difficulty in obtaining high-quality datasets, such as CGM readings and lifestyle data, due to privacy concerns and logistical issues. Hugo stressed the importance of collaborating with hospitals, ethical committees, and wearable smart devices to enhance data accuracy and user convenience. He cited the "OmniPod 5" as an example of real-time, adaptive interventions, setting a benchmark for future innovations. He advocated for making AI-driven solutions accessible and affordable, suggesting public funding or insurance coverage to address healthcare disparities. Finally, he emphasized the sustainability of AI systems, proposing energy-efficient, durable designs to align with environmental goals and upcoming certifications. He concluded that AI could revolutionize healthcare delivery and improve patient outcomes, supporting a promising outlook.

4.3 Survey

In total, the first survey included 32 participants representing seven different countries. The largest proportion of participants, accounting for exactly half of the sample, were from the United States. Canadian participants constituted 9.4% of the sample, while participants from Germany 18.8%, United Kingdom 9.3%, Portugal 6.3%, Lebanon 3.1%, and Australia 3.1% contributed the remaining distribution (Appendix 11.1). The participants' average age, calculated as a weighted mean, was 39.9 years, with a weighted standard deviation of 19.7 years (Appendix 11.1). The rationale behind these research efforts was to design something of genuine value and significance for users, foster emotional engagement with the topic, and anchor the work in evidence and facts. The main findings from the survey results (Appendix 11.2) confirmed affinity map clusters and the key question topics through direct patient

engagement. The findings from Survey 1 provided critical insights into the daily realities and challenges faced by individuals managing Type 1 Diabetes. When participants were asked, "Does diabetes affect your daily life?", 82.6% of respondents rated the impact as significant (4 or higher on a 6-point scale). The responses highlighted a broad spectrum of challenges, including physiological effects such as fluctuating blood glucose levels, which 44.8% of participants reported experiencing 2–4 times per week, and psychological burdens like stress and anxiety, emphasized by 62.1% of respondents.

Self-management emerged as a cornerstone of diabetes care, with responses to the question, "Do you keep a diary in which you record your blood glucose levels, insulin requirements, etc.?" revealing that 57.1% of participants do not maintain a diary. Common reasons included lack of time, effort required, and a perception that the benefits did not justify the work involved. For those who did keep records, many used irregular approaches or relied on digital tools like CGMs. The survey also stresses the role of technology in diabetes management. 68.1% of participants reported using an insulin pump, and 75.4% utilized CGMs such as Dexcom or Freestyle Libre. However, the responses revealed significant variability in the perceived effectiveness and usability of these tools.

The second survey was expanded to include gender-specific factors such as hormonal cycles, as well as emotional and psychological aspects such as stress, alcohol consumption, and smoking behavior. It also gathered detailed information about lifestyle (diet, exercise, sleep), health metrics (HbA1c, insulin use), and experiences with self-management tools (CGMs, insulin pumps, apps). Questions about mental health and feedback on existing diabetes tools were added to help users understand their needs and identify areas for improvement. In total 56 participants with T1D responded to the second survey. A diverse range of respondents was included, with 35.7% from the United States, 19.6% from Germany, 7.1% represented the United Kingdom, 5.4% of participants each came from Portugal and Canada,

while another Spain and Switzerland each accounted for 3.6% of the sample. The remaining 14.3% were distributed across France, Brazil, and Argentina (Appendix 12.1). Most participants were female, accounting for 76.8%, while the remaining 23.2% were male (Appendix12.1). The average age of participants, calculated as a weighted mean, was 39.9 years, with a weighted standard deviation of 15.2 years (see Appendix 12.1). Among the 56 respondents (Appendix 12.2), 94.6% reported using CGMs, with the Dexcom G6 and G7 models being the most widely adopted. This high utilization reflects the technological affinity of the target demographic and underlines their readiness to engage with advanced digital tools. However, while CGMs address core monitoring needs, the findings reveal substantial gaps in the broader landscape of diabetes management solutions.

Results showed several persistent challenges faced by individuals with T1D, highlighting critical areas for intervention and aligning with all identified obstacles analyzed in section. It was asked, “Which factors do you find most challenging when it comes to managing your blood glucose levels? (Select up to 3).”

Emotional stress emerged as the most frequently cited obstacle, reported by 46.4% of respondents, followed closely by physical activity with 39.3%. Both hormonal fluctuations and dietary challenges, such as carbohydrate counting, were mentioned by 30.4%. These challenges underline the complexity of managing diabetes beyond simple blood glucose monitoring. This also relates to the fact that when asked how frequently they communicate with their diabetes team, 39 out of 56 participants stated that they never communicate with a psychologist, even though 67.3% believe their daily lives are impacted. One participant noted, "The constant additional stress and thinking I have to do besides the normal life stress" emphasizing the mental burden of living with diabetes. Another described the challenge of managing blood sugar during various daily activities, such as work meetings or eating out, "Everything revolves around the disease in everyday life." A total of 41.07% of participants expressed a clear desire for more

advanced features in diabetes management apps, specifically A participant commented: "I need more features in the app itself like menstrual cycle, emotions, stress level, etc." (Hypothesis 1, 3). This emphasizes the need for a more comprehensive and personalized approach to diabetes management, one that goes beyond basic glucose tracking and helps users understand the multitude of factors that influence their blood sugar. In total, 48.5% of participants reported that current diabetes management solutions do not fully meet their needs. Another participant mentioned frustration with their CGM graph, saying, “My CGM graph is a rollercoaster” (Hypothesis 1). In terms of areas for improvement, 63.6% of participants identified **personalization** as a top priority, emphasizing the need for tailored solutions that account for individual lifestyle factors and medical needs. **Data integration**, specifically with other devices such as fitness trackers, was highlighted by 39.4% of participants. **Community support**, which could foster a sense of psychological well-being, and goal tracking were also cited as important areas for improvement, each receiving 33.3% of responses.

Despite widespread CGM use, many T1D patients still struggle financially. 19.6% said coverage gaps or high out-of-pocket costs for CGMs and insulin pumps pose financial barriers.

4.4 Discussion of Research Findings

The development of the two predictive models provides a foundational step toward validating H2. These models demonstrate the practical application of advanced AI systems in managing diabetes, offering insights into how such tools can enhance individualized care and support healthcare providers in improving diagnostic accuracy. The two models showcase the ability of AI to process complex datasets and thereby deliver personalized, actionable advice tailored to individual patient profiles. While these models were developed using synthetic data, they establish proof-of-concept for the integration of predictive analytics into diabetes management. Future deployment and evaluation of these models with real-world data would provide the necessary empirical evidence to substantiate the hypothesis further.

The above-mentioned findings strongly support the first hypothesis. Significant interest in

better data integration, predictive insights, and psychosocial support in diabetes management was revealed by desk research and search trend analyses. The high search volume for "female hormones blood sugar effects" suggests T1D women seek hormonal fluctuations remedies. Patient interviews showed that all participants utilized CGM systems but were dissatisfied with apps due to missing functionality and inadequate data integration. They wanted advanced software features like menstrual cycle tracking and behavioral pattern analysis. Survey results verified these findings. Time constraints prevented many from keeping complete records, demonstrating the requirement for an application that simplifies data collecting and combines diabetes management. Participants wanted predictive analytics, real-time insulin adjustments, and lifestyle indicators. Based on these consistent findings, a T1D-specific mobile health app is in high demand, verifying the first hypothesis.

Regarding the second hypothesis, while direct empirical evidence from the study is lacking since the proposed app has not been deployed, the existing scientific literature supports the potential for advanced data infrastructure systems with AI models to enhance individualized care. Studies have indicated that AI algorithms can improve glycemic control by predicting blood glucose levels and optimizing insulin dosing. For example, machine learning models have been used to forecast glucose trends, assisting patients and healthcare providers in making informed decisions about insulin administration (Zhu *et al.*, 2023, pp. 228–236). Additionally, AI-driven decision support systems have been shown to aid healthcare providers in diagnosing and managing diabetes more effectively (Contreras and Vehi, 2018). Patients in form this study expressed readiness to adopt such technologies, desiring predictive analytics and real-time recommendations based on CGM data. The integration of AI models into diabetes management tools holds promise for improving individualized care and diagnostic accuracy. However, without practical implementation and outcome data, this hypothesis cannot be fully confirmed at this stage. Future studies involving the app's deployment and evaluation of clinical outcomes

are necessary to empirically validate this hypothesis.

Substantial evidence supporting the third hypothesis is provided by both this research and existing literature. Psychological stress has been identified as a significant factor for people with type 1 diabetes, as stated by more than half of the respondents in the 4.3 Survey and the expert interview with Robby and Marta. Additionally, studies have demonstrated that stress and negative emotions can result in significant glycemic variability. (Trief et al., 2014, pp. 1565–1567). To pick up on the second part of the hypothesis, female patients specifically noted the impact of hormonal fluctuations on insulin sensitivity and blood sugar levels. This is also validated by 30.4% of the Survey 2 participants addressing hormonal fluctuations as a main problem. Furthermore, it is well-documented that hormonal changes during the menstrual cycle can affect glycemic control in women, necessitating adjustments in insulin therapy (Barata *et al.*, 2013, pp. 579–582). These observations were further confirmed by expert input, emphasizing the need to address emotional well-being and hormonal factors in diabetes care. High interest in resources related to "female hormones blood sugar effects" further substantiates this correlation. Therefore, the third hypothesis is highly supported, demonstrating a significant link between psychological stress, hormonal variations, and blood sugar fluctuations, particularly among women with T1D.

5 The Idea, Opportunity, and Context

5.1 Value Proposition

The study and its diverse findings contributed significantly to shaping the concept of a comprehensive product. DOT1 aims to be a mobile application that improves diabetes management by providing personalized insights into the impact of lifestyle and clinical factors on blood glucose levels. Utilizing AI-driven pattern recognition enables patients to reduce blood sugar fluctuations, enhance self-care, and achieve better overall disease management results. After registration on the user interface and the provision of personal details (such as name, age, gender, year of diagnosis, and weight) (Figure 2), users are prompted to link the app

to their CGM systems and, or insulin pumps and, if applicable, other health apps (e.g., Apple Health, Oura Ring, MyFitnessPal) to enable integrated data management.

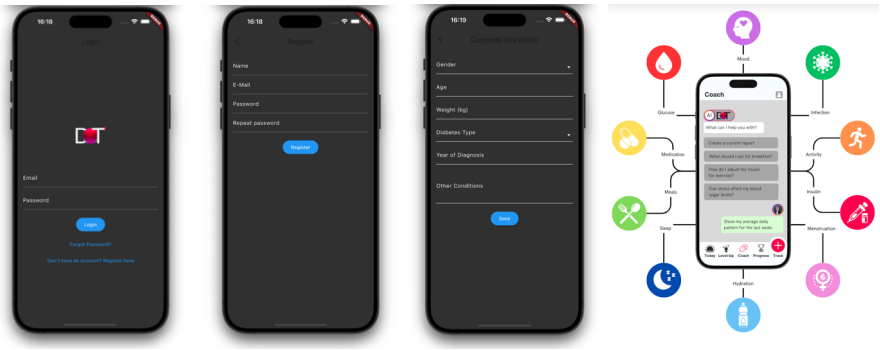

Figure 2: Registration Process and User-Interface

Glucose levels are influenced by six key factors, that have been validated through the Nutritionists expert interviews and former literature research. The factors are nutrition and food intake, exercise patterns, infections, mood, and medications, which patients can record manually. For female users, data from cycle tracking applications can either be integrated directly or added manually, providing greater flexibility.

Data will be collected by DOT1 in connection with the data from the CGM application, which measures the glucose value every minute. The AI will infer blood glucose levels and behaviors over time and with lots of data. When irregularities like nighttime hyperglycemia persist for several days, the user is notified of the likely causes. Depending on the irregularity, immediate improvement tips or doctor consultation are given. Users are notified to acknowledge their success and explain how it was achieved after these issues are resolved. DOT1 can also provide the patient's doctor with a detailed report summarizing all important data and analyses, improving patient-doctor relations. For internal use, DOT1 pseudonymizes health data to improve features and insights while maintaining user confidentiality. Anonymized data is shared with research and healthcare organizations. This always prevents user identification. Thus, users can focus on their daily lives without worrying about T1D while still feeling in control and informed.

5.2 Market Size

In Europe, the total addressable market for diabetics is estimated to comprise approximately 64 million people (WHO, 2024). The proportion of patients with T1D is estimated to be between 5-10%, corresponding to about 3-6 million T1D patients across Europe (Magliano and Boyko, 2021, p. 14). The diabetes care devices market in Europe (Figure 3) was valued at approximately USD 9.2 billion in 2023 and is projected to grow to around USD 12.4 billion by 2031 (DataM Intelligence, 2024), with an expected compound annual growth rate (CAGR) of about 6.18% over the forecast period from 2023 to 2031 (Mordor Intelligence, 2023). In Germany, around 8.5 million people are reported to be living with diabetes T1 and T2 in 2023, with approximately 431.313 individuals diagnosed with T1D. Additionally, about 2 million people in Germany may be undiagnosed with either T1 or T2D (IDF, 2021; Ogle *et al.*, 2022, p. 10). Approximately 91% of T1D patients in Germany are adults, with an estimated 4,150 adults newly diagnosed each year (Rosenbauer *et al.*, 2019, p. 29). This growth rate indicates that the proportion of T1D is increasing by approximately 3-5% annually. The serviceable addressable market (SAM) for diabetes care devices in Germany is projected to reach USD 2.88 billion by 2028, growing from USD 2.14 billion in 2023 at a CAGR of 6.07% (2023-2028) (Fortune Business Insights, 2024). Assuming a market capture of 1-5% of the SAM, the estimated serviceable obtainable market would range from approximately USD 21.4 million to USD 107 million.

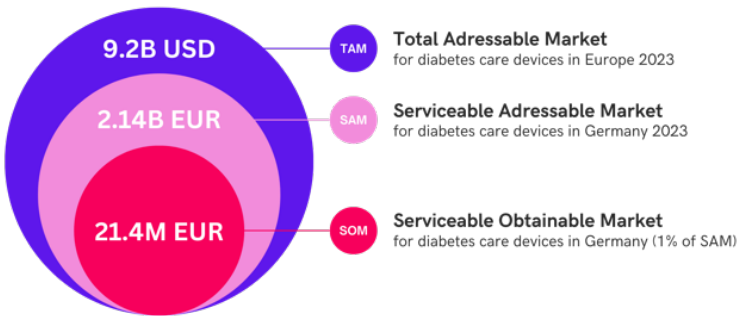

Figure 3: Diabetes Care Devices Market Size

Germany was chosen as the entry market for several strategic reasons. CGM data forms a core component of the app, and Germany has a high adoption rate of CGM systems among type 1

diabetics, largely due to comprehensive coverage by both public and private health insurance (Mordor Intelligence, 2023). Additionally, Germany's well-developed healthcare infrastructure increases the likelihood of app-related costs being reimbursed by health insurance providers (Grand View Research, 2024). Germany also has a high affinity for technology, facilitating the adoption process for the app among users (DataM Intelligence, 2024).

6 Business Model and Strategic Partnerships

DOT1's revenue model is designed to ensure financial sustainability while aligning with its mission to improve diabetes care. The primary source of revenue is a subscription-based model, where health insurance companies cover the cost of the app for users. Germany's largest statutory health insurers, such as AOK, Techniker Krankenkasse (TK), and Barmer. These partnerships ensure that the app remains free for patients while delivering measurable cost savings for insurers by reducing diabetes-related complications. By securing medical device classification and reimbursement agreements, DOT1 ensures that the app remains free to patients while insurers finance the service. This approach is attractive to insurers due to the long-term cost savings achieved by reducing complications and expensive treatments associated with T1D. To align revenue generation with patient outcomes, a value-based pricing model for partnerships with health insurers will be implemented in the long-term. Under this model, revenue is tied to measurable health outcomes, such as improved glycemic control or reduced hospitalizations. This approach is particularly attractive to insurers due to the long-term cost savings associated with reduced complications in T1D management. For instance, a single hospitalization for severe hypoglycemia or diabetic ketoacidosis costs approximately $16.000 per event (Parker *et al.*, 2024). By improving glycemic control through DOT1, insurers can achieve savings of $1,500 to $3,000 annually per patient. With over 341.000 individuals with T1D in Germany alone (Magliano and Boyko, 2021), these savings could amount to hundreds of millions of euros annually while simultaneously improving patient health outcomes. This approach incentivizes insurers to invest in DOT1 while aligning the app's

financial success with tangible improvements in patient health.

In addition to subscriptions, DOT1 generates revenue by monetizing anonymized health data for research, development, and healthcare innovation. Pharmaceutical companies, healthcare organizations, and academic institutions purchase high-quality datasets for use in drug development, clinical research, and therapeutic advancements (CB Insights, 2023). Building on this capability, the goal is to offer real-time data streams for organizations that require timely and actionable health insights. This live data monetization caters to the growing demand for dynamic datasets, especially in pharmaceutical R&D and clinical trial optimization (Agrawal *et al.*, 2024). Together, these data-driven revenue streams are scalable and highly aligned with the increasing reliance on data-driven solutions in healthcare.

Another key source of revenue comes from strategic partnerships with medical device manufacturers. These collaborations include licensing fees, co-marketing agreements, and revenue-sharing models. DOT1 facilitates device adoption through its seamless integration with these technologies, strengthening its position as a central player in the diabetes care ecosystem. Furthermore, entering into co-innovation agreements with manufacturers could lead to the development of smart devices that work in tandem with DOT1's platform.

Gamification features that reward patients for achieving health goals lead to better user engagement and retention. Users earn points or rewards for activities such as consistently logging data. Incentives such as these would also lead to better data density and, thus, better model performance. These rewards can include discounts on diabetes-related products or contributions to diabetes research. The goal of the gamification system is to be supported by sponsorships from wellness brands, pharmacies, and healthcare companies.

9 Marketing Strategy (Individual Part from Esther Klausmann)

9.1 The Importance of Marketing for Digital Health Products

Technological innovations and increased health consciousness have transformed consumer expectations, especially in the management of chronic conditions such as T1D. Consumers are

progressively seeking immediate health insights and cohesive lifestyle solutions, propelling the expansion of digital health platforms (Buchter, Cordina and Eckroate 2024). DOT1 responds to these trends by providing an AI-driven platform that integrates medical accuracy with emotional assistance and community development. The adoption of these solutions is significantly contingent upon targeted marketing strategies that foster trust, mitigate privacy concerns, and emotionally engage users (BfArM 2023). This report delineates DOT1's strategic marketing methodology, emphasizing segmentation, targeting, positioning, and benchmarking. These analyses provide actionable recommendations to position the product within a competitive digital health environment strategically.

9.2 Methodology Frameworks and Validation for Marketing Strategy

To develop DOT1's marketing strategy, two complementary analytical frameworks are applied: the STP (Segmentation, Targeting, Positioning) analysis (Kotler, 1988) and benchmarking (Camp, 2007). These frameworks are enriched by insights gained from two prior surveys and a social media expert interview with Caroline Deisler (Appendix 8.6). As a nutrition and health Instagram influencer with 646.000 followers, she provided valuable insights. We worked together on benchmark KPIs and received strategic advice for future steps, including campaign planning and content strategy. The Benchmarking analysis compares DOT1 with leading competitors by a subsequent Z-transformation to establish respective Z-scores (Field, 2013). This procedure eradicates discrepancies in measurement scales, facilitating direct comparability. Initially, the variables were quantified in disparate units: for instance, the engagement rate was represented as percentages, while the estimated earnings were denoted in euros. The differing scales presented obstacles for comparison and analysis. Standardizing all variables enables their representation on a consistent scale ranging from -2.5 to 2.5, aligning the variables while preserving their relative positions and distributions. For enhanced transparency, the comprehensive benchmark table containing all original, non-standardized values (Figure 7)

9.3 STP Analysis

The STP framework provides the strategic foundation for understanding DOT1's core audience and defining its market approach. By identifying key segments, prioritizing the most relevant targets, and positioning DOT1 as a unique and trusted digital health solution

Segmentation reveals that DOT1's audience comprises overlapping segments based on demographic, psychographic, and geographic criteria. Demographically, the primary segment consists of tech-proficient young adults aged 18–34 who actively use Instagram. Over 60% of German Instagram users fall within this age group, making it an ideal platform to reach them (Statista, 2023). Psychographically, survey data highlights that many diabetes patients face significant emotional and mental strain, reflected in comments such as "Mental and emotional burnout" and "I would like to be in a community." These insights underline a demand for emotional support and interactive, community-driven content. Geographically, in Germany, diabetes patients are required to visit specialists every three months (Appendix 7). This recurring care cycle offers an opportunity to integrate DOT1 seamlessly into patients' health routines, complementing their existing care structure.

Targeting focuses on young adults with a strong affinity for technology and personalized health solutions. This group values visual and interactive content, aligning perfectly with Instagram's strengths. According to survey results, 40.72% of participants reported using Instagram as their primary source of health information. Instagram advertising, with its ability to deliver highly-targeted ads, can maximize visibility for businesses like DOT1 (Sachs Marketing Group, 2023). Additionally, Instagram's high engagement rate in the health sector (0.58%) (Cucu, 2024) and its ability to deliver content through Reels, carousel posts, and Q&A sessions cater to the attention spans and preferences of this demographic (Microsoft Corp., nd). Including strategic hashtags can further amplify reach, as posts with at least one hashtag achieve a 12.6% higher engagement rate (Locowise, 2024). This combination of visual content and targeted advertising makes Instagram an optimal platform for DOT1 to effectively deliver both emotional

reassurance and actionable health insights.

Positioning differentiates DOT1 from competitors by emphasizing its dual focus on **medical precision** and **emotional support**, positioning the brand as a trusted, interactive digital health platform. Influencer marketing emerges as a crucial strategy for enhancing credibility and expanding reach. Research shows that influencer marketing delivers 11 times more return on investment (ROI) than traditional banner ads, with 8 out of 10 consumers acting on influencer recommendations (Phyllo, 2024). Collaborating with micro-influencers in the health and wellness space allows DOT1 to engage authentically with its audience while fostering a sense of trust and relatability. However, the analysis also identifies potential challenges, including high competition on Instagram and the risk of harmful trends such as #fitspiration, which research links to negative body image outcomes (Carrotte, Prichard and Lim, 2017). DOT1 must navigate these challenges carefully while maintaining its credibility as a reliable and supportive platform.

In conclusion, the STP analysis confirms Instagram as the optimal platform for DOT1, aligning with the target audience's demographics, psychographics, and content preferences.

9.4 Benchmark Analysis

Following the Benchmark Analysis evaluates DOT1's competitive position against direct and indirect competitors like Dexcom, Tandem Control IQ, OneDrop, Levels, Ultrahuman, and Lingo. These companies work in CGM and health technology. The selection of key performance indicators (KPIs) was supported through an interview with a social media expert and augmented by academic research. Five metrics: **engagement rate (ER), follower count, post count, estimated monthly earnings, total posts, and average likes per post**, were quantified (Table 2; Appendix 18) and standardized through a z-transformation to ensure comparability (Figure 7). Two supplementary dimensions, **ecosystem integration and visual branding**, were assessed qualitatively through the evaluation of the work on the respective Instagram profiles. The engagement ER is a key metric for assessing content interactivity and

audience connection (Tuten, 2020), whereas follower count and post frequency indicate a brand's reach, activity, and consistency, essential for visibility and audience expansion (Kaplan and Haenlein, 2010; Evans, 2010). Projected monthly revenue, calculated using CPM (Cost Per Thousand impressions), provides an understanding of monetization effectiveness, with industry standards for Instagram feed advertisements averaging €6.91 CPM (Statista, 2021). Ecosystem integration is identified as a crucial factor in brand appeal and user value, according to Joshi, Khan and Rab (2021), while visual branding significantly enhances recognition and engagement through robust design elements (Bresciani and Eppler, 2010). Initially, ERs were calculated using data from the third-party tool SocialBlade (2024). This uses the public Instagram API to evaluate the 16 most recent publicly accessible posts from each account,

Category	DOT1	Dexcom	Levels	Ultrahuman	Lingo	OneDrop	Tandem Diabetes
Engagement Rate (%)	1,50	0,55	2,76	0,20	0,18	0,08	0,99
Follower Count (in thousands)	15000,00	174000,00	216000,00	110000,00	15800,00	18000,00	47000,00
Monthly Earnings CPM (€)	394,00	1675,00	10234,00	343,00	47,60	25,20	81,08
Total Posts	4,00	2154,00	642,00	1221,00	38,00	17,00	1956,00
Average Likes per Post	15,00	96,00	5883,00	208,00	27,00	15,00	443,00

ensuring a consistent and unbiased data foundation for comparison. Healthcare industry benchmarks were examined, with data ranging from January 2022 to December 2023. During this period, the average Instagram engagement rate was 0.58%. To estimate monthly revenue on Instagram, multiply impressions derived from followers, engagement rate, and reach by CPM, a method supported by resources such as Savvy Calculator (2024) and scholarly studies such as Laila *et al.* (2024). Standardized default values were used to ensure comparability across all companies, assuming a 25% organic reach based on premium industry benchmarks (Jechorek, 2023), with all referenced metrics reflecting the status as of December 2nd.

Table 2: Benchmark Visualization Unstandardized Values on Different Scales

Among the analyzed companies, “Levels” demonstrates exceptional marketing performance with a follower base of 216.000, a total of 642 posts, 5.883 average likes, and an engagement rate of 2.76%, significantly surpassing the healthcare industry benchmark, with reels being their most successful format. Levels' estimated monthly earnings of 10.234€ show strong

monetization due to its niche focus and efficient use of a higher engagement rate and adjusted CPM values. Clean, professional design with green tones to evoke health, wellness, and modernity. Levels' content strategy is strong, combining educational narratives like “How Levels works” with actionable tips, facts, meal ideas, and success stories for tech proficient and health-conscious audiences. They work with Apple Health, Google Fit, Garmin, Strava, and Oura and support CGM devices like FreeStyle Libre and Dexcom G6 (Levels, 2024).

“Dexcom” ranks second in follower count, with 174.000 followers on its main account and an additional 15.000 across regional accounts they published in total of 2154 posts. However, its engagement rate of 0.55% falls below the industry benchmark for similar accounts, reflecting a gap in audience interaction. It’s estimated monthly earnings amount to 1.675€, highlighting limited monetization efficiency despite its substantial follower base. Their visual branding adopts a traditional medical aesthetic, also featuring green, vibrant colors and technical diagrams to convey trust and clinical precision. Regarding their partnerships Dexcom collaborates with insulin pump manufacturers like Tandem Diabetes Care and Insulet Corporation, as well as digital health platforms such as Garmin, Sugarmate, and Happy Bob, to enhance its diabetes management ecosystem. These partnerships strengthen Dexcom's integration into healthcare technology, providing users with a seamless connection between CGM devices and related applications (Dexcom, 2024).

Ultrahumanhq, with 110.000 followers, a post count of 1.221 posts and an engagement rate of 0.20% and an average like count at 208 per post demonstrates a disconnect between its visually compelling branding and audience interaction. The brand’s bold, futuristic visuals use high-contrast imagery to emphasize energy, activity, and innovation, aligning well with its positioning as a tech-driven brand for fitness enthusiasts. Despite these strengths, the brand's low engagement translates to estimated monthly earnings of 343.35€. However, they stand out with extensive ecosystem integrations, including payment facilitation through GetSimpl,

collaboration with the American Heart Association for thought leadership, and innovative initiatives like the Ultramarathon in the Himalayas showcasing their tracking technology. These efforts position the brand as a leader in blending technology with health-focused experiences, leveraging Community-building efforts. Tandem Control IQ, with 47.000 followers, shared 1.956 posts with 443 likes and 0.99% engagement using bright, optimistic imagery and relatable real-world applications to empower its audience and foster community through initiatives like the “Meet the 2024 Beyond Type 1 Run Team.” However, its estimated monthly earnings of 81.08€ suggest unmet monetization potential despite its engaging and community-driven approach. With 15.800 followers, 38 posts, 0.18% engagement, and 27 likes, Lingo has a more engaging content strategy and estimated monthly earnings of 47.60€. “Ask the Expert” reels, recipes, and interviews add variety and interactivity to the brand's feed. Lingo also strengthens its position by attending events like the “Good Food Show” and co-producing content with creators. As Lingo launched in early 2024, its newness may explain its modest performance metrics while offering growth potential. Conversely, OneDrop, with 18.000 followers, 0.08% engagement, 17 postings, and 15 likes, underperforms in every KPI and earns only 25.20€ per month. The brand's minimalist designs fail to establish a strong identity or emotional connection with its audience, resulting in low engagement and no ecosystem initiatives. These findings demonstrate the importance of a cohesive, high-quality strategy that combines engaging content formats and ecosystem integrations to engage and monetize audiences. DOT1 with the initial efforts and four initial Instagram posts that generated early engagement data (215 followers and approximately 125 story views) (Appendix 19). Preliminary indicators and own calculations using the same methodology as for the competitors suggest that reaching 15.000 followers within the first year could yield about 56,250 monthly impressions and approximately €394 in monthly earnings (at a 1.5% engagement rate and a €7 CPM), providing tangible benchmarks to assess campaign effectiveness and identify growth opportunities for

DOT1.

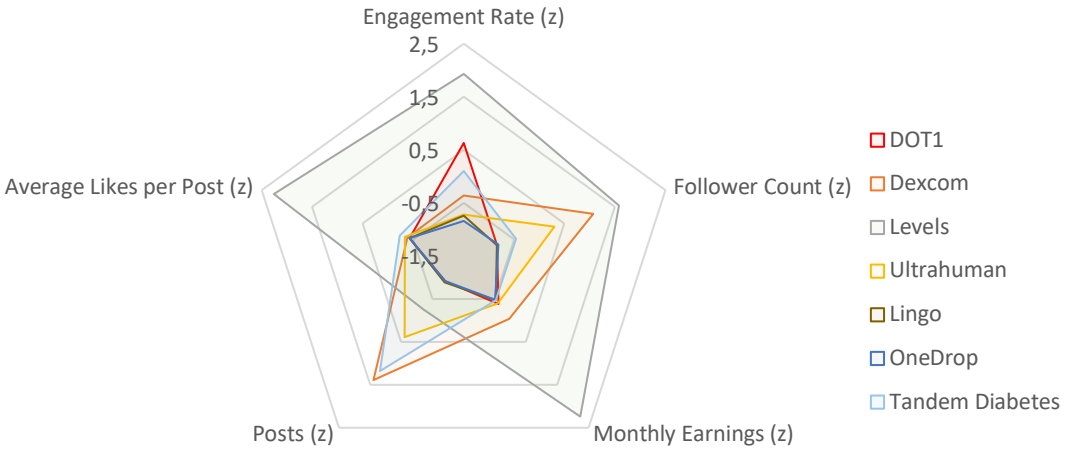

Figure 4: Weighted Normalization of Benchmark Results Across Competitors

9.6 Strategic Recommendations and Outlook on a Marketing Campaign

The identified core audience of tech-proficient young adults with T1D who regularly turn to Instagram for emotional support, interactive formats, and reliable health information. Benchmarking insights from brands like "Levels" confirm that consistent visual branding, regular posting frequencies, and a balanced mix of informative, inspiring, and entertaining content are key to building sustained community engagement. Caroline Deisler corroborates these findings, emphasizing that "Reels and Stories are currently the most effective formats for building reach while maintaining an authentic connection with the audience." These recommendations align with DOT1's existing activities: On Instagram (Appendix 20; 21), on WhatsApp through a community (Appendix 22) for direct feedback, and a landing page (Appendix 23) equipped with Google Analytics for KPI tracking.

To differentiate itself from sometimes monotonous, clinically oriented aesthetics of competitors, DOT1 has adopted a warm pink-and-orange color palette (Appendix), symbolizing both medical expertise and empathetic support. To increase relevance and authenticity, the brand has begun incorporating content formats that directly involve the audience. For instance, an Instagram post (Appendix 21) posing the question "What's one thing you wish everyone knew about Type 1 diabetes?", which encourages community dialogue while presenting three

fundamental facts about T1D's (autoimmune origins, insulin dependency, and independence) Drawing on Caroline's advice that a clear brand identity is essential before scaling up campaigns, DOT1 worked with her to develop specific content formats and a structured posting calendar (Table 3). Each feed post is complemented by a Story to reinforce recall, encourage interaction, and guide the audience toward recurring themes and recognizable formats.

DAY	TIME	REEL	POST	STORY	CONTENT
Mo	6pm	x		x	"Motivational Monday" Patient success story #DoT1Successstory
Tues	4pm	x		x	"Tech Trend Tuesday" discuss diabetes management tools & recent health-tech updates
Wed	3pm		x	x	"Bingo Wednesday" Did you try ... a new low-carb recipe; ... a mindfulness break
Thu	8pm	x		x	"Community Connection Thursday" Encourage followers to submit short videos
Fr	12pm	x		x	"Factual Friday" Basic knowledge questions
Sa	10am		x	x	Bonus post for the weekend Stories/quizzes/polls/Inspo Ex: testing diabetes knowledge
Sun	7pm		x	x	

Table 3: Posting Calendar with suggested growth formats

As Caroline notes, "Consistency and interactive content are key to building an authentic connection with your audience. A well-structured posting schedule helps maintain engagement while adapting to changing algorithms and user interests." In practice, implementing these recommendations involves leveraging all Instagram features like Reels and question boxes for Questions & Answers (Q&A), batch-producing short educational videos, and employing tools such as "Canva" to ensure uniform visuals and recognizable recurring segments. To prepare for campaign, Insights for optimal posting times, days and target group demographics need to be identified, with the Instagram business tool. Encouraging user input, rotating expert voices, and using polls or quizzes to gauge immediate feedback will help DOT1 balance educational, inspirational, and interactive elements. Maintaining a KPI dashboard to track follower growth, story views, and conversion rates allows DOT1 to experiment with format variations, A/B-test poll-based Stories vs. Q&A-based Stories, and pilot content on TikTok or LinkedIn if needed. These efforts unfold in phases as suggested by her, during Months 1–3, DOT1 should focus on

format piloting pilot new formats, closely monitor KPIs, and refine content using community feedback. In Months 4–6, the value proposition will be sharpened through user-centered success stories ("Share Your DOT1 Journey") and live Q&As with T1D experts. By Months 6–8, DOT1 can emulate successful benchmarks by attending health-tech events, approaching potential ecosystem partners such as "Fitbit" or "MyFitnessPal" but when a stable community connection and consistent engagement patterns are established (Months 9–14) will DOT1 proceed with technical integrations and co-branding campaigns. As first step in that direction, Caroline Deisler emerges as an ideal partner, having already supported the project by sharing the survey on her platform. She is a perfect fit also for a targeted campaign focused on women (Figure 8).

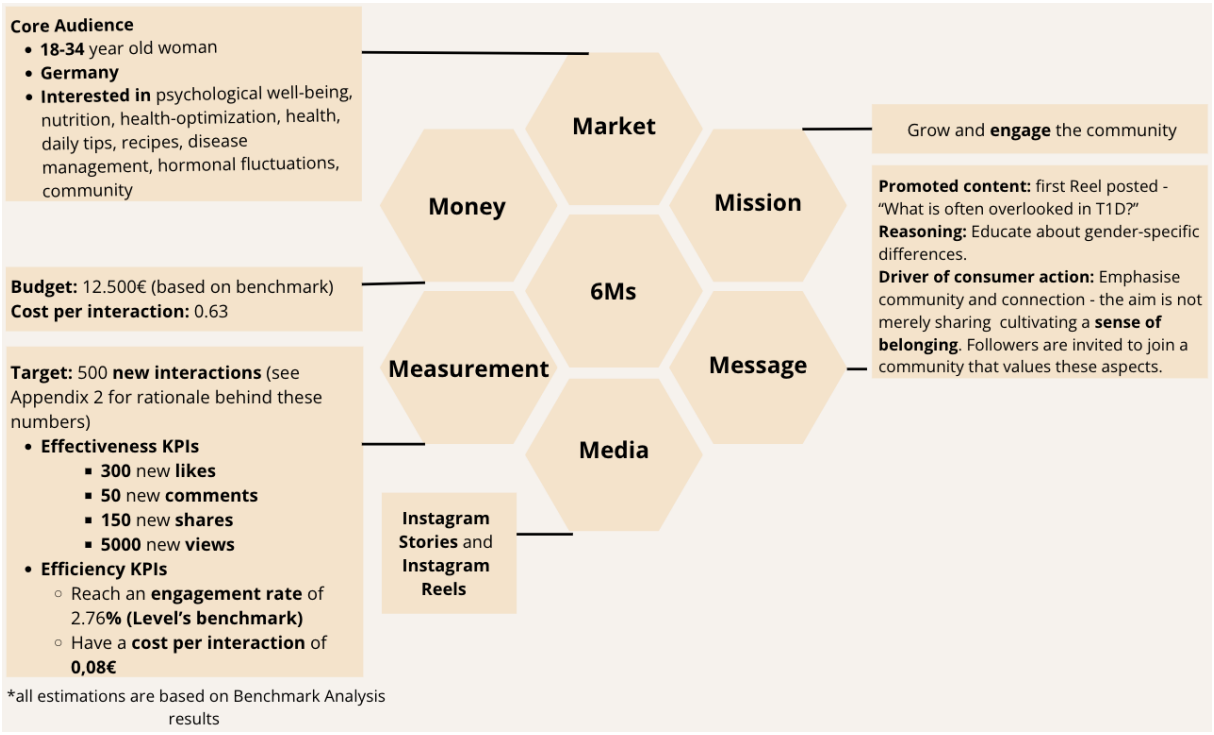

Figure 5: Potential Campaign Content

In conclusion, DOT1 has the opportunity to differentiate itself from the competition by focusing on women's health and psychological support as core elements of its value proposition to precisely set up the first campaigns. This gradual, evidence-based expansion minimizes premature investments and ensures that each strategic move is grounded in real-world performance data.

9.7 Limitations and Critical Reflection

While the proposed marketing strategy provides a data-driven trajectory for DOT1's growth, it is constrained by several uncertainties that demand ongoing adaptation. First, the absence of a fully validated Minimum Viable Product (MVP) poses a significant challenge; without confirming that DOT1's core offering aligns with user needs, large-scale campaigns or partnerships risk misalignment in expectations. Secondly, the irregular posting schedule and limited initial data complicate reliable forecasting and engagement consistency. Introducing a structured content calendar, as informed by early Instagram metrics and community feedback, will help establish a predictable stream of high-quality posts and enable more accurate assessments of content performance over time. Furthermore, the KPIs that have been tracked were only the most important one's but for future efforts more can be taken into consideration (ex: "Conversion rates" and "Impressions")

Additionally, diversifying channels, such as piloting content on TikTok or LinkedIn, mitigates the threat of over-dependence on a single platform. Further, variability in CPM rates and industry-specific reach benchmarks complicates precise revenue projections, necessitating iterative recalibration of KPIs, pricing models, and outreach tactics as more reliable sector data emerges.

In sum, these limitations do not merely highlight potential pitfalls they inform a responsive, feedback-oriented approach that transforms uncertainty into a strategic opportunity. By leveraging continuous input from the WhatsApp community, refining posting practices based on A/B-testing and staying agile in platform usage, DOT1 can gradually refine its value proposition. As the MVP matures, engagement metrics expand, and benchmarks evolve, DOT1 will be positioned to advance toward co-branding efforts, ecosystem integrations, and broader partnerships with confidence, ultimately securing a credible and progressive role in the digital T1D landscape.

10 Limitations of Main Study

Reflecting on the development and evaluation of DOT1 project revealed a range of limitations, reflecting the inherent challenges of designing an innovative healthcare solution. These challenges span the research design, product functionality, and broader systemic and strategic issues, underscoring the complexity of bringing such an impactful product to market.

The research methodology faced several constraints that limited the generalizability and scope of the findings. With a sample size of only 86 participants in the survey, limited expert opinions (1-2 experts from each field), and a compressed timeline, the study lacked the breadth needed for comprehensive validation. Although the surveys included a diverse, international audience, a larger number of participants from Germany would have been favorable since Germany was the chosen entry market. Furthermore, the predominance of female participants in the second survey could affect the findings related to gender-specific issues.

At the product level, one critical barrier was the lack of access to APIs for CGM devices, which require partnerships. This dependency on external collaborators underscores the importance of establishing strategic relationships (HOW must be mentioned in the roadmap) to ensure seamless integration. Additionally, the prototype revealed key areas requiring refinement, including data security measures and analytical capabilities. The lack of user testing during the development phase restricted insights into the usability and effectiveness of the prototype. The use of synthetic data during testing limited the product's ability to validate real-world applicability. Such data may fail to capture the nuanced patterns of real datasets, introducing biases in the outputs. This is particularly critical for patient innovation, where high data quality is paramount as it directly impacts real individuals' safety and trust. As a result, the lack of empirical data for the second hypothesis means that conclusions about the effectiveness of AI models remain speculative within this research context.

Intensive competition from established health-tech companies dominating the CGM ecosystem is a significant limitation, requiring DOT1 needs a clear USP to succeed.

Systemic and strategic challenges arise from the need for physician involvement, which is crucial for product development and clinical adoption but hinders product scalability and integration into existing healthcare systems. Despite positive trends, user trust in KI-usage in healthcare is lacking. To build trust and credibility, this requires transparent decision-making and ethical considerations like data privacy, bias mitigation, and patient autonomy.

Finally, he regulatory landscape added another layer of complexity from market-entry. The DiGA framework in Germany sets rigorous requirements for digital health applications seeking reimbursement through statutory health insurance, significantly impacting business models and marketing strategies. To qualify, applications must be CE-marked medical devices of risk class 1 or 2a under MDR, with demonstrated positive healthcare effects supported by clinical evidence. Compliance with GDPR is mandatory, requiring robust data security measures like ISO 27001 certification. Additionally, interoperability with health systems, user accessibility, and regular quality assurance updates are essential (BfArM, 2023, pp. 37–83). Under these conditions also marketing is strictly regulated. Claims must be substantiated by scientific evidence, prohibiting unverified promises (BfArM, 2023, pp. 95–108). For example, stating "DOT1 reduces HbA1c by 2% in 30 days" is not allowed unless backed by clinical studies. Instead, compliant messaging like "DOT1 supports blood sugar stabilization with scientifically validated efficacy" is required. Violations can lead to removal from the DiGA directory or legal penalties. Furthermore, certain product features also imply a classification as a medical device class 2a, which is subject to strict regulations, comprehensive clinical evidence, detailed documentation, and adherence to standards such as ISO 13485. These requirements, while ensuring safety and efficacy, place substantial time and cost demands on the development process.

During research, it became clear that building strategic partnerships will be difficult. Overcoming technical and regulatory barriers requires collaboration with CGM providers,

regulatory authorities, and healthcare institutions. Marta confirmed that policymakers and industry leaders were hard to reach. Dexcom, insurance companies (AOK, TK), and the European Commission's notified body were unresponsive.

A critical decision in the project was to forego establishing a social media campaign. This decision was primarily driven by the limited time available to build a brand account with influential followers. Without sufficient time to cultivate a substantial online presence, initiating a social media campaign would likely have resulted in minimal user engagement and ineffective behavior analysis. Meaningful insights into user interactions and preferences require a large and engaged audience, which was unattainable within the project's timeframe. Lastly the economic burden of diabetes in healthcare was less prioritized Consequently, the project focused its resources on qualitative and exploratory methods, which, while providing in-depth insights, limited the ability to gather broad-scale user data. This absence of a social media strategy underscores a strategic prioritization that, while necessary under time constraints, may have restricted the project's reach and impact. Moreover, the economic burden of diabetes, though identified as a significant issue in the problem analysis, was not thoroughly examined in this study. This omission was primarily due to limited resources and the project's focus on qualitative and exploratory methods, which restricted the ability to conduct comprehensive economic evaluations. Similarly, ethical considerations, while acknowledged, were not extensively addressed. The complexities involved in ethical analyses required more time and expertise than was available, leading to a less detailed exploration of these critical aspects. These omissions highlight the project's need to prioritize certain areas under constrained conditions. Moving forward, addressing economic and ethical factors will be essential in developing more sustainable and responsible healthcare solutions. This experience has underscored the importance of integrating comprehensive economic assessments and ethical frameworks in future research to ensure holistic and impactful outcomes.

11 Roadmap

The development and scaling of DOT1 follow a strategic roadmap divided into three phases: validation, market-entry, and sustainable expansion. This approach ensures regulatory compliance, user-centric development, and scalability to address current limitations and achieve successful market integration.

The first phase focuses on validation and MVP development (36-60 months) (Figure 9). Securing external funding will enable the launch of DOT1 as a lifestyle product, prioritizing non-medical features to comply with regulations before transitioning to a certified medical device. Strategic partnerships with CGM providers like Dexcom and Abbott will facilitate seamless data integration, reducing the need for extensive technical development and clinical trials. Collaborations with Memodio, a company developing dementia-related solutions, will provide insights into best practices for integrating health-focused applications. Preparations for Class 2a medical device classification will include data collection, AI model development, and initiating the regulatory approval process, supported by regulatory consultants, endocrinologists, and medical professionals.

The second phase, lasting for the following 12 to 24 months, focuses on market entry and establishing DOT1 as a certified medical device in Germany (Figure 9). Continuous user feedback will refine usability and optimize features based on real-world data. Securing reimbursement agreements and ensuring broad accessibility will involve partnering with health insurance companies and aligning with the DiGA framework. Concurrently, targeted DiGA-compliant marketing campaigns will be expanded to build brand awareness and foster user trust. It is crucial to adhere to regulatory guidelines, as marketing claims must be substantiated by scientific evidence. For example, stating “DOT1 reduces HbA1c by 2% in 30 days” is prohibited unless supported by clinical studies. Instead, compliant messaging such as “DOT1 supports blood sugar stabilization with scientifically validated efficacy” will be employed to avoid legal penalties and ensure inclusion in the DiGA directory.

The final phase emphasizes geographic expansion and product diversification (Figure 9). DOT1 will extend its presence to other European markets with healthcare systems similar to Germany's, followed by entry into North America. This expansion will require further collaborations with insurance providers. Product diversification will introduce features such as mental health support and community networks based on ongoing user feedback. Integration with Electronic Health Record (EHR) systems will adhere to interoperability standards like Fast Healthcare Interoperability Resources, ensuring seamless and secure data exchange (HL7 International, 2021, pp. 15–18) with platforms like Epic and Cerner, while maintaining compliance with GDPR and Health Insurance Portability and Accountability Act (HIPAA) regulations. Strategic partnerships with leading healthcare institutions, such as Charité – Universitätsmedizin Berlin and the Cleveland Clinic, and diabetes-focused centers like the Deutsches-Diabetes-Zentrum (DDZ), will facilitate pilot projects and system refinements. Rigorous validation processes, including user acceptance testing and simulated case studies, will ensure functionality and data accuracy (Gordon *et al.*, 2022). Additionally, DOT1 will provide training for healthcare providers through workshops and digital modules, supported by ongoing technical assistance.

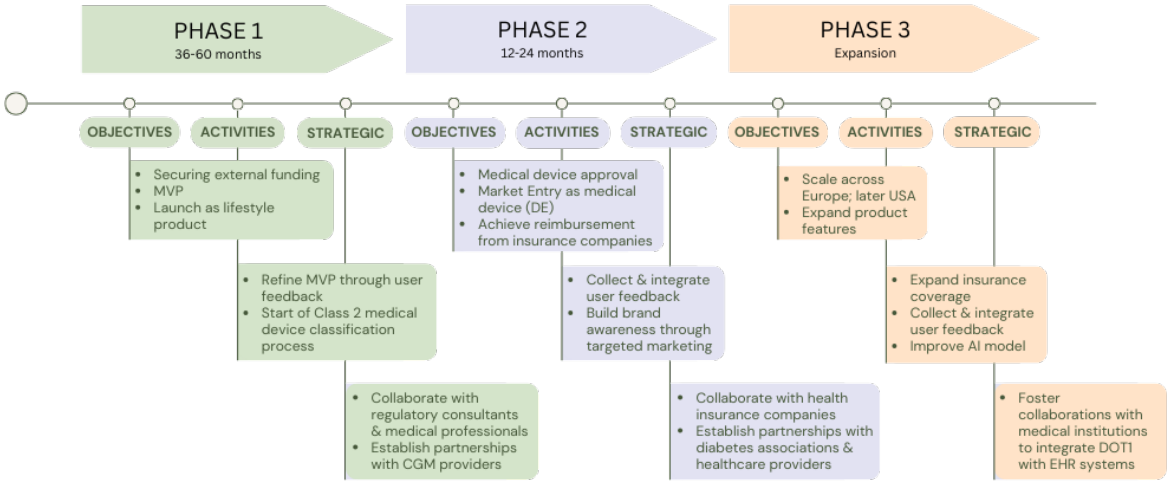

Figure 6: Roadmap

Simultaneously, the AI model will leverage larger datasets to improve predictive accuracy and enable greater personalization, further solidifying DOT1's position as a leader in T1D

management.

Through this structured roadmap, DOT1 aims to transition from a lifestyle product to a transformative medical platform that bridges patient-centered care with medical precision. By emphasizing qualitative research, targeted hypothesis validation, leveraging existing validation tools, and fostering strategic partnerships, DOT1 is poised to address the complex needs of T1D patients and navigate the challenges of the healthcare ecosystem effectively.

12 Conclusion and Personal Reflection / Lessons Learned

Throughout this iterative master's project, significant insights were gained both professionally and personally. The strong motivation to create a positive impact drove the team to engage fully. It became evident how crucial stakeholder support is, as their active participation was instrumental despite many reducing their involvement during these times.

Developing a functional prototype without prior programming experience highlighted the importance of dedication and teamwork. This process demonstrated that complex tasks can be accomplished with sufficient effort and collaboration. Recommendations from experts to connect with additional specialists emphasized the role of a well-structured network in achieving project success. Challenges were also encountered, including prototype failures and the rapid evolution of social media, which made it difficult to stay updated. Additionally, navigating regulatory requirements for medical products proved to be complex and time-consuming. These setbacks required quick adaptation and problem-solving to keep the project on track. It was determined that an immediate market launch as a medical device was not feasible. Instead, positioning the product in the beginning as a lifestyle solution was deemed more appropriate, a strategy supported by expert feedback. This strategic pivot was essential in setting realistic and achievable goals for the project.

Overall, the journey was both challenging and rewarding. The experience expanded the team's skills and deepened the understanding of the importance of networking and expert

collaboration. The initial idea remains a strong motivator, inspiring continued efforts to create a meaningful and sustainable impact. These lessons provide a solid foundation for future projects, highlighting the value of resilience, collaboration, and strategic planning in overcoming obstacles and achieving success. Finally, due to the elaborated limitations, it was decided that the project will not be further pursued by Esther Klausmann and Justin Deisler.

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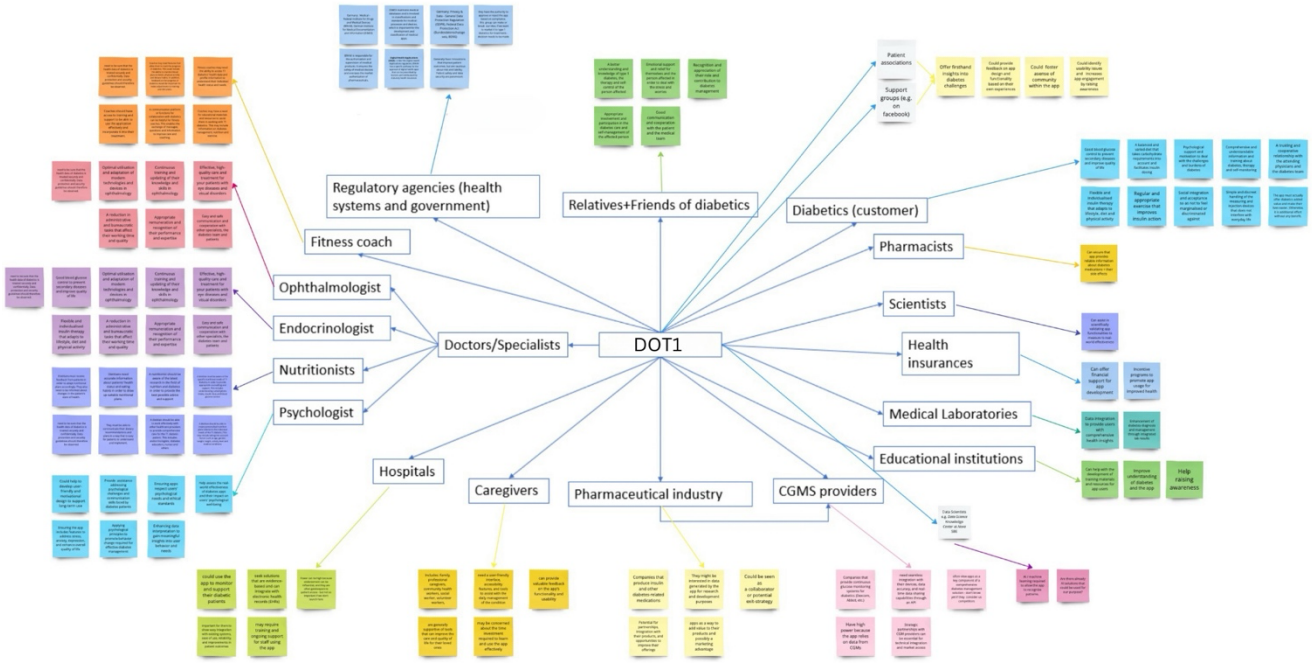
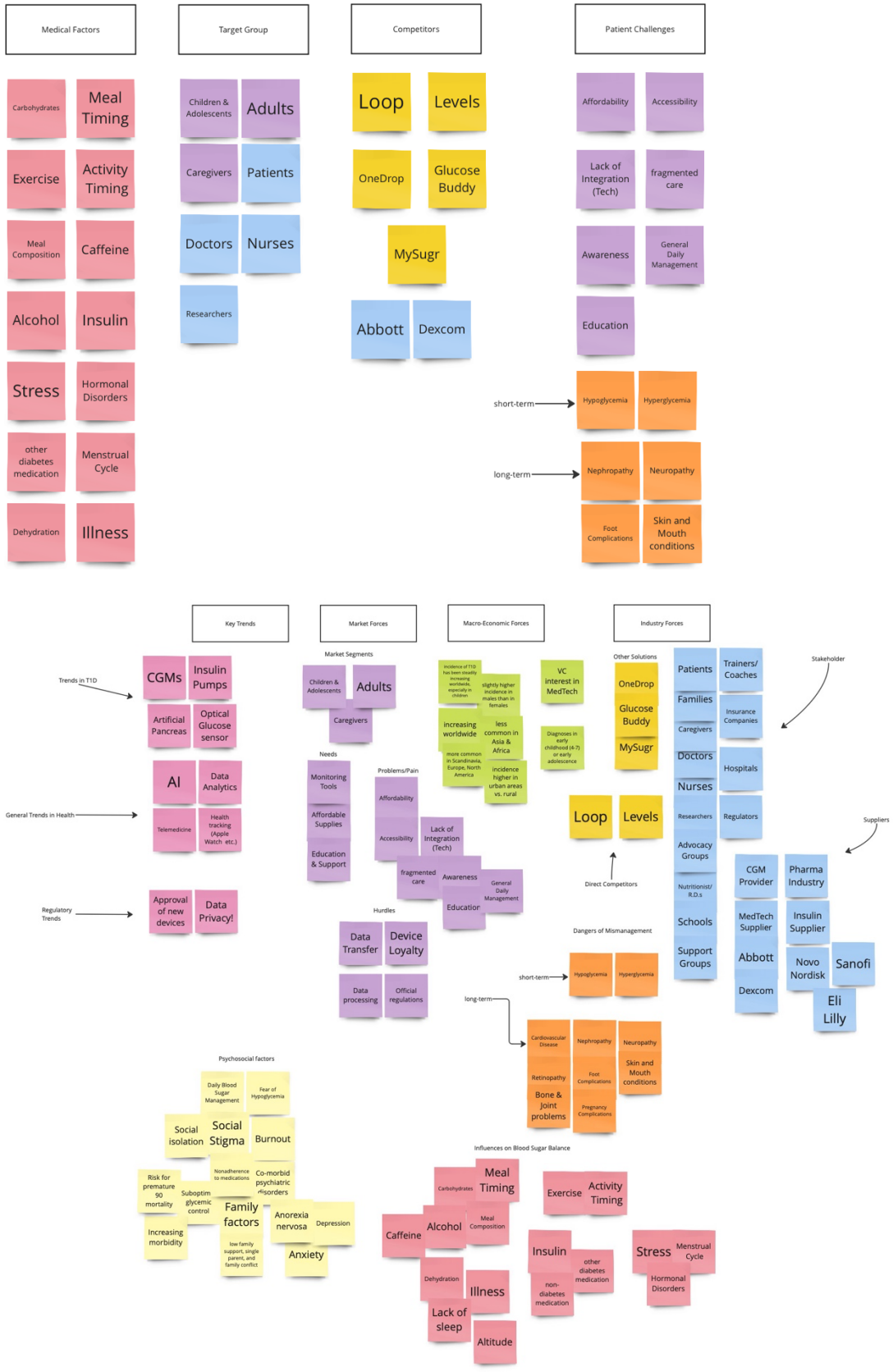
Appendix

Appendix 1: Stakeholder Map

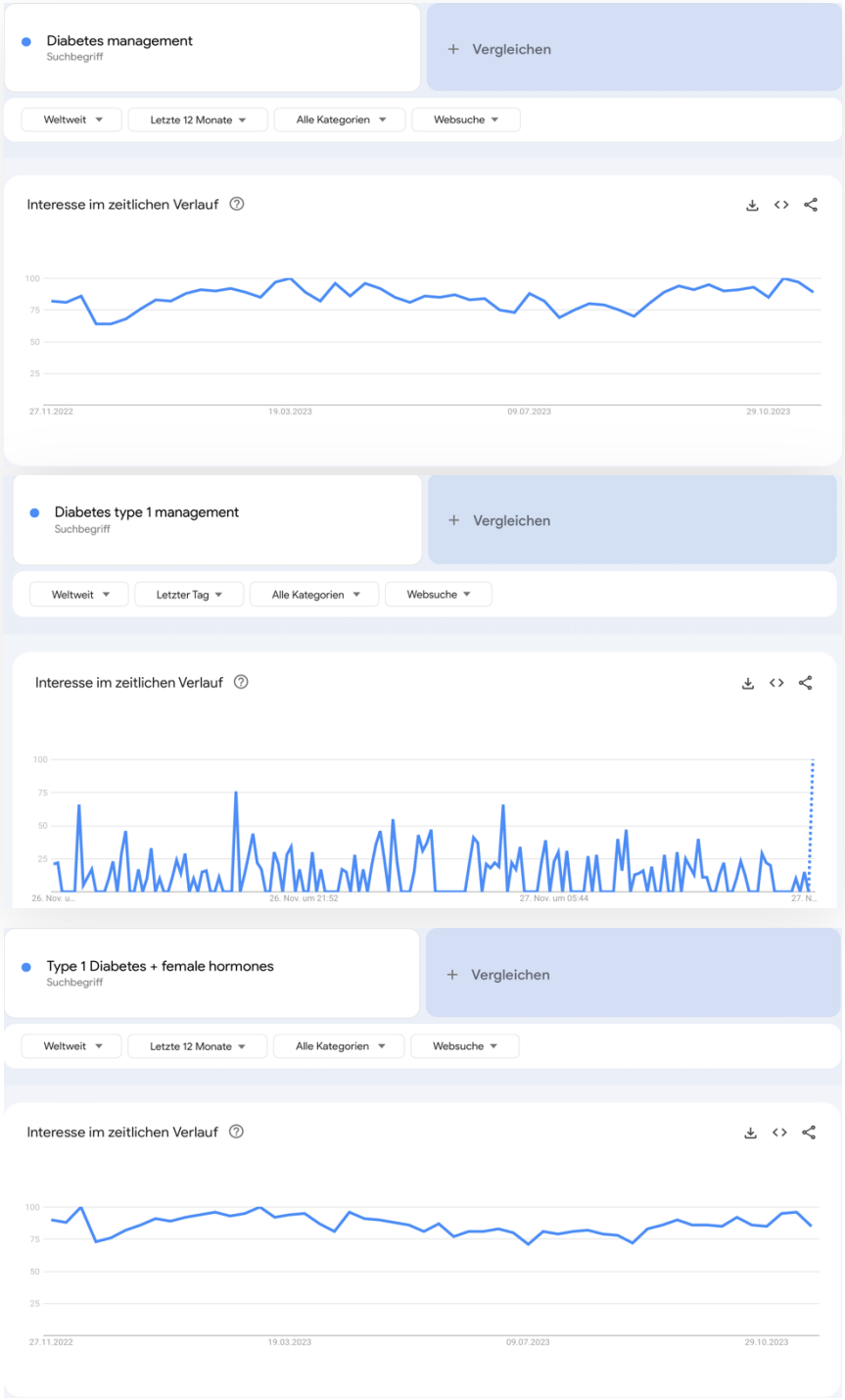


Appendix 2: Affinity Map



Appendix 3: Search Trend Analysis

Appendix 3.1: International




menstrual cycle + blood sugar levels
Suchbegriff
+ Vergleichen
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Letzter Tag
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Websuche
Interesse im zeitlichen Verlauf
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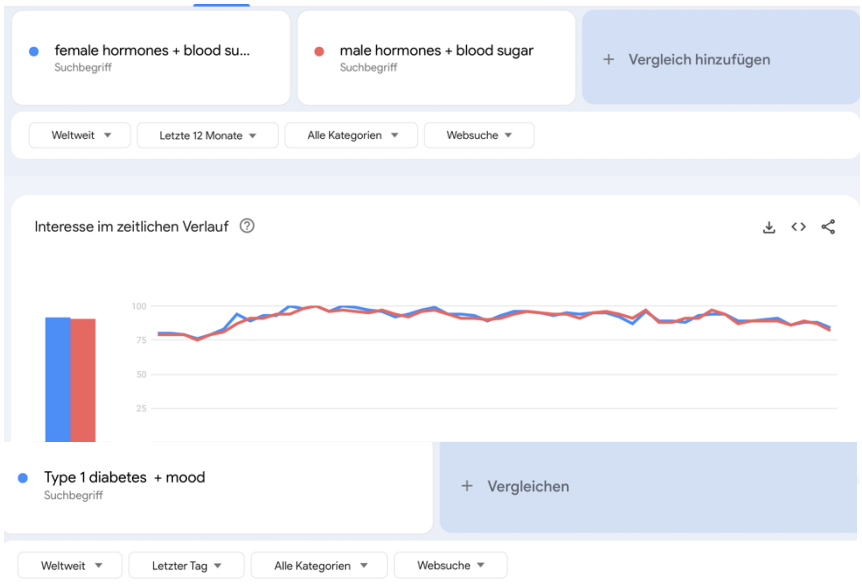
26. Nov. um 22:08
27. Nov. um 06:00
27. N...


female hormones + blood su...
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+ Vergleich hinzufügen
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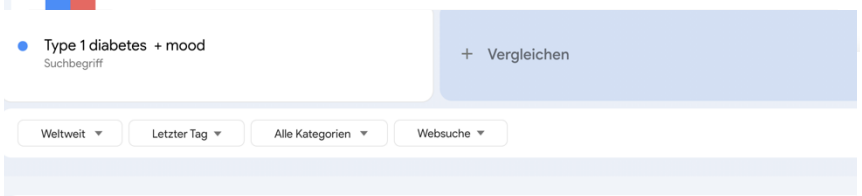
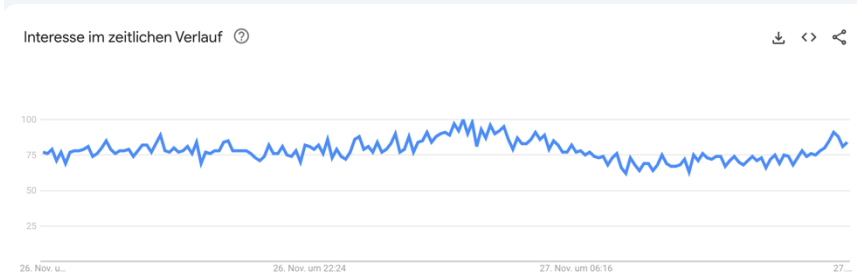

Type 1 diabetes + mood
Suchbegriff
+ Vergleichen
Weltweit
Letzter Tag
Alle Kategorien
Websuche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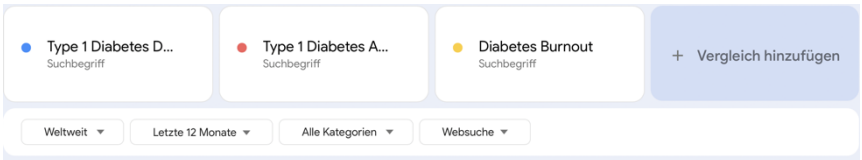
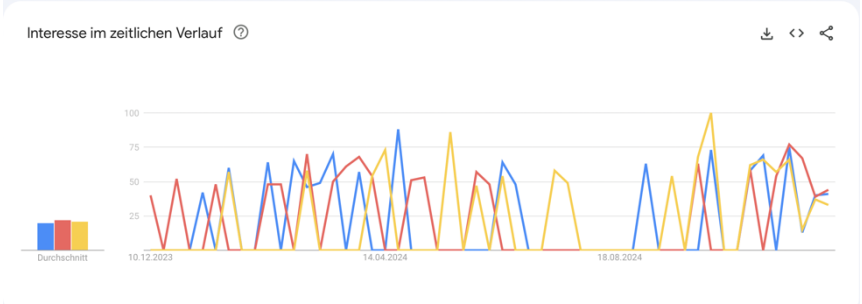
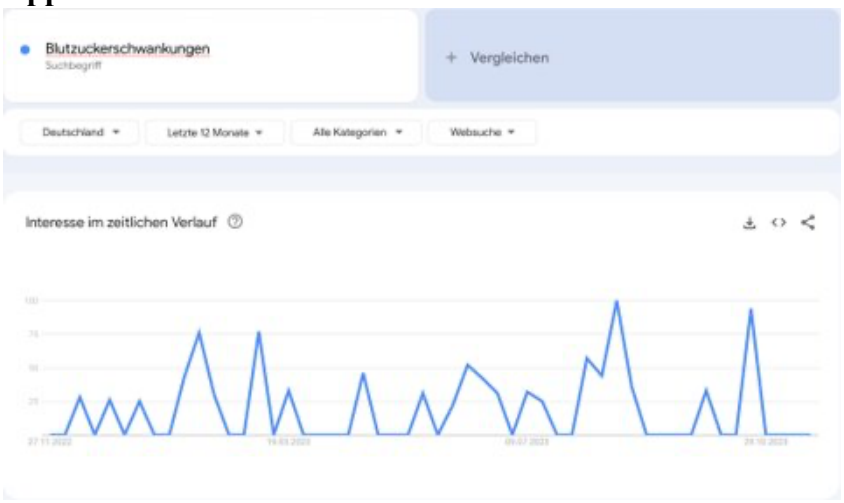
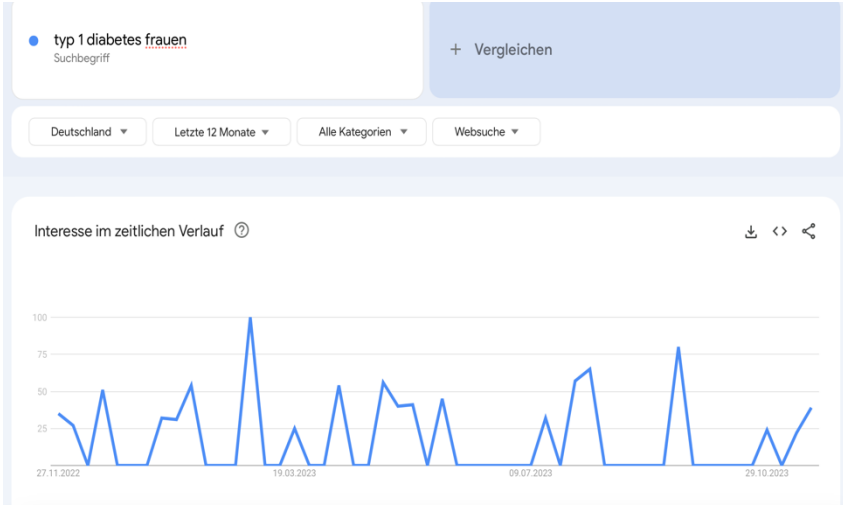
26. Nov. u...
26. Nov. um 22:24
27. Nov. um 06:16
27...

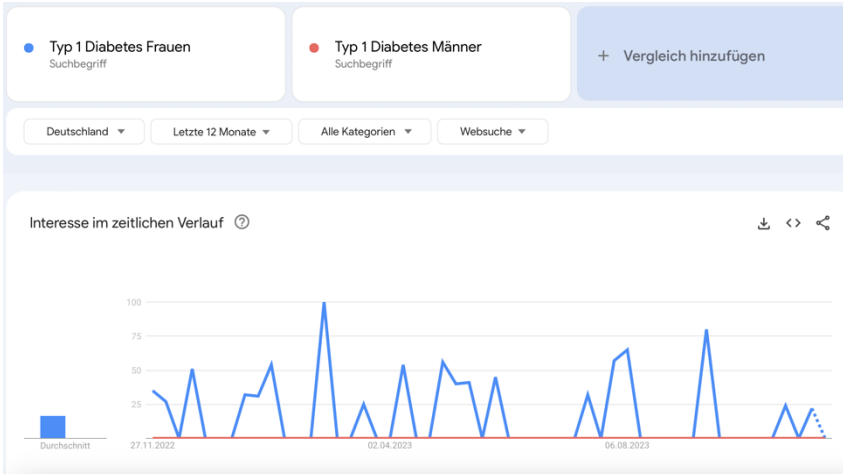

Type 1 Diabetes D...
Suchbegriff
Type 1 Diabetes A...
Suchbegriff
Diabetes Burnout
Suchbegriff
+ Vergleich hinzufügen
Weltweit
Letzte 12 Monate
Alle Kategorien
Websuche

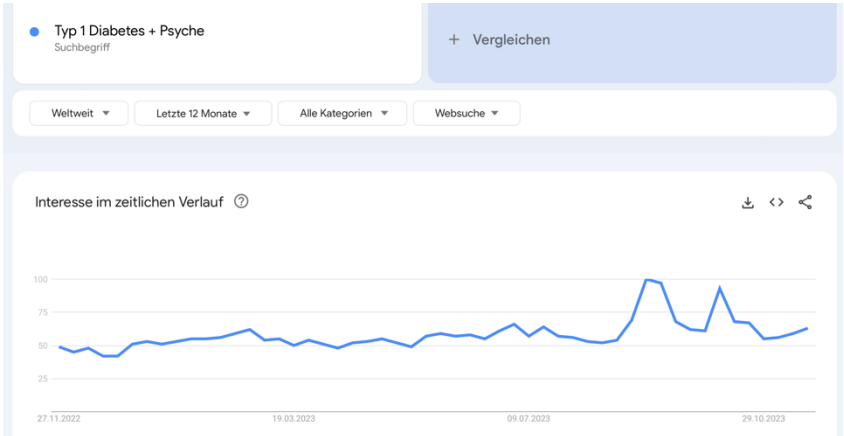

Interesse im zeitlichen Verlauf
100
75
50
25
Durchschnitt
10.12.2023
14.04.2024
18.08.2024

Appendix 3.2: National









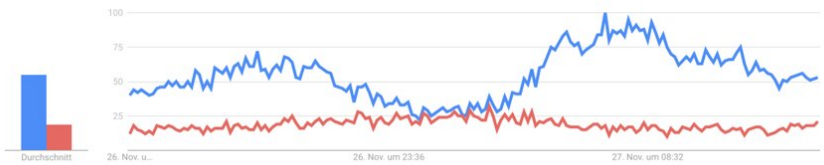
Type 1 diabetes + trauer
Suchbegriff

TYpe 1 diabetes + zufriedenh...
Suchbegriff

+ Vergleich hinzufügen

Weltweit | Letzter Tag | Alle Kategorien | Websuche

Interesse im zeitlichen Verlauf

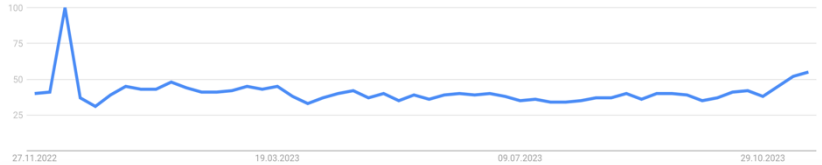


Typ 1 Diabetes + Emotionen
Suchbegriff

+ Vergleichen

Weltweit | Letzte 12 Monate | Alle Kategorien | Websuche

Interesse im zeitlichen Verlauf



Typ 1 Diabetes + Psyche
Suchbegriff

Typ 2 Diabetes + Psyche
Suchbegriff

+ Vergleich hinzufügen

Weltweit | Letzte 12 Monate | Alle Kategorien | Websuche

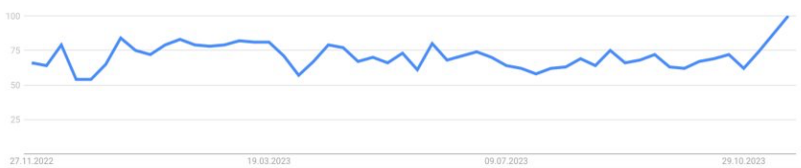
Interesse im zeitlichen Verlauf

Typ 1 Diabetes + psychische Begleiterkrankungen
Suchbegriff

+ Vergleichen

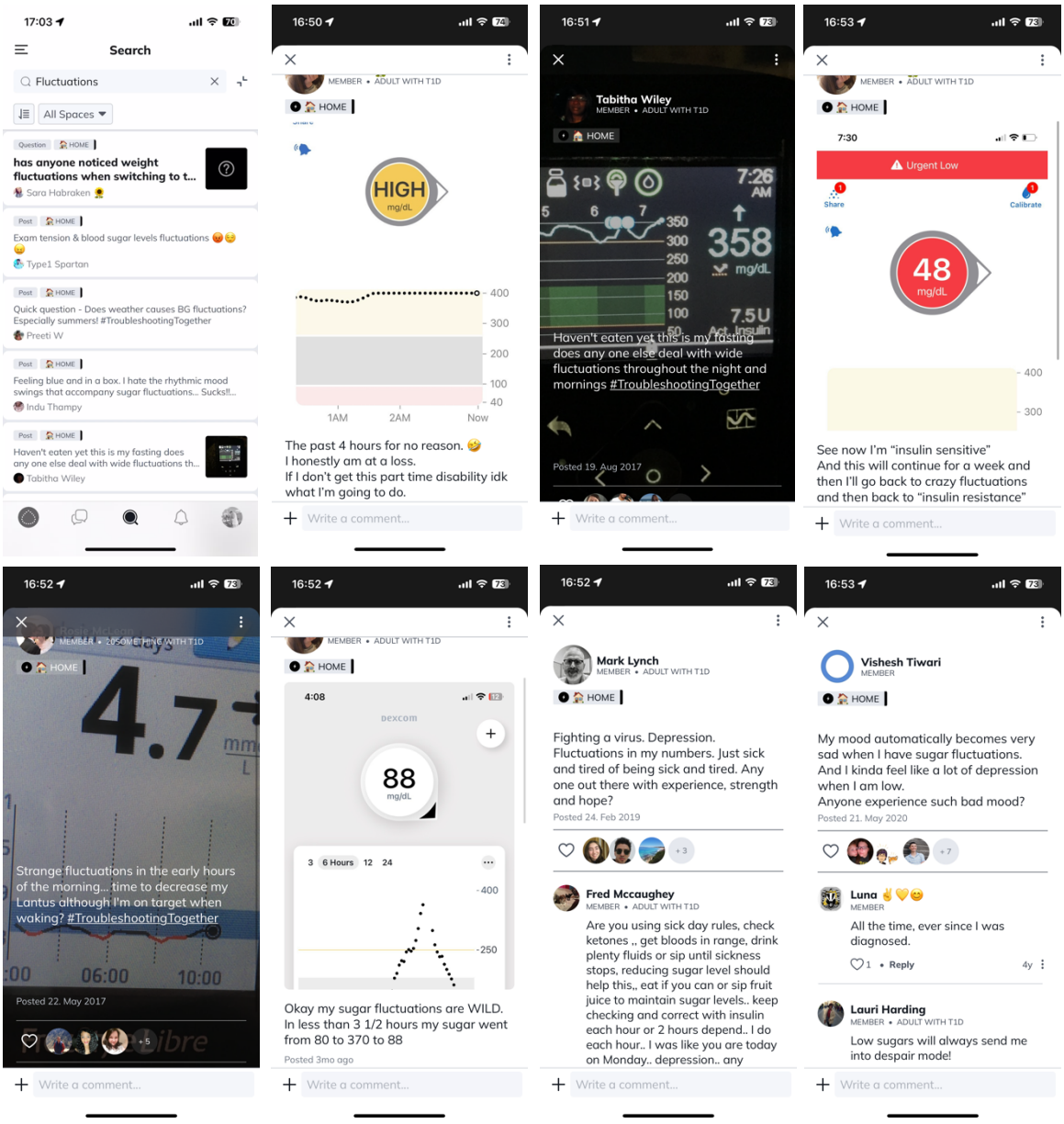
Weltweit | Letzte 12 Monate | Alle Kategorien | Websuche

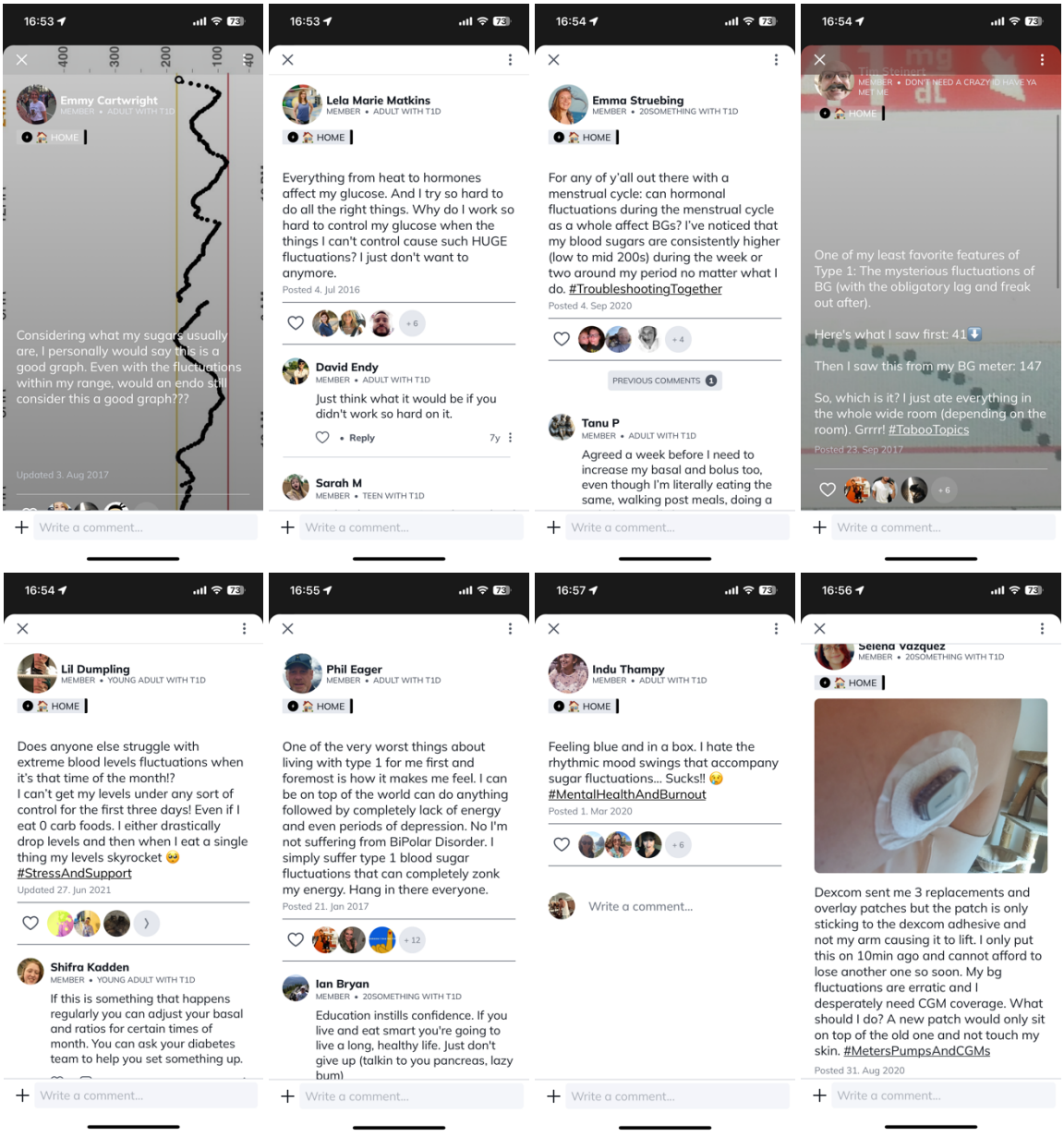
Interesse im zeitlichen Verlauf



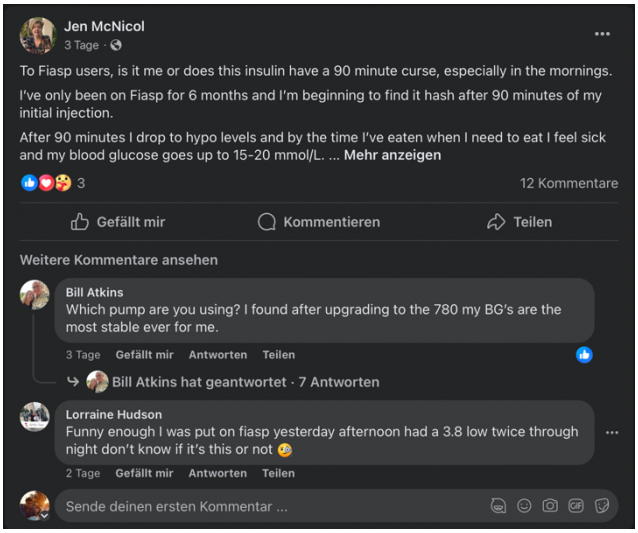
Appendix 4: Discussion Forums

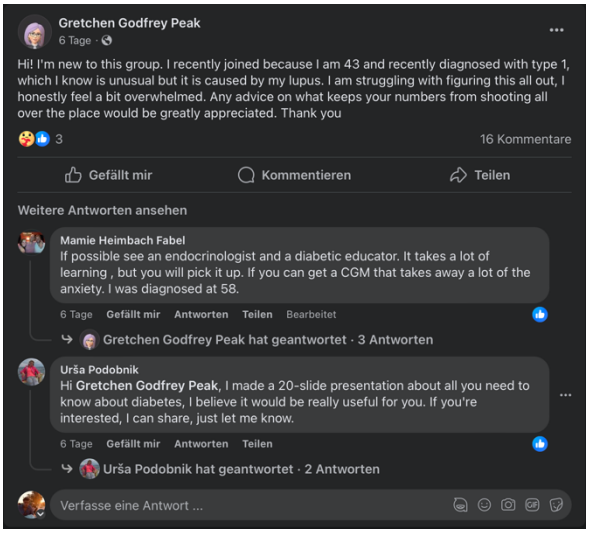
Appendix 4.1: BeyondType1 App

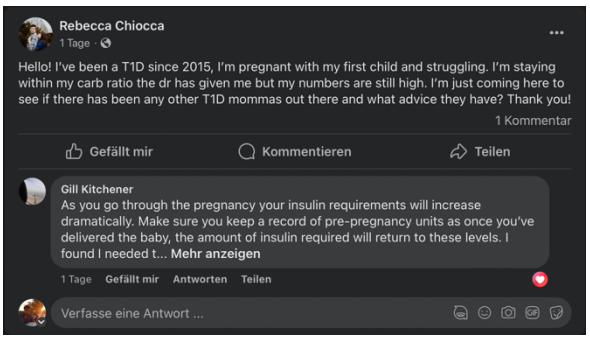




Appendix 4.2: Facebook Groups







Appendix 5: Patient Interview Script

- Introduce yourself.
- Introduce Project (as brief as possible)

1. How are you currently managing your diabetes? Are you using any specific tools? (Apps, journal, etc.) for this purpose?
2. Do you use the note function in the CGM app? If not, could you share your reasons for not using it?
3. How often per week do you experience episodes of high or low blood sugar levels and do know what triggered your last episode?
4. How did you handle the situation the last time you experienced high or low blood sugar levels?
5. If the apps you're using weren't free, would you still use them? If not, what features would an app need to have to be worth the cost?

6. Are you familiar with paid apps like Levels, Ultrahumans, etc., designed for diabetes management? What specific features of these apps interest you the most?
7. Can you describe the last biggest challenge you have faced in your day-to-day diabetes type 1 management?
8. What could have helped you in that specific situation or challenge you mentioned? Tell me something that has helped you
9. Which roles do emotions and stress play in your blood glucose levels and diabetes management?
10. Is there any aspect of diabetes management that you feel is often overlooked or requires more attention?
11. Is there anyone else you recommend I speak to, apart from patients, who can provide valuable insights into diabetes management?
12. How important is it for you to receive feedback and support from healthcare professionals or doctors through the app?

Appendix 6: Expert Interview Scripts

Appendix 6.1: Medical classifications and regulatory affairs in health innovation

Questions

1. Can you explain the primary considerations for determining the medical classification of an app like DOT1 under the MDR (Medical Device Regulation) or other relevant classifications?
2. What are the most critical regulatory frameworks (e.g., MDR, FDA, HIPAA) that DOT1 must comply with (European market)?
3. For apps incorporating AI in healthcare, are there specific regulatory or classification challenges we should be aware of, especially in terms of data accuracy and patient safety? (biggest hurdles?) →
4. What guidelines should we follow to ensure our app's algorithms meet regulatory requirements for reliability and accuracy in personalized health recommendations?(specific framework)
5. Can you give us an estimate of the duration and costs of such a process?
6. How should we handle the classification of data from multiple sources (e.g., CGM, lifestyle inputs) to ensure it complies with both privacy regulations and medical data integrity standards?
7. What steps would you recommend to navigate the regulatory approval process effectively, especially when dealing with health-related data and AI-driven health recommendations? → what would be our next step if we started today?
8. What certification processes (such as CE marking in the EU) should we consider pursuing to demonstrate compliance and build user trust, and are there specific audits for mobile health apps?
9. Are there specific medical classification codes or categories within the MDR or FDA guidelines that would best align with a diabetes management app that uses AI for personalized insights?
10. What advice would you give for setting up a compliance and risk management framework within DOT1 to monitor ongoing regulatory requirements and adapt to changes?

Follow-up Actions:

- Can you recommend any other experts or resources that could provide insights on medical device classification or regulatory compliance for digital health applications?

- Could you support the spread of a user survey within relevant communities to gather initial feedback on compliance expectations and trust factors for health apps?

Appendix 6.2: Data Security

Questions

1. Can you explain the **main challenges** in securing sensitive health data, particularly in mobile health applications like DOT1 that handle continuous glucose monitoring (CGM) data and personal lifestyle information?
2. What are the most critical data security protocols and regulations (e.g., GDPR, HIPAA) that we should ensure compliance with when developing and operating a health app in the European and global markets? Are there specific ones for apps that use ai?
3. How can we protect personal data (e.g., glucose levels, hormonal cycles) from being compromised during data transmission between the app, CGM devices, and cloud storage? --> From CGM via API —> DoT1 --> AI model (Cloud vs local?) --> DoT1 --> Doctors
4. How can we implement encryption for data at rest and in transit to ensure the highest level of protection for the sensitive information our app will collect? → his link Pseudonymization
5. In terms of AI and machine learning, how do we ensure the security and privacy of training datasets while developing algorithms for personalized recommendations in health management? → you do not need personalized data to train the AI model, go to hospitals and associations to get it
6. What types of security audits or certifications (e.g., ISO 27001) should we pursue to ensure our app is trustworthy and compliant with international standards?
7. What potential vulnerabilities are specific to mobile health applications that handle continuous health data, and how can we mitigate them to avoid breaches or unauthorized access?
8. Given the nature of the data, we are working with (e.g., CGM data, lifestyle information), what would be your recommendations for creating an incident response plan in case of a data breach?
9. Can you give us an approximate estimate of the cost of correctly backing up the data for the finished product? Are there any recurring costs to be expected?
10. What would be the first steps if we had to set up a security framework for DoT1 now?

Appendix 6.3: Nutrition

Questions

1. creation of nutrition plans for diabetics:
    a. How do you design a diet plan specifically for patients with type 1 diabetes?
    b. What indicators (e.g. blood glucose levels, weight, well-being) do you track in your diabetic patients?
2. adjustments and monitoring:
    a. How do you determine that a nutrition plan for a patient needs to be adjusted? (evaluation phase)
3. education and self-management:
    a. What role does patient education play in fostering self-management skill
    b. How do you educate diabetic patients about the relationship between their diet and management?
    c. On a scale of 0 to 10, how would you rate the level of awareness and understanding that your patients typically have about their condition?
4. dealing with blood sugar fluctuations through diet:
    a. What strategies do you recommend for acute blood glucose fluctuations?
5. use of data and AI in nutrition:
    a. One of our hypotheses is that integrating AI and data analytics into mobile apps could improve individual diabetes management. What is your experience with the use of AI in nutrition?
6. demand for nutrition apps for diabetics:
    a. Which features/ functionalities should such apps offer to be useful for patients?
7. diet and blood glucose management:
    a. Do you have specific recommendations for diabetics regarding the timing and composition of their meals, use of insulin? Long-term nutritional goals:
8. What long-term nutritional goals should diabetics have? How do you help them achieve these goals while managing their condition?
9. Are there other professionals, such as physicians or psychologists, that we should interview to gain further insight into diabetes management in the area of nutrition?

Appendix 6.4: Endocrinologist

Questions

1. How do you currently manage and monitor Type 1 Diabetes (T1D) patients in your practice?
2. What tools or applications do you typically recommend to patients for self-management of T1D?
3. Based on your interactions with patients, do they express interest in using mobile applications for diabetes management? If so, what features do they find most appealing or necessary?
4. Are there any unmet needs in T1D management that you believe a mobile application could address effectively?
5. Do you think integrating AI models and advanced data systems can improve individualized care for T1D patients? Could such systems help in making diagnostics or treatment recommendations more efficient?
6. What kind of data or insights from a mobile health app would be most beneficial for you as a healthcare provider in managing your T1D patients?
7. Have you observed any changes in glycemic variability or patient outcomes when patients use apps or other health technologies?
8. In your experience, how does psychological stress impact blood sugar levels in T1D patients?
9. Are there specific psychological or emotional challenges that T1D patients commonly report, and how do these challenges seem to affect their diabetes management or blood sugar control?
10. Are there differences between men and women due to the hormonal cycle of the women? Does this have an impact on the blood sugar?
11. Are there any systemic or logistical barriers that hinder the adoption of advanced mobile health solutions in T1D management?
12. What role do you think collaboration with healthcare professionals plays in enhancing the adoption and credibility of such apps?
13. Are there specific recommendations you have for us to consider in designing a solution that addresses both the medical and psychological needs of T1D patients?

Appendix 6.5: AI in Healthcare

Questions

1. In your opinion, what is the current state of AI in healthcare also in terms of helping medical professionals diagnose and treat diseases like diabetes?
2. What are some of the key challenges that AI models still face when applied to medical problems? For example, issues like hallucinations, bias, or a lack of transparency.
    a. How do you see these challenges being addressed in the near future?
3. AI hallucinations, where models generate inaccurate or misleading outputs, are a well-known issue. How prominent is this problem in healthcare applications, and what steps can be taken to mitigate such risks when using AI in critical medical settings?
4. When developing AI systems for healthcare, what should be the primary focus? Is it data quality, algorithm transparency, physician collaboration, or something else entirely?
    a. What do you believe is the most important aspect to get right for a successful AI healthcare application?
5. Are there any specific AI models or systems that have already demonstrated success in medical applications, (particularly in diabetes care or other chronic diseases?)
    a. What can we learn from these successes for future developments?
6. As AI becomes more prevalent in healthcare, what regulatory and ethical considerations should developers and healthcare providers keep in mind? How do you think these aspects are being handled in current AI health projects?
7. We are working with the hypothesis that AI-driven models could help improve personalized recommendations for diabetes patients. What is your perspective on the potential of AI to enhance self-management and personalized healthcare (for diabetes patients)?
8. What type of data is necessary to effectively train AI systems to provide precise recommendations (for Type 1 diabetes patients) for healthcare?
    a. How would you assess the availability and quality of such data in the healthcare sector?
9. How do you ensure that the recommendations generated by AI are reliable and understandable for both patients and healthcare providers?
10. How important is it for AI models in healthcare to dynamically adapt to new data and behavior patterns?
    a. How is this typically managed in the development of such models?
11. How important is it that AI-based applications are developed in close collaboration with doctors?
    a. What challenges do you see in integrating AI tools into the existing clinical workflow?
12. What are the key technical or ethical challenges you see when it comes to using AI in healthcare, particularly in diabetes care?
    a. How can these challenges best be addressed?

13. AI systems can be prone to bias, which could lead to inequality in healthcare.
    a. What steps can be taken to ensure that AI applications in healthcare remain fair and inclusive?
14. How do you see the future development of AI in healthcare?
    a. What advancements do you expect in the next 5-10 years, particularly regarding personalized healthcare?
15. What do you believe are the most important steps to successfully implement AI in mobile health applications?
    a. How can the adoption of such technologies be encouraged among patients and healthcare professionals?

Appendix 6.6: Social Media

Questions

1. what first steps and channels do you recommend to build initial reach and engagement for an app like DOT1?
2. which content formats and strategies, such as reels, carousels or stories, do you currently see as particularly effective in the nutrition sector, and what would you recommend for DOT1?
3. what factors would you analyze to evaluate the marketing strategy of a comparable health or nutrition app and compare it to DOT1?
4. how did you build and engage your target audience? What methods would you use for DOT1?
5. what strategies do you think are key to building trust and credibility in the health and nutrition sector?
6. how do you find the right balance of organic content and paid advertising for maximum effect?
7. in your experience, what makes a successful social media presence/campaign that retains users in the long term?
    a. What are the traditional KPIS (on Instagram) when a campaign is considered successful (maybe average % or key number)
    b. what metrics would you track to measure the success of a campaign for DOT1 and ensure sustainable engagement?
8. what mistakes do health and nutrition brands often make in (social media) marketing and how do you avoid them?
9. what opportunities and challenges do you see in meta-campaigns (Facebook/Instagram) for DOT1?
    a. Which other platforms can health nutrition companies use to increase awareness and reach

Appendix 7: Patient Interview Clustering

Interviewee	Background /Demographics
Malak	40 years old, diagnosis: 14 yo, Lebanese
Carla	60 yo, diagnosis: 9 yo, Washington DC , US
Sinan A.	45 yo, diagnosis: 42 yo, US
Michael	61 yo, diagnosis: 14 yo, NYC
Giovana K.	24 yo, diagnosis: 11yo, Sao Paulo
Lydia	32 yo, diagnosis: 30yo, Köln
Clara	21 yo, diagnosis: 21yo, Aachen, Germany

Q1	Q2	Q3
CGM, Freestyle Libre App	No	3-4 (L)
Insulin pump(Omnipod), Dexcom 6 app, My Fitness Pal (carb counting	No	2 (L), 4 (H)
Insulin pump(Novorapid), Dexcom 6 app,	No	99% in range; std.dev.=18
Insulin Pump (Metronics), Freestyle Libre sensor but NO App	No	1-2 (L)
Insulin Pump (Slim loop), Dexcom 6 App	No	<5(H,L)
CGM, Freestyle Libre 3 App, Strava App	No	2 (L,H)
Insulin Pump (Ypsopump), Dexcom 6 app	No	7(H) HB1C = 6,4

Q4
Extra injections
Extra injections + water 1 L
Strict carb counting, alerts (every 5 minutes)
Extra injections
Extra injections
X
emergency nasal spray or eat quickly. For high blooc

Q5
Yes, features: Inf. About comorbidities,
No, features: Scan Barcode for information on carbs
Yes, data customization missing
No
Yes, features: Mentrual cycle, Patterns wrong behaviour
Yes, features: Mentrual cycle, infections
Yes, features: If features offered automation and integration

Q6	Q7
No	X
No	Emergency case, hospital stay, long healing
Yes, highly educated	Job loss, High insurance and treatment costs
No	High Insurance and treatment costs
Yes, educated	X
No	Mental load, job loss
No	Disease acceptance, frustration, mental load, an

Q8	Q9
X	Impact high: Stress, Fear
Should have allowed Self-managemer	Impact high:Stress, grief, depression, appetite loss
X	Impact high: Fear, Shaking,Insulin resistence, emot. Instability
Better healthcare system	Impact high: Stress, emot. Instability
X	Impact high: Stress, emot. Instability, insulin resistance
X	X
Connceting with other diabetics, with s	Impact high: stress and emotions significantly impact my bloo

Q10
Awareness, Missing education(female hormones)
Awareness, Missing education (psychological disrimination, mental health, lack of community, female hormones)
Missing education (psychological discrimination, family support)
Missing education (mental health)
Missing education(female hormones, physical activity)
Missing education(female hormones, sexuality, pregnancy, cases of emergencies)
Food documentation and understanding how different meals affect blood sugar are areas that need more attenti

Q11	Q12
Other patients, her mentor	X
DNE	Very importa
Med. specialists	X
Blogs	No trust in d
General practioners	Very importa
Companies that work with health tech sensors	X
X	Feedback an

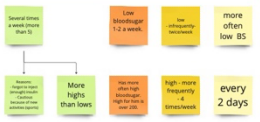
Notes
X
Celebrating Milestones
X
Getting rid of victim consciousness, acceptance
X
X
More interaction with other patients/podc Interested but not educated or familiar

Loop-System

CGM-System

"Note"-Function

Blood sugar fluctuations

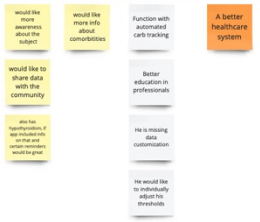


Challenges

Fears

Learnings

Wishes

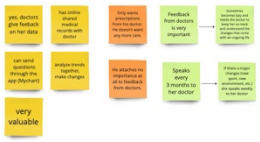


Willingness to pay

Management

Mental-Load

Relationship to Doctor



Appendix 8: Expert Interview Outcomes

Appendix 8.1: Medical Classification (Irina Lopes & Lucia Domingues)

Background:

- **Irina lopes:**
  - Bachelor's Degree in Biomedical/Medical Engineering at Instituto Superior Técnico
  - Master's Degree in Biomedical/Medical Engineering at Instituto Superior Técnico
  - Full-time at "Clynx Health" as Medical & Regulatory Affairs Representative
  - Scientific trainee at the European Commission
- **Lucia Domingues:**
  - Master's in Physiotherapy at Polytechnic Institute of Setúbal
  - Doctoral Program at Nova Medical School
  - Coordinator of Nova Clinical Research Unit (CRU)

1. Medical Device Classification

- The classification of DOT1 under the Medical Device Regulation (MDR) depends on how the app's features are used and the impact on healthcare decisions. If DOT1 provides information for medical decisions, such as insulin adjustments, it likely falls under Class 2a (Rule 11 for active medical devices).
- Class 2a requires extensive documentation, clinical trials, and compliance with quality management systems like ISO 13485. Alternatively, starting with Class 1 (less complex) and transitioning later is an option to gather data and minimize initial costs.
- Regulatory challenges include distinguishing DOT1 from lifestyle apps, which face simpler approval processes.

2. Critical Regulatory Frameworks

- MDR (EU): Primary framework for medical devices in Europe. Requires CE marking and adherence to data privacy standards (e.g., GDPR).
- FDA (USA): A more permissive process, faster than MDR, though not necessarily cheaper. Starting with FDA approval can facilitate later MDR certification.
- HIPAA (USA): Relevant if handling data within the U.S., focusing on data privacy and patient safety.
- GDPR (EU): Essential for protecting personal data and ensuring compliance with European privacy laws.

3. AI-Specific Considerations

- While EU AI-specific regulations (EU 2024/1689) exist, they are not yet tailored to healthcare. The app must align with general AI standards while addressing data accuracy, reliability, and ethical use.

- Adopting best practices outlined in Medical Device Coordination Group (MDCG) guidance documents helps align AI-driven health recommendations with regulatory requirements.

4. Duration and Costs of Certification

- Achieving Class 2a classification typically takes 2 years and costs up to €700,000, including documentation, clinical trials, and application fees (~€10,000).
- Costs escalate with additional certifications and adjustments required for compliance. Using academic partnerships for clinical trials can lower expenses.

5. Regulatory Compliance for Data

- Aggregating data from multiple sources (e.g., CGM, lifestyle inputs) must comply with GDPR for privacy and MDR for medical integrity.
- Clinical trials and ethical committee approvals are critical for validating the app's functionality and ensuring patient safety.

6. Setting Up a Compliance Framework

- A compliance framework should include quality management systems (ISO 13485) and regular audits to ensure ongoing alignment with regulatory requirements.
- Staying updated via subscriptions to notified bodies and medical device associations (e.g., MedTech Europe) is crucial. Workshops and newsletters can help maintain compliance with evolving standards.

7. Recommendations for Startups

- Starting as a Class 1 device is a cost-effective way to enter the market, gather data, and validate the app's functionality. Transitioning to Class 2a later ensures scalability.
- Partnering with established manufacturers or distributors (e.g., Dexcom, Abbott) can help navigate regulatory processes and reduce costs.

8. Certifications for Trust and Market Access

- Achieving the CE mark (EU) and ISO certifications (e.g., ISO 13485 for medical devices) builds user trust and ensures market access.
- Attending regulatory workshops offered by notified bodies helps startups streamline their application processes.

Medical Classification Guidance

State of Healthcare situation or patient condition		Significance of Information provided by the MDSW to a healthcare situation related to diagnosis/therapy		
		High Treat or diagnose *~ IMDRF 5.1.1*	**Medium** Drives clinical management *~ IMDRF 5.1.2*	**Low** Informs clinical management *(everything else)*
	Critical situation or patient condition *~ IMDRF 5.2.1*	**Class III** *Category IV.i*	**Class IIb** *Category III.i*	**Class IIa** *Category II.i*
	Serious situation or patient condition *~ IMDRF 5.2.2*	**Class IIb** *Category III.ii*	**Class IIa** *Category II.ii*	**Class IIa** *Category I.ii*
	Non-serious situation or patient condition *(everything else)*	**Class IIa** *Category II.iii*	**Class IIa** *Category I.iii*	**Class IIa** *Category I.i*

Source: (European Commission, 2019, p. 26)

Appendix 8.2: Data Science and Security (Marco Saias & Tiago Godinho)

Background:

- **Marco Saias**
  - Licentiate Degree in International & European Law at University of Lisbon
  - Master's Degree in Intellectual Property at Universidad Carlos III de Madrid
  - Full-time at "TekPrivacy" for Privacy & Data Protection
  - Lecturer on Protection of Personal Data, Privacy & Cybersecurity in the EU at Universidade Autónoma de Lisboa
  - Partner at "Amber Partners"
- **Tiago Godinho**
  - Master's Degree in Biological Engineering at Instituto Superior Técnico
  - Blockchain Programme Coordinator at Nova SBE
  - Area Coordinator at Nova SBE Executive Education

1. Main Challenges in Securing Sensitive Health Data

- The communication between the mobile device and CGM devices must be very secure, particularly ensuring secure Bluetooth connections because of their limited range.
- A manufacturer license is crucial to enable data sharing between the app and the CGM manufacturer's app.
- Data transmission between the mobile device and the server must involve anonymization techniques, such as assigning pseudonyms or hashes to personal identifiers.
- Providers like Microsoft and Amazon may have policies that do not align with storing healthcare data, emphasizing the need for specific contracts with compliant cloud storage providers.

2. Critical Data Security Protocols and Regulations

- GDPR compliance is fundamental, requiring strong data processing agreements with suppliers.
- HIPAA is not applicable in European contexts, but regulations such as ISO certifications (e.g., ISO 27001) are important to meet global standards.
- Conducting Data Protection Impact Assessments (DPIAs) is a legal necessity.

3. Protection During Data Transmission

- A secure data flow structure: CGM → API → DOT1 → AI model (cloud or local processing) → DOT1 → Doctors.
- Encryption for data at rest and in transit is essential. Links to additional resources on pseudonymization and encryption were provided by Marco Saias.

4. Encryption Implementation

- Encryption at all points: from CGM data collection to cloud storage.
- Use of pseudonymization and other anonymization techniques to further secure sensitive data.

5. AI and Training Data Privacy

- Training datasets should not use personalized data; data can be sourced from hospitals and associations to ensure privacy.
- Ensuring that datasets are pre-anonymized during the training process.

6. Security Audits or Certifications

- Recommendations included pursuing ISO 27001 certification for international compliance and building trust with users.

7. Incident Response Plan Recommendations

- Before a breach: Conduct regular security checks on cloud providers and perform DPIAs.
- After a breach: Inform the supervisory authority within 72 hours, specify the nature of the data breach, and notify affected users if the breach is severe. Refer to GDPR Articles 32, 33, and 34 for detailed guidance.
- For medical devices: Inform cybersecurity authorities in the respective country.

8. Cost Considerations

- Costs for compliant cloud providers were highlighted.
- The medical classification process was noted to include many of the foundational elements for data security.

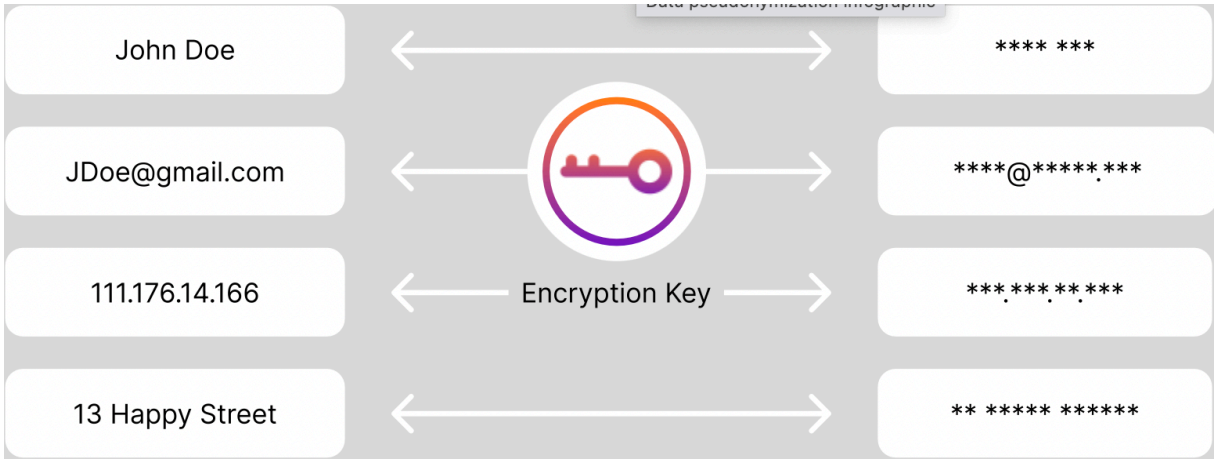
9. First Steps for Setting Up a Security Framework

- Align security requirements with the medical classification process.
- Involve external consultants for DPIAs if internal expertise is limited.

Anonymization

Source: (Simon, 2024)

Pseudonymization



Source: (Simon, 2024)

Appendix 8.3: Nutritionists: (Robby Barbaro & Marta Silvestre)

Background:

- **Robby Barbaro**
  - Bachelor's Degree in Event Management at the University of Florida
  - Master's Degree in Public Health at the American Public University
  - Co-Founder of "Mastering Diabetes"
- **Marta Silvestre**
  - Bachelor's Degree in Nutritional Sciences at Universidade do Porto
  - Doctoral Program in Biochemistry and Molecular Biology at Queen Mary University of London
  - Doctoral Program in Metabolic Diseases and Food Behavior at Universidade de Lisboa
  - Researcher at the University of Auckland
  - Professor at Nova Medical School

1. Nutritional Strategies for Diabetes Management

- Primary Focus Areas:
  - Blood Glucose Control: Maintaining 70% or more time in range (70–180 mg/dL), with tighter ranges for specific populations (e.g., pregnant women: 63–140 mg/dL).
  - Weight Management: Critical for Type 2 diabetics, as excess fat increases insulin resistance.
  - HbA1c Targets: Below 7% for Type 1 and Type 2 diabetics; lower targets (e.g., 6.5%) for well-managed cases, but not at the cost of increasing hypoglycemia risk.
  - Children: Proper growth is a unique goal, as insulin is an anabolic hormone critical for development.
- Preferred Nutritional Approach:
  - High-Fiber, Plant-Based Diets: Foods like lentils, chickpeas, and other legumes delay glycemic peaks and provide stable energy. Greens are recommended in every meal.
  - Protein Intake: Increased to up to 1.8 grams per kg of body weight daily, with a focus on plant-based sources.
  - Fat Limits: Fat intake capped at 30% of total energy, with low saturated fats. Keto diets are discouraged due to long-term cholesterol and metabolic risks.
  - Personalization: Dietary recommendations are tailored to patient preferences and biochemical markers, ensuring sustainability.
- Challenges with Certain Diets:
  - High-Fat Diets: These cause delayed glucose spikes, complicating control. While short-term improvements may occur, the long-term risks (e.g., elevated cholesterol) outweigh benefits.
  - Dairy Products: Controversial for their potential role in Type 1 diabetes development and their lactose/glucose impact on blood sugar. However, they are generally acceptable if the patient tolerates them well.

2. Indicators for Tracking and Adjustments

- Tracked Metrics:
  - CGM data: Time in range, time above and below range.
  - Blood Tests: HbA1c every 3–6 months, cholesterol, triglycerides, vitamins (B12, B9, D).
  - Physical Metrics: Body weight, waist circumference.
  - Patient Well-being: Energy levels, sleep quality, and focus.
- Adjustment Triggers:
  - Blood test results: High cholesterol prompts reduced saturated fats; low weight necessitates increased energy intake.
  - Patient feedback: Addressing boredom or aversion to certain foods with new recipes.
  - Biochemical changes: Adjustments to ensure stability without compromising overall health.

3. Education and Self-Management

- Educational Strategies:
  - Initial appointments often focus on explaining diabetes, its impacts, and the role of diet and insulin. Subsequent visits address specific dietary plans.
  - Emphasis on teaching patients to correlate food intake with insulin dosages.
  - Tools like PowerPoint presentations and direct communication enhance understanding.
- Key Areas of Focus:
  - Weightlifting and Exercise: Building muscle mass improves insulin sensitivity and glucose metabolism. Patients are encouraged to incorporate sustainable exercises like stair climbing or weightlifting at home.
  - Burnout and Emotional Barriers: Addressing diabetes burnout is critical, particularly for patients lacking support systems. Family involvement or support groups are recommended.
- Outcomes:
  - Patients typically progress from moderate awareness (5/10) to a deeper understanding (8–9/10) after consistent coaching.

4. Role of Digital Tools and AI

- Potential Features for DOT1:
  - Meal Logging and Tracking: Voice input, portion size estimation, and tracking the delayed impact of fats on glucose.
  - Personalized Insights: Real-time feedback on glucose patterns, dietary recommendations, and insulin timing.
  - Pattern Detection: AI could identify trends, such as hormonal influences (e.g., menstrual cycles) or emotional states (e.g., stress), and adjust recommendations accordingly.
  - Integration with Devices: Seamless syncing with CGM data for automated analysis and guidance.

- Existing Applications:
    - Tools like OmniPod 5 demonstrate AI's capability for real-time insulin adjustments, providing a model for DOT1's development.

5. Community Building and Engagement

- Social Media Strategies:
    - Platforms like Instagram foster engagement through reels, carousels, and interactive content. Sharing success stories builds trust and motivates patients.
    - Community features in apps could encourage peer support and reduce feelings of isolation.
- Support Networks:
    - Encouraging family or peer involvement improves adherence. Patients with a strong support system often achieve better outcomes.

6. Practical Strategies for Managing Blood Sugar Fluctuations

- For Acute Fluctuations:
    - Pre-bolus insulin before meals.
    - Consistent meal timing and insulin dosing.
    - Avoid high-fat diets, which complicate postprandial glucose management.
- Long-Term Goals:
    - Building resilience and metabolic memory through sustained lifestyle changes.
    - Achieving independence in self-management while maintaining regular check-ins for accountability.

Appendix 8.4: Endocrinologist (Carolina Neves)

Background:

- Endocrinologist at APDP in Lisbon, Portugal.

1. Multidisciplinary and Holistic Management:

- Team-Based Approach: Management of T1D extends beyond the endocrinologist's office. A coordinated network, including endocrinologists, dietitians, diabetes educators, and mental health professionals, works together to provide comprehensive care. This team-based model ensures that patients receive medical guidance, nutritional planning, and psychological support, reflecting a recognition that diabetes care is multifaceted and not purely physiological.
- Continuous Adjustments: Regular consultations allow clinicians to tailor insulin regimens, dietary recommendations, and other therapeutic measures based on each patient's evolving needs. This iterative process ensures that treatment remains dynamic and responsive rather than static.

2. Technology Integration in T1D Care:

- Devices and Tools: Continuous Glucose Monitors (CGMs) and insulin pumps are standard in modern T1D management. CGMs provide real-time glucose readings, reducing the burden of frequent finger-stick tests. When paired with insulin pumps, patients often achieve more stable glycemic control.
- Mobile Applications and Digital Health Tools: Apps like mySugr and Glucose Buddy help patients track blood sugar levels, insulin doses, carbohydrate intake, and physical activity. Manufacturer-specific CGM apps (e.g., Dexcom, FreeStyle Libre) enable seamless, on-the-go glucose monitoring and data visualization.
- Empowerment Through Technology: By facilitating self-monitoring, these apps help patients take a more active and informed role in their day-to-day care. Clinicians report that patients using these tools often become more engaged and proactive in managing their condition.

3. Patient Enthusiasm and Desired App Features:

- High Patient Interest: Many patients express strong enthusiasm for mobile health applications, as these solutions simplify data collection and interpretation.
- Key Functionalities Sought by Patients:
- Real-Time Glucose Monitoring: Immediate feedback on glucose levels allows for prompt interventions, potentially preventing severe hypo- or hyperglycemic events.
- Alert Systems: Personalized notifications, especially regarding blood sugar excursions, help patients respond quickly and avoid long periods of dysglycemia.
- Data Sharing: The ability to transmit data directly to healthcare providers enables more informed and collaborative clinical decisions.

- User-Friendly Interface and Visualization: Clear, easy-to-interpret data graphs and dashboards reduce patient frustration and enhance comprehension, making complex data accessible.

4. Unmet Needs and Opportunities for App-Based Solutions:

- Comprehensive Data Integration: Patients and providers desire a single platform that consolidates all relevant data—glucose readings, insulin dosing records, meal composition, physical activity logs, stress indicators, and even hormonal fluctuations. This integrated approach would reduce the fragmented experience patients currently face across multiple platforms.
- Psychological and Emotional Support: Beyond glucose and insulin metrics, there is a need for mental health resources within the same application. The inclusion of stress management techniques, cognitive-behavioral exercises, mood tracking, and direct access to mental health professionals could provide a more holistic approach.
- Holistic Care Delivery: Recognizing that T1D management is not just about numbers, respondents suggest embedding features that address both the psychological and social aspects of living with a chronic condition.

5. Potential of Artificial Intelligence (AI) and Advanced Data Systems:

- Predictive Analytics: Advanced algorithms can sift through large datasets, identifying patterns and predicting future glucose fluctuations. For example, AI might forecast when a patient is likely to experience low blood sugar during certain times of the day or after specific activities.
- Personalized Treatment Adjustments: By analyzing past trends and patient-specific factors, AI could recommend more accurate insulin dosing strategies, help fine-tune carbohydrate ratios, and suggest lifestyle modifications. This personalized approach can reduce trial-and-error in managing T1D, ultimately improving outcomes.

6. Valuable Data Insights for Providers:

- Trend Analysis Over Time: Healthcare providers benefit from aggregated data that shows long-term glucose patterns rather than isolated readings. This can inform more strategic treatment decisions.
- Insulin and Dietary Patterns: Understanding how a patient's insulin usage correlates with their dietary choices, physical activities, and stress levels helps clinicians craft more effective and individualized treatment adjustments.
- Psychosocial Factors: Stress levels and emotional well-being, when monitored alongside physiological metrics, can provide a more nuanced understanding of glycemic control challenges.

7. Documented Improvements in Patient Outcomes:

- Better Glycemic Control: Patients using digital tools often report lower HbA1c levels and reduced glucose variability. Real-time feedback and data-driven interventions contribute to these improvements.
- Enhanced Engagement and Accountability: The sense of responsibility and empowerment derived from easy-to-understand data can lead to more consistent treatment adherence, healthier lifestyle choices, and fewer acute complications.

8. Psychological and Gender-Specific Considerations:

- Psychological Stress: Emotional distress and anxiety about hypoglycemia can lead to elevated blood sugar levels and reduced adherence to management plans. Addressing this stress is crucial for maintaining stable glycemic control.
- Diabetes Burnout: Feeling constantly burdened by the demands of T1D management can result in patients disengaging from self-care routines.
- Hormonal Influences in Women: Hormonal fluctuations throughout the menstrual cycle can significantly impact insulin sensitivity and glycemic control. Tailored solutions that account for these variations are needed to help women maintain stable glucose levels during different phases of their cycle.

9. Barriers to Widespread Adoption of Mobile Health Solutions:

- Access and Equity Issues: Not all patients have reliable smartphone access or stable internet connectivity. This digital divide may prevent some individuals from benefiting from the latest technology.
- Data Privacy and Security: Concerns about how personal health data is collected, stored, and shared may deter patients from fully utilizing these tools.
- Interoperability and Ease of Use: Technical hurdles, such as a lack of standardization across devices and platforms, and a steep learning curve for non-tech-savvy patients, can hinder adoption.

10. The Importance of Healthcare Professional Endorsement:

- Credibility and Trust: When clinicians recommend and guide patients in using digital tools, patient confidence increases. Professional involvement ensures data is not only collected but also meaningfully interpreted to inform treatment decisions.
- Clinical Integration: Strong collaboration between developers, patients, and healthcare providers leads to solutions that are both clinically relevant and patient-friendly, ultimately increasing adoption and positive outcomes.

11. Recommendations for Designing Future Solutions:

- Holistic Features: Incorporate capabilities that address both clinical metrics and mental health—such as stress reduction exercises, psychoeducation modules, and easy access to mental health professionals.

- Tailored User Experience: Allow customization so patients receive actionable insights without feeling overwhelmed. Interfaces should be intuitive, visually appealing, and adjustable to varying levels of health literacy.
- Privacy, Security, and Compatibility: Ensure robust data protection measures and seamless integration with existing devices and platforms. This helps alleviate privacy concerns and eases the technical challenges patients and providers might face.

Appendix 8.5: AI in Healthcare (Hugo Placido da Silva)

Background:

- Bachelor's Degree in Computer Engineering at Instituto Politécnico de Setúbal
- Master's Degree in Electrical & Computer Engineering at Instituto Superior Técnico
- Doctoral Program in Electrical & Computer Engineering at Instituto Superior Técnico
- Biomedical Researcher at Instituto de Telecomunicações
- Assistant Professor at Instituto Superior Técnico

1. Current State of AI in Healthcare

- The healthcare industry is slow to adopt new technologies, including AI, due to strict regulations and the high stakes involved in patient care.
- AI has the potential to transform the healthcare sector by enabling personalized treatments and improving data analysis, but this process requires substantial time and validation.

2. Challenges with AI Integration

- Data Quality and Accessibility: High-quality, multi-modal datasets (e.g., CGM data, dietary intake, activity levels) are necessary for effective AI applications but are often challenging to obtain. Collaboration with hospitals and ethical committees is crucial for accessing patient data.
- Ethical Risks: Issues include bias, inequality, and potential misuse of AI for self-diagnosis or self-management. These raise concerns about accessibility and fairness in healthcare.
- Regulatory Barriers: Adhering to regulations like Europe's Medical Device Regulation (MDR) is essential to ensure the safety and efficacy of AI systems in healthcare.

3. Potential and Applications of AI in Diabetes Management

- AI could enhance self-management by analyzing CGM data alongside lifestyle factors (e.g., food intake, exercise) to identify patterns and provide personalized recommendations.
- Future innovations might include real-time food analysis through tools like smart plates or wearables with built-in sensors for nutritional content.
- AI-driven insulin dosing systems (e.g., OmniPod 5) demonstrate the potential for real-time, adaptive interventions.

4. Mitigating AI Risks

- The risk of AI hallucinations (producing inaccurate or misleading results) is less significant in diabetes management since AI would primarily analyze historical and real-time data.
- Performance issues, such as misclassification or underperformance in critical predictions, must be minimized through robust validation and transparent model processes.

5. Improving AI Adoption

- Collaboration with healthcare professionals is key to integrating AI into clinical workflows. Systems must be transparent, showing the rationale behind decisions to build trust among users and providers.
- Accessibility and affordability are vital for broad adoption. Public funding or reimbursement by insurance companies can help make advanced AI tools available to more patients.

6. Sustainability and Longevity

- AI systems must be energy-efficient and designed for long-term viability to prevent technological discontinuities. Sustainability concerns include the high energy consumption of training large models and maintaining systems over time.

Appendix 8.6: Social Media Expert (Caroline Deisler)

Background:

- 600.000+ Follower
- Main target group: Fitness and Nutrition Enthusiasts

1. **Initial Reach and Platform Selection:**
- Define a clear target audience and choose platforms where they are most active.
- For a nutrition-focused app, Instagram, TikTok, and Facebook groups are effective early channels.
- Collaborating with micro-influencers can quickly establish credibility and broaden reach.

2. **Effective Content Formats and Strategies:**
- Short-form videos (e.g., Reels, TikTok) are highly effective for bite-sized nutrition tips and recipes.
- Carousels on Instagram help share detailed guides or meal-prep routines.
- Stories offer behind-the-scenes looks, Q&As, and polls to increase interaction.
- A mix of these formats keeps the content engaging and diversified.

3. **Evaluating Marketing Strategies:**
- Assess content quality, posting frequency, audience engagement, influencer partnerships, and conversion actions.
- Compare DOT1's performance metrics, like engagement and user feedback, with industry benchmarks or competitors to identify strengths and areas for improvement.

4. **Building and Engaging the Audience:**
- Offer value-driven content that educates, inspires, or solves a problem for the audience.
- Use interactive tactics (polls, live sessions with nutrition experts, challenges) to foster community.
- Encourage user-generated content and maintain open communication channels.

5. **Establishing Trust and Credibility:**
- Present evidence-based information and collaborate with certified professionals to bolster authority.
- Be transparent about what the app can and cannot do, address user concerns, and share authentic success stories to build trust.

6. **Balancing Organic and Paid Strategies:**
- Use organic content to nurture an engaged community and paid advertising to scale reach.
- Test and refine organic content before amplifying top performers with paid campaigns.
- Continuously monitor performance to maintain an optimal balance.

7. **Long-Term Retention and Success Metrics:**
- Consistency, quality, and ongoing value lead to long-term audience retention.
- KPIs include engagement rate (aiming for above-average benchmarks like 5%), follower growth, click-through rates, and ultimately conversions like app downloads and sign-ups.
- Sustained engagement relies on adapting to audience feedback and evolving trends.

8. **Common Mistakes and How to Avoid Them:**
- Don’t over-promote without offering value or share unverified information.
- Engage with comments and feedback to maintain a positive brand image.
- Ensure content is both credible and community-centric.

9. **Opportunities, Challenges, and Additional Platforms:**
- Meta platforms (Facebook/Instagram) offer advanced targeting but face increasing competition and privacy restrictions.
- Other platforms like TikTok, Pinterest, YouTube, LinkedIn, podcasts, and blogs can diversify reach and appeal to different audience segments.

Appendix 9: Survey 1 Questions

1. How old are you?
2. Please state your country of residence
3. How long have you been living with type 1 diabetes?
4. Do you use an insulin pump?
5. Do you use a continuous glucose monitor (CGM)?
6. If you don't use a CGM, how often do you check your blood sugar per day?
7. How do you assess your blood sugar level?
8. How often do you have hypoglycemia (low blood sugar) per week? (<3,3 mmol/l ; <60 mg/dl)
9. How often do you have hyperglycemia (high blood sugar) per week? (>8,9 mmol/l ; >160 mg/dl)
10. How often do you consume alcohol?
11. How would assess the management of your diabetes?
12. Do you keep a diary in which you record your blood glucose levels, insulin requirements, etc.?
13. If you answered with "No" to the previous question, why not?
14. If you answered "Yes" to the previous question, what kind of data do you collect in your diary?
15. Have you ever had a hospital stay due to your diabetes?
16. How informed do you feel about your diabetes?
17. Have you ever attended diabetes management training? If no, why not?
18. How often do you have contact with your diabetes team (doctor, diabetes advisor, etc.)?
19. How supported do you feel by your diabetes team? (e.g. Doctors)
20. Do you have difficulties paying for your medication, treatments, etc.?
21. Does diabetes affect your daily life?
22. If you answered with a 4 or more, in which way?
23. Are you currently using apps to better manage your diabetes?
24. If no, why not?
25. If yes, which app(s) do you use?
26. How much do you pay for those app(s)?
27. What is the biggest pain when it comes to your life with diabetes?

Please leave your email if you would be willing to participate in a short interview. It would

be very much appreciated! Thank you!

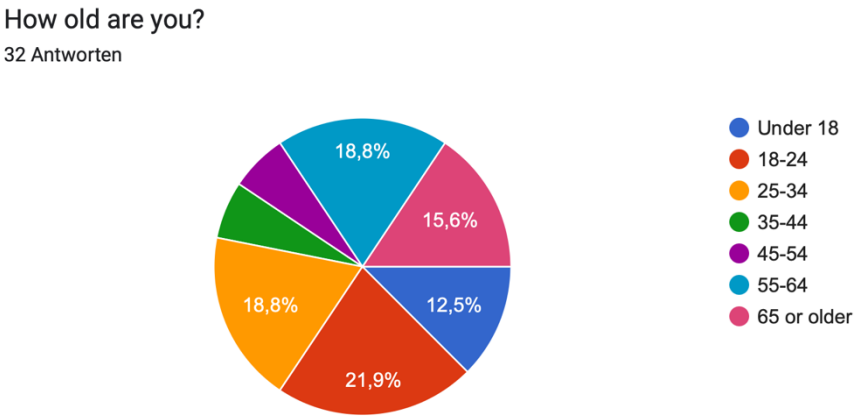
Appendix 10: Survey 2 Questions

1. Please state your gender
2. How old are you?
3. Please state your country of residence
4. How long have you been living with Type 1 diabetes?
5. What insulin management system do you currently use?
6. Do you use a Continuous Glucose Monitor (CGM)?
7. If you don't use a CGM, how often do you check your blood sugar per day?
8. How do you perceive your blood sugar level?
9. How often do you find your blood sugar levels fluctuate without an obvious cause?
10. How often do you have hypoglycemia (low blood sugar) per week? *(<3,3 mmol/l ; <60 mg/dl)?*
11. How often do you have hyperglycemia (high blood sugar) per week? *(>8,9 mmol/l ; >160 mg/dl)?*
12. How often do you consume alcohol?
13. Do you smoke?
14. How would describe the management of your diabetes?
15. Do you keep a journal in which you record your blood glucose levels, insulin requirements, activity level, sleep quality, etc.?
16. If you answered with "No" to the previous question, why not?
17. If you answered "Yes" to the previous question, what kind of data do you collect in your journal?
18. Which factors do you find most challenging when it comes to managing your blood glucose levels? (Select up to 3)
19. How informed do you feel about your diabetes?
20. Which sources do you preferably use to inform yourself about your disease?
21. Which social media channels do you use to inform yourself?
22. Have you ever attended diabetes management training?
23. If you answered the previous question with "yes", please specify.
24. If you answered the previous question with "no", why not?

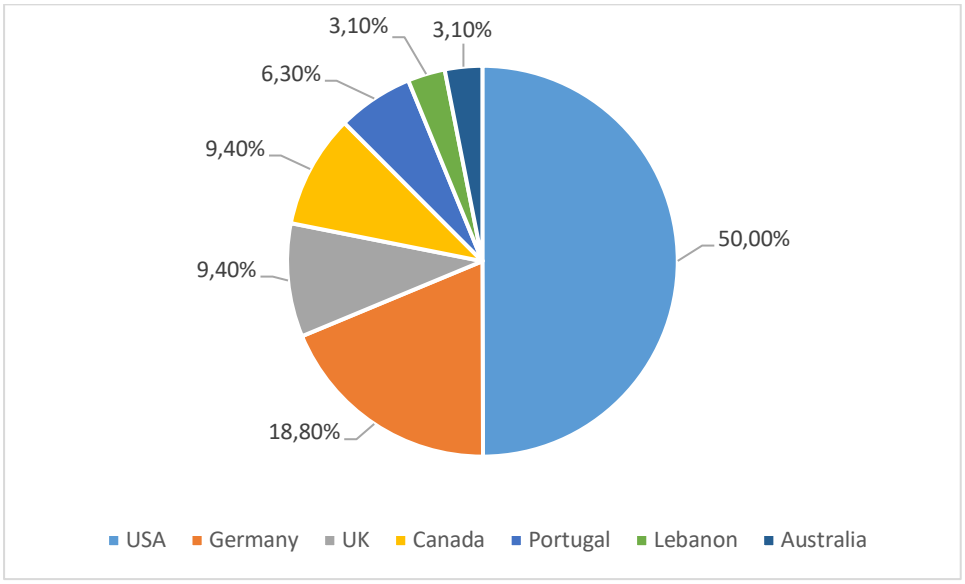
25. Which specialists are you working with?
26. How important is it for your endocrinologist to regularly exchange data (e.g., sending detailed reports, syncing data)?
27. If you answered the previous question with 4-6, what is the reason for that?
28. What kind of data do you share with your team?
29. How often do you have contact with your diabetes team (doctor, diabetes advisor, etc.)?
30. How helpful do you find the support from your team?
31. How supported do you feel by your diabetes team? (e.g. Doctors)
32. Does diabetes affect your daily life?
33. If you answered with a 3 or more, in which way(s)?
34. What is the biggest pain when it comes to your life with diabetes?
35. Are you currently using apps to better manage your diabetes?
36. Why are you not using app(s) to help you manage your diabetes?
37. Which app(s) do you use?
38. Do you use the "note/comment" function of your CGM app (e.g. Freestyle libre, Dexcom)
39. If you answered the previous question with "no", please specify why.
40. If you answered the previous question with "yes", please specify how this function helps you.
41. Do you feel current solutions for managing your diabetes fully meet your needs?
42. If you answered the previous question with "no", please specify why.
43. Which of the following areas do you think need the most improvement when it comes to those apps?
44. How much do you pay for those app(s)?
45. Does your insurance or national healthcare system pay for your medication, treatments, etc.?
46. Do you have difficulties paying for your medication, treatments, etc.?
47. Is there anything else you would like to share about your experience managing Type 1 Diabetes?
48. Please leave your email, if you would be willing to participate in a short interview. It would be very much appreciated! Thank you!

Appendix 11: Survey 1 Results

Appendix 11.1: Demographics



Country of Residence



*This figure was created by us since this question was an open question and, therefore, results were not uniform

Agegroup	Prozentsatz (%)	Teilnehmeranzahl	Durchschnittsalter	Participants X Durchschnittsalter	Deviation MW	Weighted Deviation	Variance	Weighted SD
Under 18	12,5	4	17	68	527,5634766	2110,253906	389,655273	19,73969
18-24	21,9	7	21	147	359,8134766	2518,694336		
25-34	18,8	6	29	174	120,3134766	721,8808594		
35-44	6,3	2	40	80	0,000976563	0,001953125		
45-54	6,3	2	50	100	100,6259766	201,2519531		
55-64	18,8	6	60	360	401,2509766	2407,505859		
65 or older	15,6	5	70	350	901,8759766	4509,379883		
		32				12468,96875		
Weighted MW								
39,96875								
Weighted SD								
19,73968777								

Appendix 11.2: Results

Zeitstempel	How old are you?	Please state your country	How long have you been
02.11.2023 16:24:09	18-24	Portugal	More than 10 years
02.11.2023 16:29:12	Under 18	England	6-10 years
02.11.2023 16:30:07	18-24	Germany	More than 10 years
02.11.2023 16:33:42	35-44	United states	1-5 years
02.11.2023 16:49:55	55-64	United States	More than 10 years
02.11.2023 17:02:48	45-54	United States	1-5 years
02.11.2023 17:09:11	18-24	Germany	1-5 years
02.11.2023 17:27:56	25-34	Lebanon	More than 10 years
02.11.2023 17:34:23	65 or older	UK	More than 10 years
02.11.2023 17:36:03	18-24	Portugal	1-5 years
02.11.2023 17:44:44	65 or older	Nevada	More than 10 years
02.11.2023 17:45:43	55-64	USA	More than 10 years
02.11.2023 18:19:24	45-54	USA	More than 10 years
02.11.2023 19:03:53	Under 18	The United States of Ame	1-5 years
02.11.2023 19:23:44	55-64	United States	More than 10 years
02.11.2023 19:26:04	Under 18	Uk	6-10 years
02.11.2023 19:26:55	18-24	Germany	More than 10 years
02.11.2023 19:42:00	18-24	United States	6-10 years
02.11.2023 19:49:54	25-34	United States	More than 10 years
02.11.2023 20:00:30	Under 18	Canada	1-5 years
02.11.2023 20:01:54	65 or older	Canada	6-10 years
02.11.2023 21:30:11	25-34	Usa	6-10 years
02.11.2023 22:00:15	25-34	Canada	More than 10 years
02.11.2023 22:30:54	55-64	Unite	More than 10 years
03.11.2023 00:51:11	65 or older	U S A	More than 10 years
03.11.2023 00:56:35	55-64	Ohio	1-5 years
03.11.2023 01:43:38	65 or older	United States of America	More than 10 years
03.11.2023 11:18:31	25-34	Germany	1-5 years
04.11.2023 20:22:43	35-44	United States	1-5 years
07.11.2023 11:08:16	55-64	Germany	More than 10 years
07.11.2023 22:04:48	25-34	Germany	1-5 years
09.11.2023 09:32:19	18-24	Australia	More than 10 years

Do you use an insulin pur	Do you use a continuous	If you don't use a CGM, h	How do you assess your l
Yes	Dexcom G6		4
No	Freestyle Libre 2		4
No	Dexcom G7		4
Yes	Dexcom G6		3
Yes	Dexcom G7		4
Yes	Dexcom G6		1
No	Freestyle Libre 3		4
No	Freestyle libre	Less than 4 times	2
No	Freestyle Libre 2		4
Yes	Freestyle Libre 2		3
Yes	Dexcom G6		3
Yes	Dexcom G6	More than 6 times	4
Yes	Dexcom G6	Less than 4 times	2
No	Freestyle Libre 3		2
Yes	Freestyle Libre 2	More than 6 times	3
Yes	Dexcom G6		3
No	Freestyle Libre 3		3
Yes	Dexcom G6	4-6 times	3
Yes	Dexcom G6		3
Yes	Dexcom G6	4-6 times	5
Yes	Freestyle Libre 2		3
Yes	Dexcom G6		1
No	Dexcom G7		4
Yes	Dexcom G6		2
Yes	Dexcom G6		2
Yes	Dexcom G6		3
Yes	Dexcom G6		2
No	Freestyle Libre 3		2
No	No	Less than 4 times	3
Yes	Freestyle Libre 3		6
No	Dexcom G7		3

Do you keep a diary in wh	If you answered with "No"	If you answered "Yes" to t	Have you ever had a hosp
No	No time		No
No	Don't know how to		No
Yes, but irregularly (e.g. only at times when it is nece		Insulin intake, Physical ac	Yes
No	Don't know how to, No time		Yes
No	Too much effort, Too less benefits		Yes
No	Everything is recorded online by dexcom and tander		No
No	Too much effort, Too less benefits		Yes
Yes, but irregularly (e.g. only at times when it is nece		Carbohydrate intake, Insu	No
Yes, but irregularly (e.g. only at times when it is nece		Insulin intake	No
Yes, regularly		Carbohydrate intake, Insu	Yes
No	Too much effort, Too less	Insulin intake	Yes
No	No time		No
No	The pump, cgm, and glucose meter software do this		Yes
Yes, regularly		Carbohydrate intake, Insu	Yes
No	Too less benefits		No
No	No need		Yes
No	Too much effort		No
No	My pump records it for me		No
No	Too much effort, Too less benefits, No time		No
No	Don’t see the point	I don’t use a diary	No
Yes, but irregularly (e.g. only at times when it is nece		Carbohydrate intake, Insu	Yes
No	Don’t need one.		Yes
Yes, but irregularly (e.g. only at times when it is nece		Carbohydrate intake, Insu	No
Yes, regularly		Carbohydrate intake, Insu	Yes
Yes, regularly		Carbohydrate intake, Insu	No
No	Recorded by CGM		Yes
Yes, regularly		Carbohydrate intake, Mea	No
Yes, regularly		Insulin intake	No
Yes, but irregularly (e.g. only at times when it is nece		Meal ingredients, Hydratic	No
Yes, regularly		Carbohydrate intake, Insu	No
Yes, regularly		Insulin intake, Physical ac	No
No	Too much effort, No time		Yes

How often do you have hy	How often do you have hy	How often do you consum	How would assess the ma
2-4 times	More than 10 times	Weekly	3
5-7 times	2-4 times	Never	4
Once or less	More than 10 times	Never	4
Once or less	2-4 times	Occasionally	4
5-7 times	2-4 times	Occasionally	3
Once or less	2-4 times	Never	4
2-4 times	More than 10 times	Occasionally	5
2-4 times	2-4 times	Weekly	4
2-4 times	5-7 times	Never	4
2-4 times	5-7 times	Never	3
2-4 times	2-4 times	Never	4
2-4 times	2-4 times	Never	5
Once or less	2-4 times	Daily	3
5-7 times	2-4 times	Never	3
Once or less	8-10 times	Never	6
2-4 times	5-7 times	Occasionally	3
5-7 times	5-7 times	Monthly	3
2-4 times	8-10 times	Weekly	4
Once or less	8-10 times	Never	6
Once or less	More than 10 times	Never	6
2-4 times	Once or less	Never	5
Once or less	2-4 times	Never	1
2-4 times	5-7 times	Never	4
2-4 times	2-4 times	Occasionally	4
Once or less	2-4 times	Monthly	4
2-4 times	8-10 times	Never	4
Once or less	2-4 times	Daily	3
Once or less	5-7 times	Weekly	3
Once or less	2-4 times	Occasionally	4
8-10 times	8-10 times	Weekly	6
2-4 times	8-10 times	Occasionally	3
2-4 times	2-4 times	Occasionally	3

How informed do you feel	Have you ever attended d	If no, why not?	How often do you have cc
5	Yes		Monthly
5	No	Haven't been offered	Monthly
6	Yes		Monthly
3	No	Never had the opportunity	Annually
6	No	They gave me minimal inf	Monthly
6	Yes		Monthly
4	Yes		Annually
5	No	We dont have	If necessary
3	Yes		Annually
5	No	Never heard of it	Monthly
6	Yes		Annually
5	Yes		Annually
6	No	There was no such thing,	Annually
2	Yes		Annually
6	Yes		Annually
6	No	No need	Annually
5	No		Monthly
5	Yes		Monthly
4	Yes		Annually
4	No	I haven’t had the option to	Monthly
6	Yes		Monthly
6	No	Didn’t need it.	If necessary
4	No	Not very available in my a	If necessary
6	Yes		If necessary
6	Yes		Annually
5	Yes		Monthly
6	No	Other than getting instruct	Monthly
5	Yes		If necessary
5	No	not sure	Annually
6	Yes		Monthly
4	Yes		Monthly
4	Yes		Annually

Are you currently using ap	If no, why not?	If yes, which app(s) do yo	How much do you pay for
No	They are not helpful		
No	Don't know about any		
Yes		MySugr	Nothing
Yes		Beyond type 1	Nothing
Yes		Clarity	Nothing
Yes		Dexcom g6 app, tandem '	Nothing
Yes		Freestyle Libre 3 App	Nothing
Yes	Free style		Nothing
Yes		Libre2	Nothing
No	Haven't found a truly useful one yet		
Yes		Clarity an t-Conect	Nothing
Yes		Shuggah, SugarPixelHub,	Nothing
Yes		xDrip+, t:Connect and Cla	Nothing
No	I have yet to find on that is useful enough for me to be faithful to.		
No			
No	No need		
No			
Yes		Beyond type 1	Nothing
No			
Yes		Dexcom app	Nothing
Yes		LibreView & Glooko	Nothing
No			
Yes		Mysugr, Dexcom g7, Fitbi	Nothing
Yes		MyFitnessPal , dexcom, c	Nothing
Yes		calorie king, google, T-co	Nothing
Yes		Cgm and Beyond Type 1	Nothing
Yes		Clarity, Dexcom G6 and t:	Nothing
Yes		Libre 3	Nothing
No	not sure		
Yes		mylife CamAPS FX	Nothing
No			
Yes			Nothing

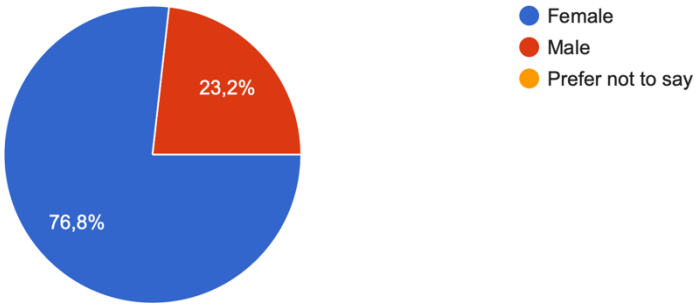
How supported do you fe	Do you have difficulties pa	Does diabetes affect your	If you answered with a 4 c
5	Yes	5	Psychologically, Social int
4	No	6	Physically, Psychologicall
4	No	5	Psychologically
5	Yes	4	Physically, Psychologicall
3	No	4	Physically, Psychologicall
6	No	6	Physically, Psychologicall
5	No	6	Physically, Psychologicall
1	Yes	4	Physically, Psychologicall
6		4	Physically
6	No	3	
6	No	6	Physically, Psychologicall
3	No	6	Physically, Psychologicall
6	No	3	
3	Yes	5	Physically, Psychologicall
5	Yes	6	Physically, Psychologicall
5	No	3	
5	No	3	
3	No	4	Psychologically
4	No	6	Physically, Psychologicall
4	No	6	Physically, Psychologicall
6	No	6	Physically, Psychologicall
6	No	6	Physically, Psychologicall
4	Yes	4	Physically, Psychologicall
6	No	6	Physically, Psychologicall
6	No	1	
5	Yes	6	Physically, Psychologicall
6	No	2	
5	No	3	
4	No	5	Physically, Psychologicall
5	No	6	Physically, Psychologicall
6	No	4	Psychologically
5	No	4	Psychologically, Financial

Appendix 12: Survey 2 Results

Appendix 12.1: Demographics

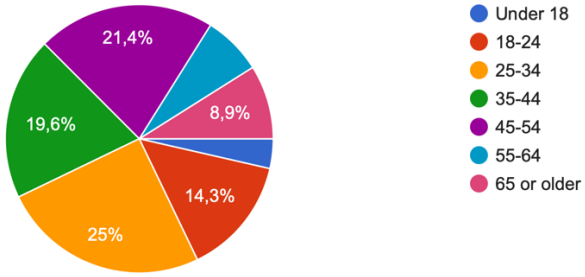
Please state your gender

56 Antworten

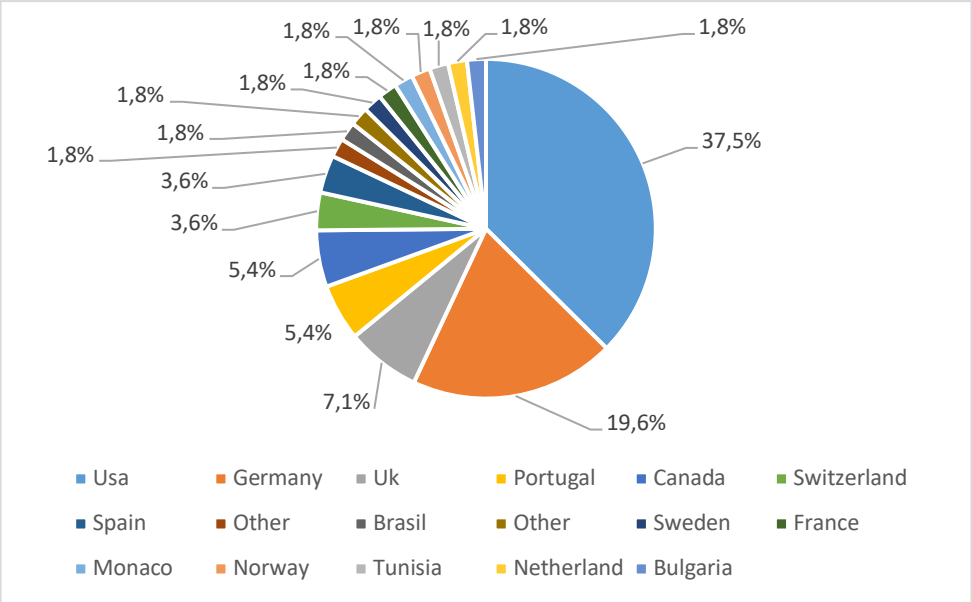


How old are you?

56 Antworten



Country of Residence



*This figure was created by us since this question was an open question and, therefore, results were not uniform

Age	proportion of each participant in age group	Participants	Midpoints age group	Participants x Midpoints	Deviation from MW	Weighted Deviation	Variance	Weighted SD
Under 18:	3.6%	2	17	34	527,3584184	1054,716837	231,0701531	15,20099184
18-24:	14.3%	8	21	168	359,6441327	2877,153061		
25-34:	25.0%	14	29	406	120,2155612	1683,017857		
35-44:	19.6%	11	40	440	0,00127551	0,014030612		
45-54:	21.4%	12	50	600	100,7155612	1208,586735		
55-64:	7.1%	4	60	240	401,4298469	1605,719388		
65 or older:	8.9%	5	70	350	902,1441327	4510,720663		
		56	287	2238		12939,92857		
	Weighted MW	39,96428571						
	Weighted SD	15,20099184						

Appendix 12.2: Results

MA_Survey_Patients

Zeitstempel	Please sta	How old are	Please state your country	How long have you	What insulin management s	Do you use a Con	If you don't use a C	Ho	Ho
2024/09/29 12:58:02 PM GMT	Female	18-24	Y	Less than 1 year	Multiple daily injections	Dexcom G6	More than 6 times	1	1
2024/09/29 1:57:21 PM GMT	Female	18-24	Germany	5-10 years	Multiple daily injections	Freestyle Libre 3		4	3
2024/09/29 3:09:19 PM GMT	Female	18-24	Germany	1-3 years	Multiple daily injections	Freestyle Libre 3		4	3
2024/09/29 7:41:05 PM GMT	Female	18-24	Germany	3-5 years	Hybrid closed-loop system	Dexcom G6		5	4
2024/09/29 8:53:40 PM GMT	Female	18-24	Brasil	5-10 years	Multiple daily injections	Freestyle Libre 2	4-6 times	5	4
2024/09/29 9:30:35 PM GMT	Male	25-34	Portugal	More than 10 years	Multiple daily injections	Freestyle Libre 2		4	2
2024/09/29 10:56:04 PM GMT	Female	35-44	Germany	More than 10 years	Multiple daily injections	Dexcom G6	4-6 times	4	4
2024/09/30 9:47:03 AM GMT	Female	25-34	Portugal	More than 10 years	Insulin pump	Dexcom G6		5	5
2024/10/01 6:24:49 PM GMT	Female	45-54	USA	More than 10 years	Hybrid closed-loop system	Gaurdian 4	Less than 4 times	3	2
2024/10/01 7:16:26 PM GMT	Female	65 or older	USA	More than 10 years	Insulin pump	Dexcom G7		2	2
2024/10/02 1:43:31 AM GMT	Female	45-54	United States	1-3 years	Insulin pump	Dexcom G7		2	4
2024/10/02 3:52:56 AM GMT	Male	45-54	USA	More than 10 years	Multiple daily injections	Dexcom G6		4	2
2024/10/02 5:07:10 AM GMT	Male	65 or older	USA	More than 10 years	Hybrid closed-loop system	Dexcom G7		2	2
2024/10/02 4:35:44 PM GMT	Female	55-64	United States	More than 10 years	Insulin pump	Dexcom G6		5	3
2024/10/02 4:58:35 PM GMT	Female	35-44	United states	1-3 years	Insulin pump	Dexcom G7		2	3
2024/10/02 6:20:31 PM GMT	Female	45-54	Canada	More than 10 years	Insulin pump	Dexcom G6		4	4
2024/10/02 6:59:07 PM GMT	Female	45-54	United States	More than 10 years	Hybrid closed-loop system	Dexcom G7		3	4
2024/10/03 7:38:28 AM GMT	Female	18-24	Portugal	5-10 years	Multiple daily injections	Freestyle Libre 2		6	4
2024/10/03 12:20:53 PM GMT	Male	45-54	United States Of America	More than 10 years	Insulin pump	Dexcom G6	4-6 times	2	2
2024/10/03 12:23:54 PM GMT	Male	45-54	USA	More than 10 years	Hybrid closed-loop system	Dexcom G7	More than 6 times	3	5
2024/10/03 12:25:28 PM GMT	Male	55-64	Usa	More than 10 years	Multiple daily injections	Dexcom G7		2	3
2024/10/03 4:40:00 PM GMT	Female	35-44	Canada	More than 10 years	Hybrid closed-loop system	Dexcom G7	Less than 4 times	6	6
2024/10/04 4:57:33 AM GMT	Male	65 or older	USA	More than 10 years	Hybrid closed-loop system	Dexcom G7		2	3
2024/10/07 6:47:11 PM GMT	Female	45-54	England	5-10 years	Multiple daily injections	Freestyle Libre 2		2	5
2024/10/07 6:47:45 PM GMT	Female	35-44	United Kingdom	More than 10 years	Hybrid closed-loop system	Dexcom G6		3	3
2024/10/07 8:41:01 PM GMT	Male	55-64	United States	More than 10 years	Hybrid closed-loop system	Dexcom G7	More than 6 times	6	1
2024/10/07 8:43:22 PM GMT	Male	65 or older	USA	More than 10 years	Insulin pump	Medtronic 780G		1	2
2024/10/07 9:01:51 PM GMT	Female	55-64	Canada	More than 10 years	Multiple daily injections	Dexcom G7		4	3
2024/10/07 9:56:30 PM GMT	Female	45-54	México	1-3 years	Multiple daily injections	Freestyle Libre 1	Less than 4 times	4	3
2024/10/07 11:25:37 PM GMT	Female	35-44	Germany	More than 10 years	Hybrid closed-loop system	Freestyle Libre 3		3	1
2024/10/08 1:54:29 AM GMT	Female	45-54	USA	5-10 years	Insulin pump	Dexcom G7		2	2
2024/10/08 2:34:48 PM GMT	Female	45-54	United States of America	More than 10 years	Insulin pump	Dexcom G6	More than 6 times	5	5
2024/10/09 3:31:31 PM GMT	Female	18-24	Germany	3-5 years	Insulin pump	Dexcom G6		3	2
2024/10/10 4:44:41 PM GMT	Female	25-34	Switzerland	5-10 years	Multiple daily injections	Freestyle Libre 3		2	2
2024/10/10 5:21:21 PM GMT	Female	25-34	Spain	More than 10 years	Multiple daily injections	Freestyle Libre 2		2	4
2024/10/10 6:34:08 PM GMT	Female	25-34	Germany	More than 10 years	Multiple daily injections	No	4-6 times	5	4
2024/10/10 7:23:44 PM GMT	Female	25-34	Sweden	More than 10 years	Multiple daily injections	Freestyle Libre 3		4	4
2024/10/10 8:02:13 PM GMT	Male	35-44	France	1-3 years	Insulin pump	Dexcom G6		5	3
2024/10/10 8:27:28 PM GMT	Female	35-44	Germany	3-5 years	Multiple daily injections	Dexcom G7		4	3
2024/10/10 8:58:34 PM GMT	Female	25-34	Monaco	More than 10 years	Insulin pump	Freestyle Libre 2		2	3
2024/10/10 9:07:22 PM GMT	Female	18-24	Norway	More than 10 years	Insulin pump	Guardian 4		5	3
2024/10/10 9:08:35 PM GMT	Female	25-34	New York	More than 10 years	Insulin pump	No	More than 6 times	4	3
2024/10/11 3:05:15 AM GMT	Female	45-54	USA	More than 10 years	Multiple daily injections	Dexcom G7	Less than 4 times	5	5
2024/10/11 4:22:05 AM GMT	Male	25-34	UK	3-5 years	Multiple daily injections	Freestyle Libre 2		3	4
2024/10/11 4:35:04 AM GMT	Male	Under 18	United States	5-10 years	Insulin pump	Dexcom G6		3	3
2024/10/11 4:49:12 AM GMT	Female	25-34	Germany	More than 10 years	Multiple daily injections	Freestyle Libre 3		3	4
2024/10/11 6:01:04 AM GMT	Female	25-34	Spain	More than 10 years	Multiple daily injections	Freestyle Libre 2		2	2
2024/10/11 6:15:37 AM GMT	Female	35-44	Germany	More than 10 years	Hybrid closed-loop system	Dexcom G6		3	4
2024/10/11 9:14:36 AM GMT	Female	25-34	Switzerland	More than 10 years	Multiple daily injections	Freestyle Libre 3		2	2
2024/10/11 9:37:02 AM GMT	Female	35-44	United Kingdom	More than 10 years	Multiple daily injections	Dexcom G6		3	3
2024/10/11 11:57:54 AM GMT	Female	25-34	Germany	5-10 years	Insulin pump	Dexcom G6		2	3
2024/10/11 1:13:13 PM GMT	Female	25-34	tunisia	More than 10 years	Multiple daily injections	No	Less than 4 times	3	2
2024/10/11 2:20:49 PM GMT	Female	Under 18	Usa	5-10 years	Multiple daily injections	Dexcom G7	More than 6 times	3	4
2024/10/11 2:59:57 PM GMT	Female	35-44	Netherland	More than 10 years	Insulin pump	Freestyle Libre 3		6	6
2024/10/11 3:35:08 PM GMT	Female	35-44	Bulgaria	More than 10 years	Multiple daily injections	Dexcom G6	More than 6 times	2	3
2024/10/22 1:34:28 AM GMT	Male	65 or older	United States of America	More than 10 years	Hybrid closed-loop system	Dexcom G7		3	3

How often do you h	How often do you h	How often do	Do you smoke?	Hov	Do you keep a journal in which you record your blood glucose levels, insulin requirements,
5-7 times	2-4 times	Monthly	Daily	1	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
2-4 times	More than 10 times	Occasionally	Occasionally	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
2-4 times	8-10 times	Occasionally	Never	4	No
2-4 times	More than 10 times	Never	Occasionally	4	No
2-4 times	5-7 times	Never	Never	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
2-4 times	More than 10 times	Monthly	Never	3	No
5-7 times	2-4 times	Never	Never	5	No
2-4 times	8-10 times	Occasionally	Never	5	No
Once or less	5-7 times	Never	Never	5	No
2-4 times	2-4 times	Occasionally	Never	2	No
2-4 times	Once or less	Never	Never	2	No
5-7 times	8-10 times	Weekly	Never	3	No
Once or less	2-4 times	Daily	Never	2	Yes, regularly
2-4 times	2-4 times	Never	Never	5	No
Once or less	2-4 times	Occasionally	Occasionally	3	No
2-4 times	8-10 times	Occasionally	Never	5	No
2-4 times	5-7 times	Never	Never	5	No
5-7 times	More than 10 times	Monthly	Never	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
Once or less	5-7 times	Never	Never	4	Yes, regularly
Once or less	8-10 times	Never	Never	6	Yes, regularly
2-4 times	8-10 times	Never	Never	4	No
8-10 times	More than 10 times	Never	Never	6	No
Once or less	2-4 times	Daily	Never	2	Yes, regularly
Once or less	More than 10 times	Occasionally	Never	5	No
2-4 times	5-7 times	Occasionally	Daily	6	No
2-4 times	8-10 times	Occasionally	Never	3	No
Once or less	Once or less	Daily	Never	2	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
5-7 times	5-7 times	Occasionally	Never	4	Yes, regularly
Once or less	5-7 times	Occasionally	Occasionally	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
2-4 times	More than 10 times	Occasionally	Never	3	No
5-7 times	2-4 times	Never	Never	3	No
5-7 times	More than 10 times	Never	Daily	6	No
2-4 times	8-10 times	Never	Never	5	No
2-4 times	5-7 times	Occasionally	Never	3	Yes, regularly
5-7 times	5-7 times	Weekly	Monthly	3	No
Once or less	8-10 times	Occasionally	Occasionally	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
2-4 times	More than 10 times	Weekly	Never	5	No
2-4 times	More than 10 times	Weekly	Daily	4	No
5-7 times	8-10 times	Never	Never	4	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
5-7 times	5-7 times	Occasionally	Never	2	No
2-4 times	More than 10 times	Occasionally	Never	4	No
2-4 times	5-7 times	Never	Never	5	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
Once or less	5-7 times	Never	Never	5	No
2-4 times	More than 10 times	Weekly	Occasionally	5	No
More than 10 times	More than 10 times	Never	Never	5	No
5-7 times	8-10 times	Occasionally	Never	3	No
Once or less	2-4 times	Occasionally	Never	1	Yes, regularly
2-4 times	8-10 times	Never	Never	5	Yes, regularly
5-7 times	8-10 times	Weekly	Never	2	No
Once or less	5-7 times	Never	Never	4	No
2-4 times	5-7 times	Occasionally	Never	3	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
5-7 times	2-4 times	Occasionally	Daily	2	No
8-10 times	8-10 times	Never	Never	4	No
8-10 times	More than 10 times	Occasionally	Never	6	No
8-10 times	8-10 times	Never	Never	3	Yes, but irregularly (e.g. only at times when it is necessary to improve my blood glucose levels).
Once or less	2-4 times	Daily	Never	2	Yes, regularly

If you answered with "No" to the previous question, why not?
No time
Too much effort
Too much effort
Too less benefits
Too much effort
Too much effort;Too less benefits;No time
Too less benefits
Can download info from pump & cgm.
never thought to do this
No time
Too much effort;Too less benefits;No time
Most thongs are recorded in my pump logs
Too much effort;Too less benefits;Don't know how to;No time;Dexcom and Tandem automatically track BGs and insulin use. Garmin watch automatically monitors sleep, stress, etc.
Too less benefits
No time
Too much effort;Too less benefits;No time
No time
Too much effort;No time
Too less benefits
Too much effort;Too less benefits;No time
Too much effort
Too much effort;No time
No time
Too much effort;Too less benefits
Don't know how to
Too much effort
Too much effort;Too less benefits;Un use full
Too much effort
Too much effort
Too much effort
Too much effort
Too much effort;Don't know how to;Too many different effects in fluctual glucose level have to be kept
Too much effort
Too much effort
no need
Too less benefits
Too much effort

If you answered "Yes" to the previous question, what kind of data do you collect in your journal?
Meal ingredients
Meal ingredients;Insulin intake;Sleep data (via smart devices like an apple watch or Oura ring);Emotional state;Hormonal fluctuation during periods and menopause;Long distance travel (change i
Carbohydrate intake;Insulin intake;Long distance travel (change in time range)
Carbohydrate intake;Meal ingredients;Insulin intake;Physical activity (from a tracker)
Carbohydrate intake;Meal ingredients;Insulin intake;Hormonal fluctuation during periods and menopause;Physical activity (from a tracker)
Carbohydrate intake;Meal ingredients;Insulin intake;Sleep data (via smart devices like an apple watch or Oura ring);Emotional state;Infections (e.g. common cold);Physical activity (from a tracker)
Carbohydrate intake;Insulin intake;Sleep data (via smart devices like an apple watch or Oura ring);Emotional state;Infections (e.g. common cold);Medications used (steroids, diuretics & Antidepre
Carbohydrate intake;Meal ingredients;Insulin intake;Infections (e.g. common cold);Physical activity (from a tracker)
Long distance travel (change in time range)
Carbohydrate intake;Insulin intake;Hydration level;Medications used (steroids, diuretics & Antidepressants);Physical activity (from a tracker);Alcohol consumption;Use of artificial sweeteners
Carbohydrate intake;Insulin intake;Hydration level
Meal ingredients;Insulin intake;Hydration level;Hormonal fluctuation during periods and menopause
Carbohydrate intake;Meal ingredients;Insulin intake
Carbohydrate intake;Insulin intake
Carbohydrate intake;Meal ingredients;Insulin intake;Emotional state;Infections (e.g. common cold);Seasonal changes
Insulin intake
Carbohydrate intake;Meal ingredients;Insulin intake;Sleep data (via smart devices like an apple watch or Oura ring);Emotional state;Infections (e.g. common cold);Hormonal fluctuation during per
Carbohydrate intake;Insulin intake;Sleep data (via smart devices like an apple watch or Oura ring);Infections (e.g. common cold);Hormonal fluctuation during periods and menopause;Physical act
Carbohydrate intake;Meal ingredients;Insulin intake;Medications used (steroids, diuretics & Antidepressants);Physical activity (from a tracker)
Carbohydrate intake;Meal ingredients;Insulin intake

Which factors do you find most challenging when it comes to managing your blood glucose levels? (Select up to 3)	Ho
Physical activity and exercise	3
Physical activity and exercise;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	5
Managing stress or emotions;Illness or infection;Unpredictable fluctuations for no apparent reason	3
Managing stress or emotions;Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	4
Carbohydrate counting;Managing stress or emotions;Hormonal fluctuations (e.g., menstrual cycle, puberty)	4
Tracking insulin usage	5
Carbohydrate counting;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	3
Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty);Binge eating in case of low glucose level	4
Carbohydrate counting;Physical activity and exercise;Binge eating in case of low glucose level	6
Carbohydrate counting;Unpredictable fluctuations for no apparent reason	6
Physical activity and exercise	6
Carbohydrate counting;Unpredictable fluctuations for no apparent reason	6
Managing stress or emotions;Unpredictable fluctuations for no apparent reason	6
Managing stress or emotions;Unpredictable fluctuations for no apparent reason	6
Managing stress or emotions	4
Carbohydrate counting;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	5
Managing stress or emotions;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	5
Carbohydrate counting;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	3
Managing stress or emotions;Unpredictable fluctuations for no apparent reason;Eating late then dealing with overnight hyperglycemia episodes	6
Managing stress or emotions;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	5
Managing stress or emotions;Unpredictable fluctuations for no apparent reason	6
Managing stress or emotions;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	3
Managing stress or emotions;Unpredictable fluctuations for no apparent reason	6
Unpredictable fluctuations for no apparent reason	3
Managing stress or emotions;Illness or infection;Hormonal fluctuations (e.g., menstrual cycle, puberty)	4
Unpredictable activity following aggressive insulin use	6
Physical activity and exercise;Illness or infection	6
Carbohydrate counting;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	6
Carbohydrate counting	5
Managing stress or emotions;Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	6
Carbohydrate counting	4
Carbohydrate counting;Tracking insulin usage;Physical activity and exercise	2
Managing stress or emotions;Physical activity and exercise;Binge eating in case of low glucose level	5
Illness or infection;Hormonal fluctuations (e.g., menstrual cycle, puberty);Binge eating in case of low glucose level	6
Managing stress or emotions;Illness or infection;Hormonal fluctuations (e.g., menstrual cycle, puberty)	5
Carbohydrate counting;Managing stress or emotions;Unpredictable fluctuations for no apparent reason	3
Managing stress or emotions;Hormonal fluctuations (e.g., menstrual cycle, puberty);Binge eating in case of low glucose level	5
Managing stress or emotions;Physical activity and exercise;Binge eating in case of low glucose level	5
Carbohydrate counting;Hormonal fluctuations (e.g., menstrual cycle, puberty);Binge eating in case of low glucose level	3
Managing stress or emotions;Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	6
Carbohydrate counting;Tracking insulin usage;Bulimia nervosa	5
Managing stress or emotions;Tracking insulin usage;Binge eating in case of low glucose level	6
Unpredictable fluctuations for no apparent reason	6
Carbohydrate counting;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	4
Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	3
Managing stress or emotions;Hormonal fluctuations (e.g., menstrual cycle, puberty);Unpredictable fluctuations for no apparent reason	5
Carbohydrate counting;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	3
Managing stress or emotions;Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	6
Illness or infection;Hormonal fluctuations (e.g., menstrual cycle, puberty);Unpredictable fluctuations for no apparent reason	6
Managing stress or emotions;Physical activity and exercise;Unpredictable fluctuations for no apparent reason	5
Managing stress or emotions;Illness or infection;Hormonal fluctuations (e.g., menstrual cycle, puberty)	5
Physical activity and exercise;Unpredictable fluctuations for no apparent reason;Binge eating in case of low glucose level	6
Hormonal fluctuations (e.g., menstrual cycle, puberty);Unpredictable fluctuations for no apparent reason	5
Carbohydrate counting;Physical activity and exercise;Hormonal fluctuations (e.g., menstrual cycle, puberty)	1
Managing stress or emotions;Binge eating in case of low glucose level	6
Unpredictable fluctuations for no apparent reason	6

Which sources do you preferably use to inform yourself about your disease	Which social media channels do you use to inform y	Have
Internet forums	F	No
Social Media;Doctors;Internet forums;Magazines/TV		No
Social Media;Doctors		No
Doctors;Internet forums;Friends, fellow diabetics	Certain "influencers" with diabetes like shesdiabetic	Yes
Social Media;Doctors;Internet forums;Friends, fellow diabetics		No
Doctors;Internet forums		Yes
Social Media	Instagram	No
Doctors		No
Doctors;Internet forums;Friends, fellow diabetics		Yes
Social Media;Doctors	Beyond type 1 & type 1 diabetes group on Facebook.	No
Doctors;Internet forums;Magazines/TV;Friends, fellow diabetics		Yes
PubMed and podcasts	X (Twitter)	No
Doctors;Friends, fellow diabetics	Beyond Type One	Yes
Social Media;Internet forums;Friends, fellow diabetics	Beyond Type 1	Yes
Social Media;Internet forums;Friends, fellow diabetics	beyond type 1	No
Doctors;Internet forums;Friends, fellow diabetics	Various	Yes
Social Media;Doctors;Internet forums;Magazines/TV;Friends, fellow diabetics	Facebook, Instagram, Beyond Type 1	No
Doctors		No
Doctors;Friends, fellow diabetics;Medical books and conferences		Yes
Doctors;Friends, fellow diabetics	Beyond type 1	Yes
Social Media;Doctors;Internet forums;Magazines/TV;Friends, fellow diabetics	TCOYD	No
Internet forums;Friends, fellow diabetics		Yes
Doctors;Internet forums;Friends, fellow diabetics	Beyond Type 1	Yes
Internet forums	Internet	No
Internet forums;Friends, fellow diabetics	Facebook	Yes
Doctors		Yes
Doctors;Friends, fellow diabetics		No
Social Media;Doctors;Internet forums	YouTube, Beyond Type 1, Facebook Instagram	Yes
Internet forums	You tube	No
Social Media;Doctors	Youtube, Instagram	Yes
Doctors;Internet forums;Books	NA	No
Social Media;Doctors;Friends, fellow diabetics	Beyond Type 1	Yes
Internet forums		Yes
Social Media;Doctors	instagram and tiktok	No
Social Media;Doctors		Yes
Doctors;Internet forums		No
Doctors		No
Doctors	Instagram eventually	Yes
Social Media;Doctors	Instagram	Yes
Social Media;Doctors;Friends, fellow diabetics		No
Doctors		Yes
Doctors;Magazines/TV;Friends, fellow diabetics		Yes
Pub Med		Yes
Internet forums;Friends, fellow diabetics		No
Doctors		Yes
Social Media;Internet forums;Magazines/TV;Try and error	Instagram	Yes
Social Media		Yes
Social Media;Doctors;Friends, fellow diabetics	Insta @diabetes_endurance_sport	Yes
Doctors		No
Doctors;Friends, fellow diabetics		Yes
Doctors;Internet forums		Yes
Doctors	Articles	Yes
Doctors		No
Doctors		No
Social Media;Doctors;Internet forums	Mastering Diabetes - life changer!!!	Yes
Doctors;Internet forums;Friends, fellow diabetics		No

If you answered the previous question with "yes", please specify.
F
When I was diagnosed, I had to doba 2 week training
At Doctor
Formal training only at diagnosis 44 years ago
in the hospital
Training with my doctors and a nurse.
When I was first diagnosed in 1983
When I was first diagnoses and when I started on a pump and at various intervals outside of those milestones
Mastering Diabetes, Take Care of Your Diabetes, Academy of Integrative Health and Medicine, American Academy of Lifestyle Medicine, UC San Francisco and Stanford-based diabetes training/
Nutritional advice - useless
Diabetes educator at my endocrinologist office.
Carb counting
Hospital and pump training
See a diabetes nurse ,dietitian, Endocrinologist, And went to an insulin pump education
My endo team offers training to refresh basic knowlegde or connect with other T1Ds every year or so
Diabetes Education
Hospital
I went all the summers when i was a child to diabetes campus
At the hospital - 1 week each year
Einsteigerschulung
Received training when I first got diabetes and when I started using pump/glucose monitors
When diagnosed I was educated at the hospital for 2 days
A basic training in the hospital at the beginnig and a basic training with my boyfriend because he wanted to be better informed. But it was too basic to get very helpful Tips for daily life.
Hospital prepared a training for young diabetica
Regulary and I train other people with diabetes
How to manage with exercise and carb counting
Basic Training After Four years with the Diagnose
group training for diabetic people
Mastering Diabetes - recommended 1000%

If you answered the previous question with "no", why not?
X
Don't know where to search so I just didn't
Don't want to spend time on that
Here in Brazil it is not easy to find a lot of information about
Not offered
Don't know where to find it
Was not recommended
No perceived benefit
Was never offered
I'm sure the hospital staff trained me on the basics when I was first diagnosed. However, that was 1988, so even if I could remember what they taught me, everything has completely changed sir
I don't find it useful
On LINE
I don't know
Did not need it.
It had not been necesary
It was never offered when I was first diagnosed
Interested in short "bite sized" advice
Bislang keine Angebote erhalten
I don't know how to
No need
Don't know
Dont know
In Bulgaria there are no such trainings, so it is up to the people…unfortunately…
It was never offered.

Which specialists are you working with?	Ho
Personal Trainer	4
Endocrinologist	5
Endocrinologist	5
Endocrinologist	5
Endocrinologist;Nutrition counsellor	3
Endocrinologist	1
Endocrinologist;Psychologist (specifically in context with diabetes)	1
Endocrinologist	5
Endocrinologist;Psychologist (specifically in context with diabetes)	5
Nutrition counsellor	2
Endocrinologist	5
Endocrinologist	1
Endocrinologist;Personal Trainer;Nutrition counsellor	5
Endocrinologist	1
Endocrinologist	5
Endocrinologist	6
Endocrinologist	3
Endocrinologist	2
Endocrinologist	5
Endocrinologist	6
Endocrinologist	3
Endocrinologist	6
Endocrinologist	6
Endocrinologist	6
Endocrinologist	2
Endocrinologist	2
Endocrinologist	6
Endocrinologist;Psychologist (specifically in context with diabetes)	4
Endocrinologist	6
Endocrinologist;Nutrition counsellor	4
Endocrinologist	6
Endocrinologist	4
Nutrition counsellor	5
Endocrinologist	5
Endocrinologist	6
Endocrinologist;Psychologist (specifically in context with diabetes)	5
Endocrinologist	3
Endocrinologist;Personal Trainer	3
Endocrinologist	3
Endocrinologist	3
Endocrinologist	2
Endocrinologist	3
Endocrinologist;Personal Trainer	3
Endocrinologist	3
Endocrinologist	6
Endocrinologist	1
Endocrinologist	6
Endocrinologist	1
Endocrinologist	5
Endocrinologist	6
Endocrinologist	5
Endocrinologist;Psychologist (specifically in context with diabetes)	2
Endocrinologist	6
Endocrinologist	1
Endocrinologist;Personal Trainer;Nutrition counsellor	2
Endocrinologist;Nutrition counsellor	6

If you answered the previous question with 4-6, what is the reason for that?
J
To see how we can change habits that lead to fluctuation in blood sugar
Basically all we do is check my data and see how it is going
By providing my data the endo is able to see trends and how to help me finetune things like timing of insulin boluses, carb ratio, diet, etc.
they need the data to help make adjustments
I want him to know what is going on in my life.
I want to stay on top of my health and an endo is one of the only people that can help with that.
The data gives him insight into how things are going on a daily basis, helps us pinpoint problems and potential solutions
Keeps me responsible, trouble shooting at higher level when reporting to another and getting test results with their feedback
Treatment planning
The more informed everyone is, the better my care should be.
No
I have a team of physicians and they exchange data about me with each other.
I pretty much manage my condition by myself
It is am usefull tool to control my deasease
Thats how treatment and check up is done in Germany
To know my status
Endocrinologist doesn't communicate except at appointments...
Controlling my health is the most important thing in my life.
Ensure HbA1C in good range, information about new developments, vitamin levels, rest insulin production
Starke Schwankungen der Blutzuckerwerte
To work thru current issues like stubborn highs, too many lows
To know all data from free style libre 2
Long time Health
I like to know all the information
To change the Rate of needed
To manage my diabetes
Well, receipts are prescribed twice per year and there is no obligation for anything but A1H twice per year
The more he knows about me the better care he can give me.

What kind of data do you share with your team?	How often do you hav	How often do	How often do you
CGM data live synchronization (e.g. Libre Link)	Weekly	Weekly	Weekly
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly;Annually	Annually	Monthly;Annually
None	If necessary	If necessary	Never
None	Annually	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor);Personal Journal/Diary	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Monthly	Annually
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Annually	Never	If necessary
CGM data live synchronization (e.g. Libre Link)	If necessary	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	If necessary	Weekly	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually;If necessary	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);Pump upload	Monthly	Never	If necessary
Tandem insulin pump report	If necessary	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);Personal Journal/Diary	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Annually	Annually
None	Annually	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	If necessary	If necessary	If necessary
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Monthly	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	If necessary
CGM data live synchronization (e.g. Libre Link)	Monthly	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	If necessary
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	Never
CGM data live synchronization (e.g. Libre Link)	If necessary	Never	Monthly
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Annually	Never	If necessary
CGM data live synchronization (e.g. Libre Link)	Annually	Never	Never
Personal Journal/Diary;Messdaten	Monthly	Never	Never
None	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Monthly	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Monthly	Never	If necessary
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Annually	Never	Never
None	If necessary	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Monthly	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	Never
None	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
None	Monthly	Annually	Annually
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Monthly	Never	Never
None	Monthly	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Never	Never
CGM data live synchronization (e.g. Libre Link)	Annually	Never	Never
CGM data report (e.g. every time you have an appointment with your doctor)	Monthly	Weekly	Weekly
CGM data report (e.g. every time you have an appointment with your doctor);CGM data live synchronization (e.g. Libre Link)	Monthly	Never	If necessary

How often do	How	How	Doe	If you answered with a 3 or more, in which way(s)?
Weekly	4	2	4	Social interactions
Annually	3	2	4	Physically;Psychologically;Social interactions;Financially
Never	5	5	6	Physically;Psychologically;Social interactions;Daily life constraints
Never	3	5	4	Physically;Psychologically;Daily life constraints
Annually	3	3	2	
Never	3	4	3	
Monthly	1	1	5	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	5	6	5	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Weekly	6	6	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Annually	5	6	2	
Never	5	5	5	Physically;Financially
Never	2	1	3	Psychologically;Social interactions;Daily life constraints
Never	6	5	3	Physically
Never	1	1	6	Physically;Psychologically;Social interactions;Financially
Never	4	4	4	Financially;Daily life constraints
Never	4	4	5	Physically;Psychologically
Never	4	4	5	Psychologically;Social interactions;Financially
If necessary	3	3	6	Physically;Psychologically;Social interactions;Daily life constraints
Never	5	5	6	Physically;Psychologically;Daily life constraints
Annually	6	6	6	Physically;Psychologically;Social interactions
Annually	5	3	3	Psychologically
Annually	1	1	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	6	6	3	Physically;Financially
Never	6	6	5	Daily life constraints
Annually	5	5	5	Physically;Psychologically;Social interactions;Daily life constraints
Never	5	5	4	Physically;Financially
Never	6	6	2	
Monthly	4	3	5	Physically;Psychologically;Financially
Annually	4	4	5	Social interactions;Financially
Never	5	4	5	Psychologically
Never	6	6	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	3	3	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	3	2	6	Physically;Psychologically
If necessary	3	5	5	Physically;Psychologically;Social interactions;Daily life constraints
Never	5	5	4	Social interactions;Daily life constraints
Monthly	5	4	4	Physically;Psychologically;Daily life constraints
Never	3	4	6	Physically;Psychologically;Daily life constraints
Never	6	5	5	Psychologically;Social interactions;Daily life constraints
Never	3	3	4	Psychologically;Social interactions;Daily life constraints
If necessary	5	5	2	
Never	3	3	2	
Never	3	3	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	3	3	6	Daily life constraints
Never	2	4	6	Physically;Psychologically;Social interactions
Never	5	6	6	Physically;Daily life constraints
Never	1	1	5	Planning an be prepared
Never	5	3	5	Physically;Daily life constraints
Annually	4	4	6	Psychologically;Social interactions;Daily life constraints
Never	5	5	5	Physically;Daily life constraints
Never	5	5	6	Physically;Psychologically
Never	5	5	3	Social interactions
If necessary	4	6	4	Daily life constraints;it is a lot of effort to regulate my diabetes in order to have a safe pregnancy
Never	3	3	6	Physically;Psychologically;Social interactions
Never	6	6	6	Physically;Psychologically;Social interactions;Daily life constraints
Never	5	5	6	Physically;Psychologically;Social interactions;Financially;Daily life constraints
Never	5	5	2	

What is the biggest pain when it comes to your life with diabetes?	Are yo
H	No
Being exhausted from 24/7 management	No
Currently calculating and having that in mind	No
The constant additional stress and thinking I have to do besides the normal life stress. Also I feel like few things in society are prepared or informed about T1 diabetes	Yes
Fear of not taking enough care	Yes
Staying in the right ranges with the blood sugar	Yes
Eating disorders body weight concerns	Yes
Stress from highs and fear of having lows	No
The wear and tear on my physical health, mood and mental heallth. Dealing with complications like eye disease.	No
That I had to lie on this questionnaire because I do not see an encrinolgist, nutritionist, psychologist, or trainer. I could not move on without answering.	Yes
worrying about where number is trending and having juice all the time just in case	Yes
Emotional drain from all of the added cognitive burden.	No
Dealing with unexpected lows and highs.	Yes
Keeping my BG within range during meetings/work	Yes
The crazy levels you get even when you eat the same things.	Yes
Always having to be on alert for lows with any activity or outing	No
Dealing with random high and low BGs whiling being a full-time caregiver to my mother. They come on much more quickly than when I had a desk job.	Yes
People not making an effort to understand how really my illness works and affects my emotional health, even my beloveds.	Yes
Mindful of blood glucose level management	Yes
Unexplained sugars	No
Control	Yes
Emotionally	Yes
Blood sugars that don't make sense.	Yes
Every thing	Yes
Forever changing blood sugar levels even if I have done the same as the day before	Yes
Control and low bs	Yes
Having to wear the pump, since I'm on a system that monitors the BG and I do not have to do finger stick it allows me to just live my life.	Yes
Having to deal with the fluctuations!	Yes
Complications	Yes
Managing the every changing needs for insulin, the constant awareness I need to have for it	Yes
Having to count carbs for food, not being able to eat without thinking how my blood sugar will rise	Yes
Packing enough carbohydrates	Yes
Everything revolves around the disease in everyday life.	No
No breaks no pause, unexpected happenings (late dinners, forgetting my insulin pen at home) and sometimes high levels during night waking up exhausted (sometimes	Yes
Restriction	No
Trotz Bemühungen keine konstant guten BZ-Werte, auswärts Essen ist eine Herausforderung	Yes
To always have to think about it	Yes
Not being normal ever again	No
The eatinghabits	No
Niddle and diet	Yes
Hard to maintain a stable blood sugar	No
Feeling alone	No
Weight	No
Sugar Stress	Yes
Having to think about it 24/7 and changing pods, dexcoms, running out of dexcoms & pods	Yes
To manage it every day, there ist no holiday, not even one meal or day (maybe Christmas) without managing it	No
Changes in daily food, carbohidrate intake and hormonal changes produces different effects to my sugar levels deppending on the day	No
Prejudices and plan marathon runs and other sports	Yes
Always checking the blond sugar	No
Up and down blood sugars and concentration	No
Fear of sequelae	No
no sugar with hypoglycemia of 0.7	No
Shots	Yes
Always busy with the bloodsugars	No
Developing control freak habits 😂	Yes
Dealing with unusual variations of my blood sugar.	No

Why are you not using app(s) to help you manage your diabetes?
Hh
For me not created individually enough, need more options in the app itself (menstrual cycle, emotions, stress lvl, etc). For remembering that I've eaten 36g of carbs and what I dosed I don't nee
There's no app I know about that I think would contribute to my diabetes management
Don't find them useful
All the info that I need from my sensor and pump is easily accessible on the screen of my Medtronic 780g.
No time, not sure helpful
Haven't found a good one yet
They suck
No time
Na
No need
Havent found an easy one yet
I do have a app, but I don't find it very helpfull
Don't know
Don't know any
For every meal, every activity and so in I have to check and think about my glucose level. I'm not interested in beeing informed by any App and using more time by managing diabetes so far.
I don't know them
No need
I have CGM
Dont know
didn't try it before
Dont know
I haven't found any that would help me.

Which app(s) do you use?	Do you use the "note/com	If you answered the previous question with "no", please specify why.
Beyond Type 1	Yes, but only sometimes	
SocialDiabetes	Yes, but only sometimes	
FreeStyle Libre	No	No benefit
Dont	No	No time
Beyond Type 1	No	Don't need to.
Beyond Type 1	Yes, but only sometimes	
Beyond Type 1	Yes, alwasy	
Beyond Type 1	No	No familiar with Notes
Beyond Type 1	No	I just keep mental notes
Beyond Type 1	Yes, but only sometimes	
Beyond Type 1	No	Laziness
Beyond Type 1;Dexcom, Tandem	No	Not aware how. No use.
Beyond Type 1	Yes, alwasy	
Beyond Type 1	No	
Beyond Type 1;Excel	No	It doesn't have that feature.
Beyond Type 1	Yes, but only sometimes	
Beyond Type 1	Yes, but only sometimes	
Dexcom clarity. Tandem	No	Not useful
Carelink	No	Don't need it.
Beyond Type 1;Contour next	Yes, alwasy	
Fitia and freestyle libre link	Yes, alwasy	
Beyond Type 1	No	My app doesn't have that (CAMAPS fx)
Beyond Type 1;TConnect	No	I don't know what it is.
Beyond Type 1;FatSecret	No	How do I do so?
Habit tracker, lifesum	No	Usually I remember by heart what the cause was
OneTouch	I don't use a CGM	
Freestyle libre	No	I don't think it will help
Beyond Type 1	No	
Beyond Type 1	No	
Dexcom	Yes, alwasy	
iOS Loop, Dexcom	No	Write those notes in my Loop App
None	No	Don't know how to use it
Cronometer	No	I do not check the comments, prefer diary for better visibility (maybe just a habit)…

If you answered the previous question with "yes", please specify how this function helps you.	Do yo
	No
	Yes
	Yes
	No
	Yes
if something is unique it helps me remember and explain the blood sugar change	Yes
It allows me to give advice to others.	Yes
	No
	Yes
The Dexcom G7 is not nearly as reliable or accurate as the G6. I get random extreme low alerts that do not match my actual blood sugar. I make note of those times.	Yes
	Yes
	No
Helpful	Yes
	No
	No
I want to be better	Yes
Understand what happens under certain events	Yes
	No
	Yes
It helps me to remember what food I ate	Yes
I can check it for following days	Yes
	No
	No
	No
	No
	No
	No
	Yes
	No
Helps me know when I need to drink a juice to avoid going lower	Yes
	Yes
	No
	No

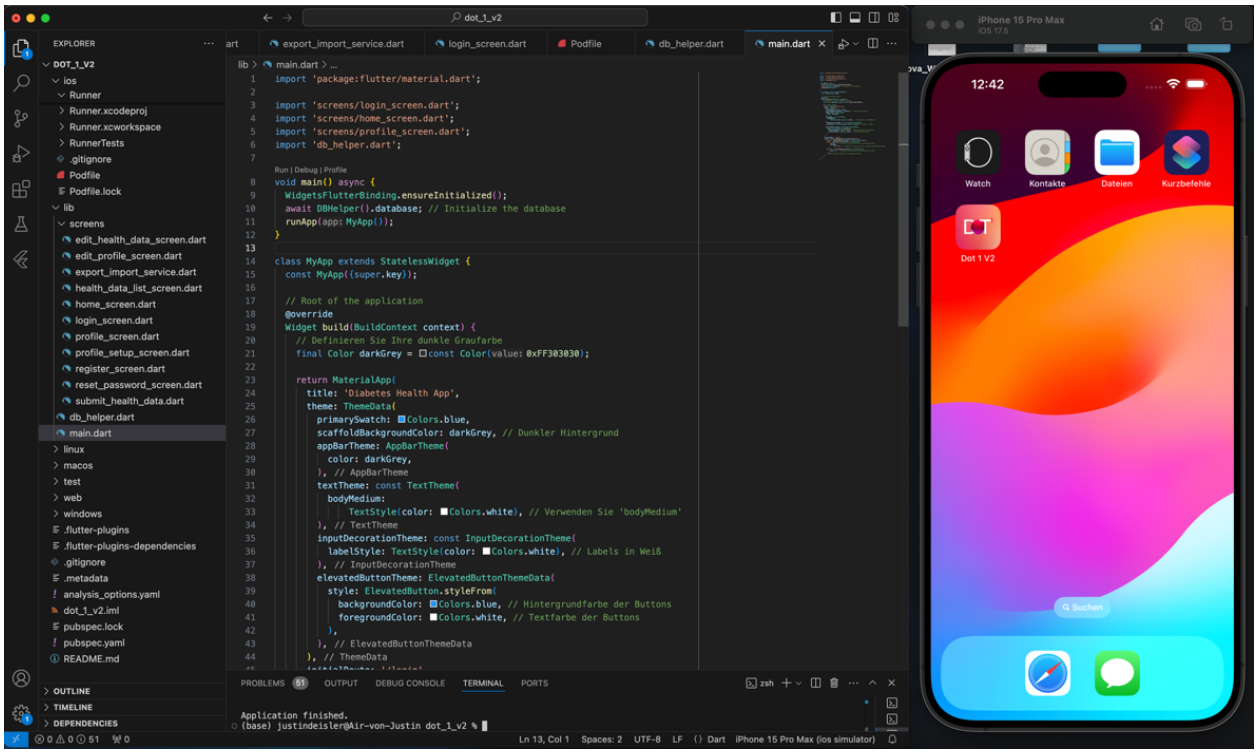
If you answered the previous question with "no", please specify why.
The closed loop system doesn't react that well and often has technical failures. Also the only thing I can do about low bloodsugar is eat candy and I think there should be a different (maybe techn
Not individual
Would like more support for Type 1s on GLP-1s for BG management (not weight loss).
Control is good, but I'm not normal
I desire to have better control than I can attain now.
Need instantaneous accurate blood sugar monitoring
Its obvious that there is no way this disease can be dealt easily with
I would like my pump/CGM to be cordless, smaller, less obvious I wish I could just eat and it would automatically dispense insulin without me giving the order.
My CGM graph is a Rollercoaster. Straight lines (like overnight are not straight or kept around 160mg/dl). I'm made to eat when I don't want to. Blood sugar readings drop before what I've eaten
I hate the alarm sound it makes me so nervous a vibration would be so much better. Also having freestyle libre data on a digital watch would be amazing.
Aktuell keine Struktur in meinem Management
I would like to get more help and information
Too many highs and lows
CGM are not covered by BG health care and it is a personal expense to buy them.

Which of the following areas do you think need the most improvement when it comes to those apps?
Personalization;Community Support;Practicability/Ease of understanding the app;Goal Setting and Tracking
User Interface and Experience;Personalization;Practicability/Ease of understanding the app
Data Integration (ex: connectivity with other tools like fitness trackers)
User Interface and Experience;Personalization;Community Support;Goal Setting and Tracking;Security & Privacy
Community Support
Goal Setting and Tracking
Data Integration (ex: connectivity with other tools like fitness trackers);Personalization;Community Support;Practicability/Ease of understanding the app;Accessibility Features (language, features
User Interface and Experience
Personalization
User Interface and Experience;Data Integration (ex: connectivity with other tools like fitness trackers);Personalization
Data Integration (ex: connectivity with other tools like fitness trackers)
Personalization
User Interface and Experience;Goal Setting and Tracking
Community Support
Data Integration (ex: connectivity with other tools like fitness trackers);Personalization
Goal Setting and Tracking
Data Integration (ex: connectivity with other tools like fitness trackers);Personalization;Community Support;Practicability/Ease of understanding the app
Personalization
Practicability/Ease of understanding the app
User Interface and Experience;Personalization
Data Integration (ex: connectivity with other tools like fitness trackers)
Personalization;Goal Setting and Tracking
Personalization
Personalization
Data Integration (ex: connectivity with other tools like fitness trackers);Personalization;Goal Setting and Tracking
Data Integration (ex: connectivity with other tools like fitness trackers);Personalization
Data Integration (ex: connectivity with other tools like fitness trackers);Community Support;Goal Setting and Tracking
Personalization;Community Support;Goal Setting and Tracking;Security & Privacy
Personalization
User Interface and Experience;Personalization;Community Support;Practicability/Ease of understanding the app
User Interface and Experience;Data Integration (ex: connectivity with other tools like fitness trackers);Personalization;Community Support;Practicability/Ease of understanding the app
User Interface and Experience;Data Integration (ex: connectivity with other tools like fitness trackers);Personalization;Community Support;Practicability/Ease of understanding the app;Goal Setti
Data Integration (ex: connectivity with other tools like fitness trackers);Practicability/Ease of understanding the app;Goal Setting and Tracking

How much do you pay for those app(s)?	Does your insurance or national healthcare system pay for your medication, treatments, etc.?	Do yo
	Yes, fully	Yes
	Yes, partially	No
	Yes, fully	No
Nothing	Yes, partially	No
Nothing	Yes, partially	No
Nothing	Yes, fully	No
Nothing	Yes, partially	Yes
	Yes, partially	Yes
	Yes, partially	No
Nothing	Yes, fully	No
Nothing	Yes, partially	No
	Yes, partially	No
Nothing	Yes, partially	Yes
Nothing	Yes, partially	Yes
Nothing	Yes, partially	No
	Yes, partially	No
Nothing	Yes, partially	No
Nothing	Yes, fully	No
Cost of Dexcom and Tandem supplies; $700/annually	Yes, partially	No
	Yes, partially	Yes
Nothing	Yes, partially	No
Nothing	Yes, partially	Yes
Nothing	Yes, partially	Yes
Nothing	Yes, fully	No
Nothing	Yes, fully	No
Nothing	Yes, partially	No
Nothing	Yes, fully	No
Nothing	No	Yes
Nothing	Yes, partially	Yes
Nothing	Yes, partially	No
Nothing	Yes, partially	No
Nothing	Depends upon insurance. No for most plans, yes for HIP +	Yes
	Yes, partially	No
Nothing	Yes, partially	No
	Yes, partially	No
Nothing	Yes, fully	No
Nothing	Yes, fully	No
	Yes, fully	No
	Yes, partially	No
Nothing	Yes, fully	No
	Yes, fully	No
	Yes, partially	No
	Yes, partially	No
Nothing	Yes, fully	No
Nothing	Yes, partially	No
	Yes, partially	No
	Yes, partially	No
Nothing	Yes, partially	No
	Yes, partially	No
	Yes, partially	No
	Yes, fully	No
	Yes, partially	No
Nothing	Yes, fully	No
	Yes, fully	No
5-10€ / month	Yes, partially	No
	Yes, partially	No

Is there anything else you would like to share about your experience managing Type 1 Diabetes?
Hh
There really needs to be more psychological help, if you don't have enough luck to be resilient enough to manage without having a breakdown every now and then. People are very different, we c
Growing up I was taught that I could live a normal life, just had to take care of myself. While this is indeed true, the fact that living with a chronic illness 24/7 is hard and may take its toll was neve
Have been type 1 for 52 years. Doing very well.
No
Most primary physicians don't have a clue about T1D!
It is so much easier to i've in spain with it than in portugal
Greatest success has been with carb counting, regular insulin use, exercise, low fat whole food plant-based diet, sleep, mindfulness practice and psychological support.
No
It's always improving, but not fast enough for me.
No
It's a rollercoaster and has an impact more than you realise
I have been a type 1 diabetic for 38 yrs and have also been a RN for 55 yrs and still have an active license. I have seen all of the life saving changes that have occurred over my career to help all
No
I just want to specify that in Germany it is required to see your endo or diabetes counselor every three month ...the diabetes counselor plays the biggest part in the support team
Talking about your illness and being in contact with people who can understand you and empathize with your experiences.
Find a cure. Second influence of GLP1 for type 1 - if beneficial make it accessible
I would like to be in a community and get more information
God bless anyone with it
The most and best things i've leraned by myself over the past years, try and error. It's important to never give up. But it's also heavy to do your daily business (lived alone for years, studied, to sp
acceptance is the key to a better life
The space may not be enough (😌 nope) but good luck with the quiz initiative!!
I learned long ago that most primary care physicians are NOT qualified to take care of T1D patients. We should all be under the care of an endocrinologist.

Appendix 13: Development Environment



*Please click the link to access the code of the app: [Thesis_Additional Documents]

Appendix 14: Original Data Points (left) and added Data Points for correlations (right)

	Patient_ID	Date	Age	Gender	Weight	Activity_Level_Minutes	\
0	1	20240101	43	1	73	129.0	
1	1	20240102	43	1	73	71.0	
2	1	20240103	43	1	73	58.0	
3	1	20240104	43	1	73	1.0	
4	1	20240105	43	1	73	26.0	

	Sleep_Quality	Mental_Health	Long_Acting_Insulin	HbA1c_Start	...	\
0	NaN	8.0	24.0	6.07	...	
1	6.0	4.0	24.0	6.07	...	
2	NaN	7.0	24.0	6.07	...	
3	6.0	1.0	NaN	6.07	...	
4	2.0	NaN	24.0	6.07	...	

	Meal_3_BSL_Post	Meal_3_Insulin	Meal_3_Carbs	Snack_2_BSL_Pre	\
0	73.12	10.44	95.0	142	
1	95.98	12.51	113.0	248	
2	NaN	NaN	NaN	70	
3	304.96	8.52	53.0	204	
4	87.02	5.99	50.0	158	

	Snack_2_BSL_Post	Snack_2_Insulin	Snack_2_Carbs	Meal_1_IC	Meal_2_IC	\
0	NaN	NaN	NaN	0.505121	0.928222	
1	240.24	3.88	14.0	0.505121	0.928222	
2	70.00	3.46	30.0	0.505121	0.928222	
3	190.32	6.84	48.0	0.505121	0.928222	
4	NaN	NaN	NaN	0.505121	0.928222	

	Meal_3_IC
0	1.54255
1	1.54255
2	1.54255
3	1.54255
4	1.54255

[5 rows x 35 columns]

	Snack_2_Carbs	Meal_1_IC	Meal_2_IC	Meal_3_IC	Meal_1_Delta_BSL	\
0	3.00	0.51	0.93	1.54	-69	
1	14.00	0.51	0.93	1.54	4	
2	30.00	0.51	0.93	1.54	67	
3	48.00	0.51	0.93	1.54	-9	
4	27.00	0.51	0.93	1.54	79	

	Meal_2_Delta_BSL	Meal_3_Delta_BSL	Daily_Insulin_Usage	\
0	-8	-68	24.00	
1	-188	134	34.50	
2	-85	19	48.00	
3	-202	-189	46.21	
4	12	23	40.00	

	Daily_Carb_Stability	Daily_BSL_Stability	Meal_1_Glycemic_Efficiency	\
0	37.49	42.02	23.00	
1	38.57	77.93	-0.73	
2	42.29	51.46	-7.44	
3	30.10	106.46	0.56	
4	31.49	30.60	-7.90	

	Meal_2_Glycemic_Efficiency	Meal_3_Glycemic_Efficiency	\
0	2.29	4.12	
1	47.00	-6.87	
2	7.73	-0.93	
3	22.44	21.00	
4	-1.00	-2.71	

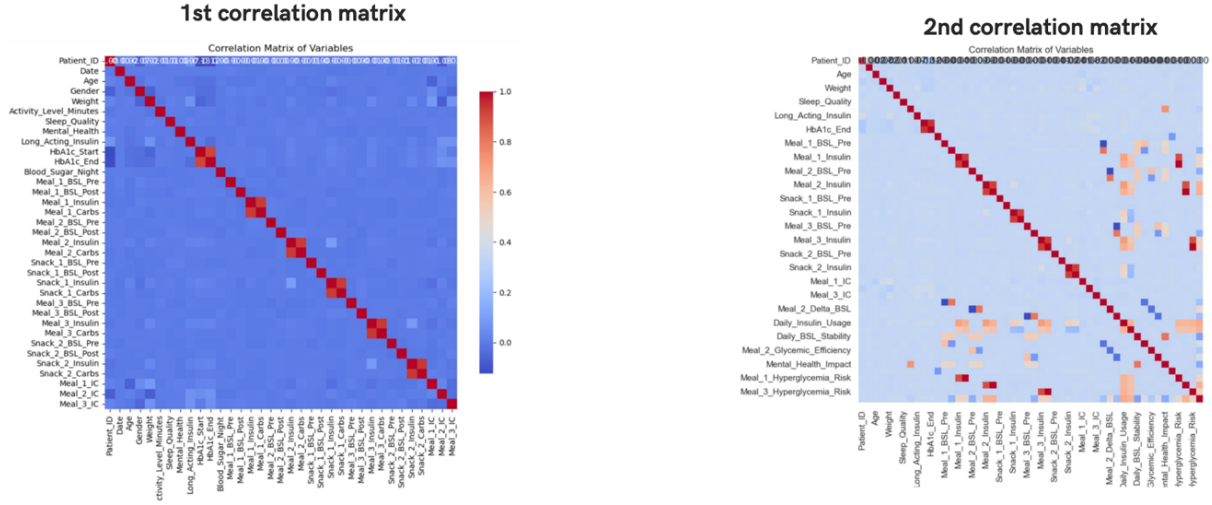
	Mental_Health_Impact	Nighttime_Hypo_Indicator	Meal_1_Hyperglycemia_Risk	\
0	336.13	0	0.20	
1	311.72	0	0.34	
2	360.23	0	0.55	
3	106.46	0	1.00	
4	214.20	0	0.61	

	Meal_2_Hyperglycemia_Risk	Meal_3_Hyperglycemia_Risk
0	0.29	0.79
1	0.32	0.94
2	0.91	0.98
3	0.72	0.44
4	0.97	0.41

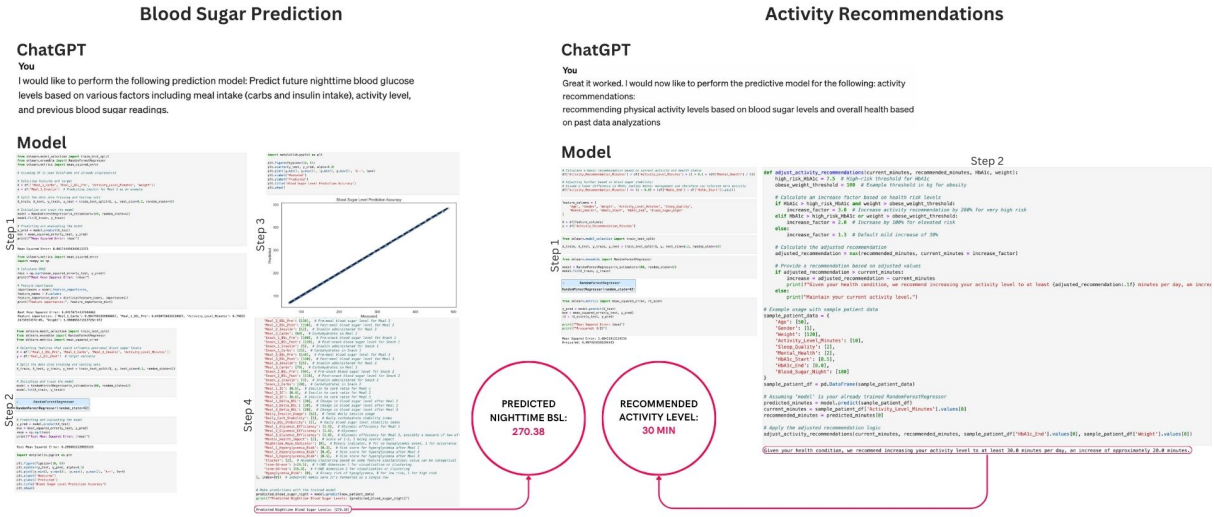
Appendix 15: Dataset

*Please click the link to access the complete dataset: [Thesis_Additional Documents]

Appendix 16: Correlation Matrix



Appendix 17: Predictive Models

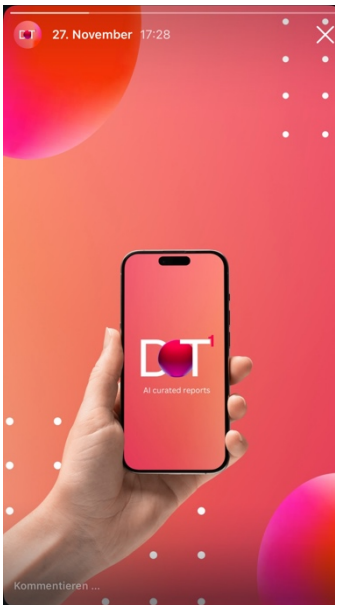


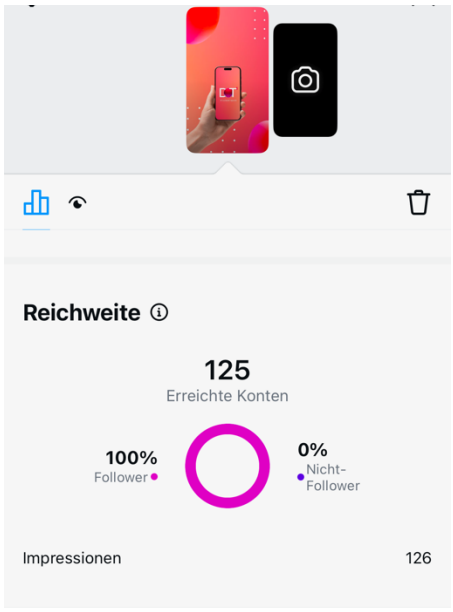
Appendix 18: Heatmap of Relative Platform Performance with Z-Transformed Data

	DOT1	Dexcom	Levels	Ultrahuman	Lingo	OneDrop	Tandem Diabetes
Engagement Rate (%)	0,63	-0,36	1,93	-0,72	-0,74	-0,84	0,10
Follower Count	-0,84	1,07	1,58	0,30	-0,84	-0,81	-0,46
Monthly Earnings (€)	-0,38	-0,04	2,24	-0,40	-0,47	-0,48	-0,47
Posts	-0,92	1,39	-0,24	0,39	-0,89	-0,91	1,18
Average Likes per Post	-0,43	-0,39	2,26	-0,34	-0,43	-0,43	-0,24

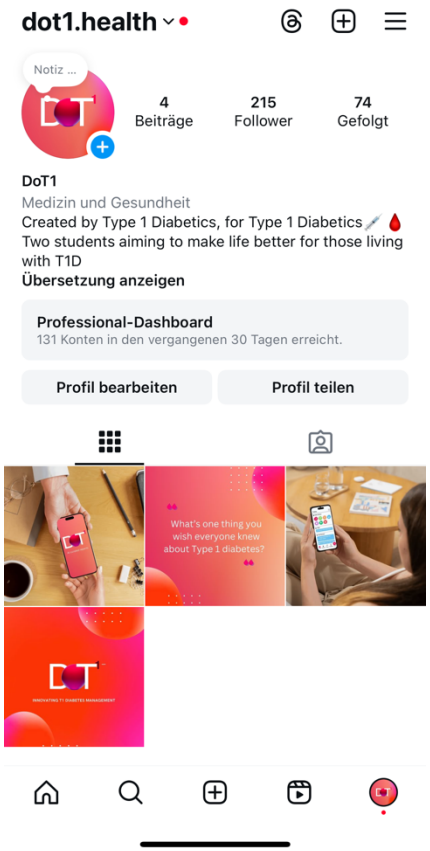
Link to excel sheet: [Thesis_Additional Documents]

Appendix 19: DOT1's First Story Posting with Insights/ KPIs

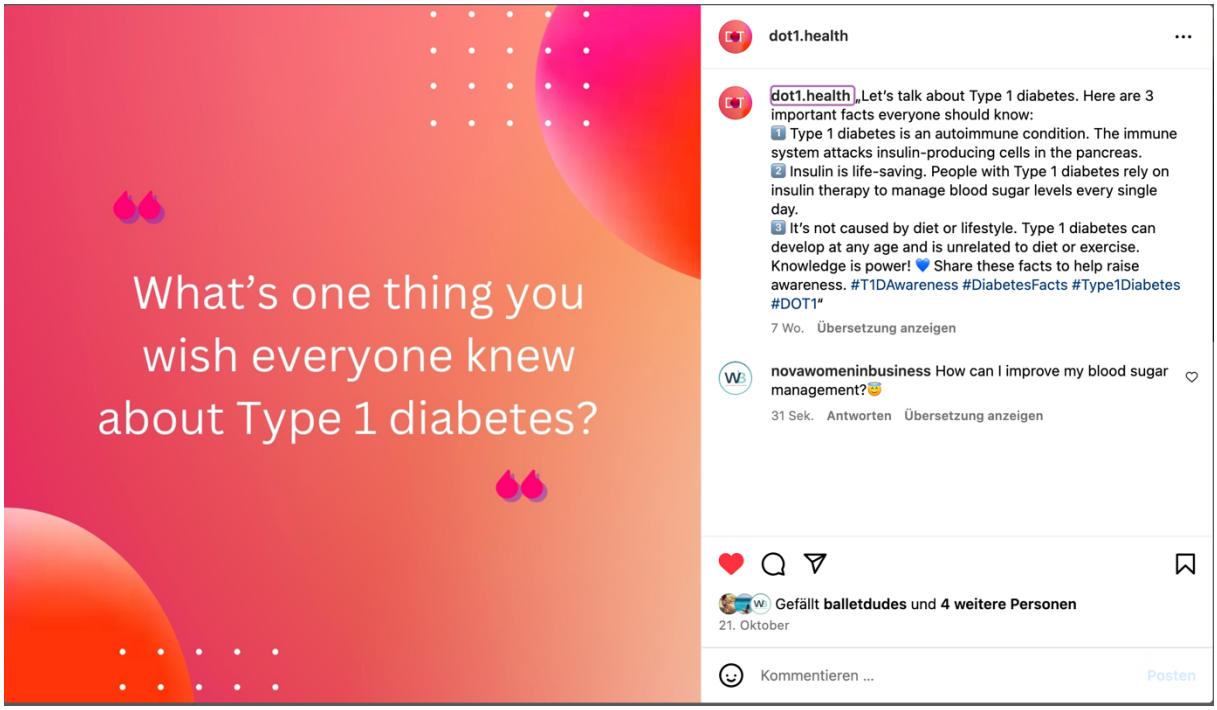




Appendix 20: Dot1's Instagram Profile

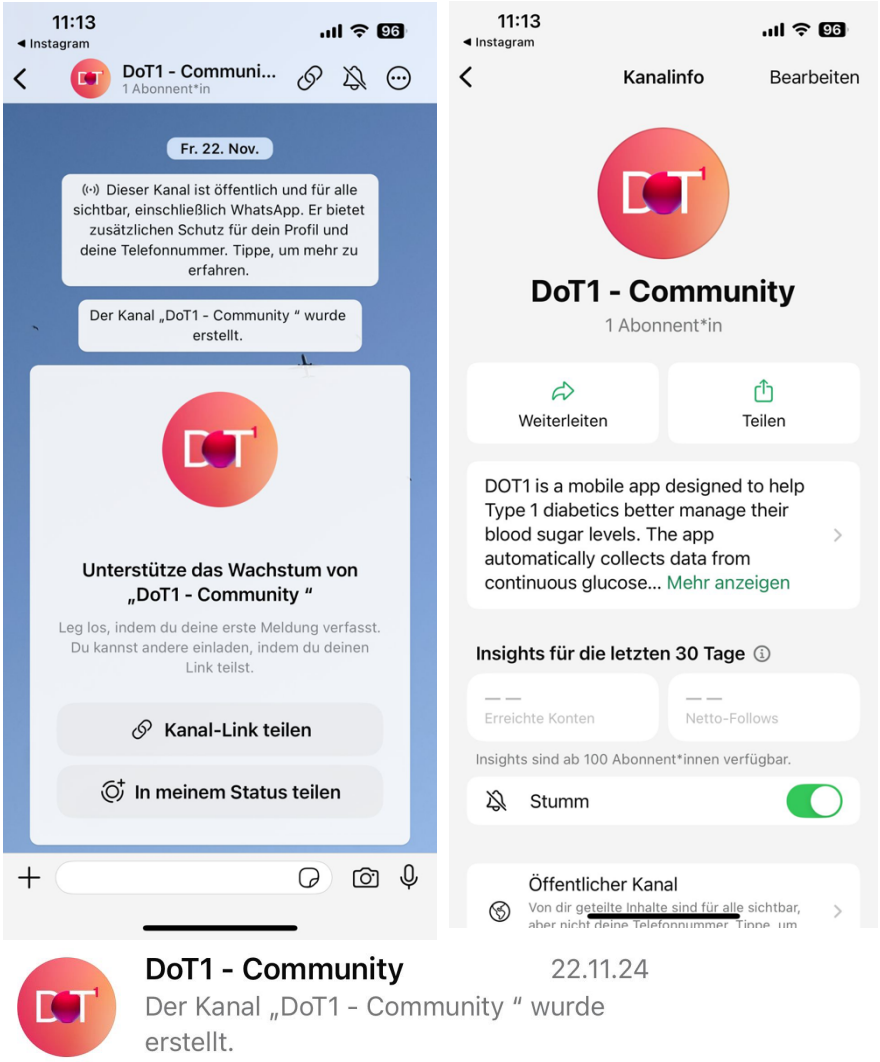


Appendix 21: Example of Dot1's Content



Educational content with descriptive and informative captions and consistent visual branding and use of hashtags

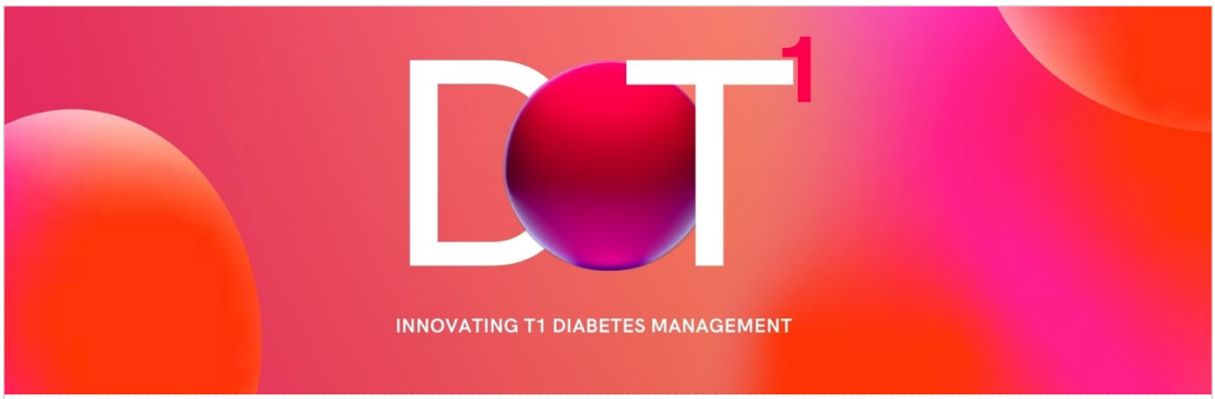
Appendix 22: DOT1's Whatsapp Community



Link to Whatsapp group:

https://www.google.com/url?q=https%3A%2F%2Fwhatsapp.com%2Fchannel%2F0029VatIhDq0AgWGfAzUOU0Y&sa=D

Appendix 23: Landing Page



Hey, thanks for clicking! This is part of our **Master's thesis**, and we're so excited that you're interested in what we're working on:

DOT1 is a mobile app designed to help Type 1 diabetics better manage their blood sugar levels. The app automatically collects data from continuous glucose monitoring (CGM) systems and combines it with lifestyle information such as diet, exercise, and hormonal cycles. Using AI, DOT1 analyzes these data, detects patterns, and provides personalized recommendations to stabilize blood sugar. The goal is to minimize blood sugar fluctuations, improve quality of life, and reduce the mental burden of managing Type 1 diabetes.

For more updates and information about Dot1 enter our Community Group on Whatsapp.
CLICK HERE to join now. 📲

Link to landing page:

https://sites.google.com/d/1Odo0OCLGVBLT-Je99K4dGiKnB4fOjPz2/p/1T9_jEHX0U-FVHiJktWd9GGMp2CXXRjUN/edit