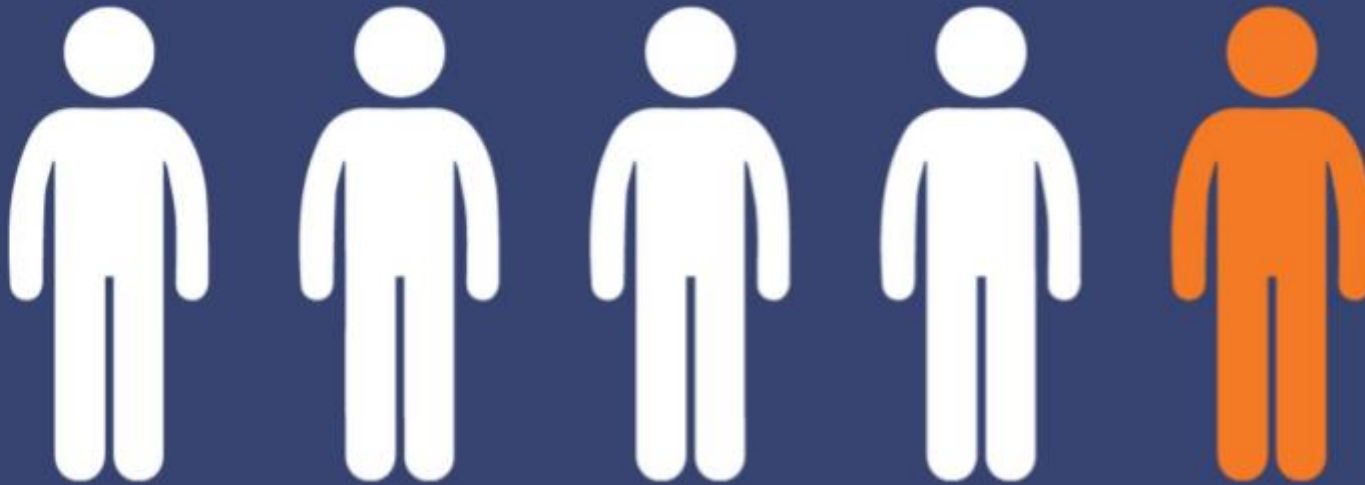


Sensei

Carlos Miguel Lasa
Audrey Leung
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1 in 5 Americans suffers from a
mental health condition.



350 million

The number of people globally who are affected by some form of depression.

11%

The percentage of adolescents who have a depressive disorder by the age of 18.

70%

The percentage by which women are more likely than men to experience depression in their lifetime.

16 million

The estimated number of U.S. adults who had at least one major depressive episode 2012. This made up approximately 6.9 percent of all adults in the country.

14%

The percentage of women from a 2013 postpartum depression study who had the disorder four to six weeks after giving birth.

30%

The number of college students who reported feeling depressed, which disrupted their ability to function in school.

\$80 billion

The estimated annual cost of depression in the U.S. due to lost productivity and health care.

50%

The percentage of Americans with major depression who don't seek treatment for the mental illness.

10 - 20

The number of weeks psychotherapy treatments for depression usually lasts (though it varies depending on the condition).

http://www.huffingtonpost.com/2015/01/20/depression-statistics_n_6480412.html

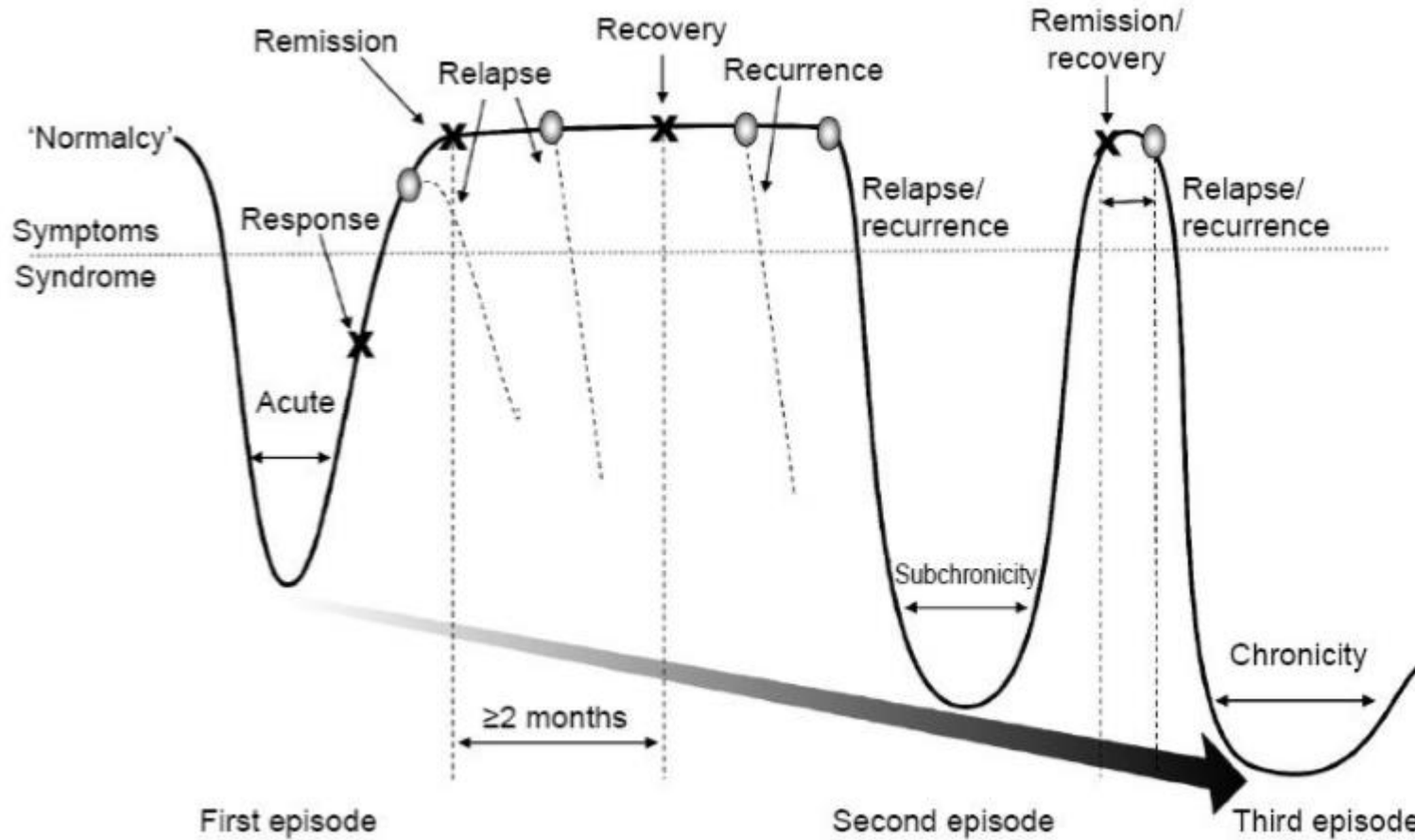
<http://www.livescience.com/5997-depressed-americans-treatment.html> http://www.dbsalliance.org/site/PageServer?pagename=education_statistics_depression

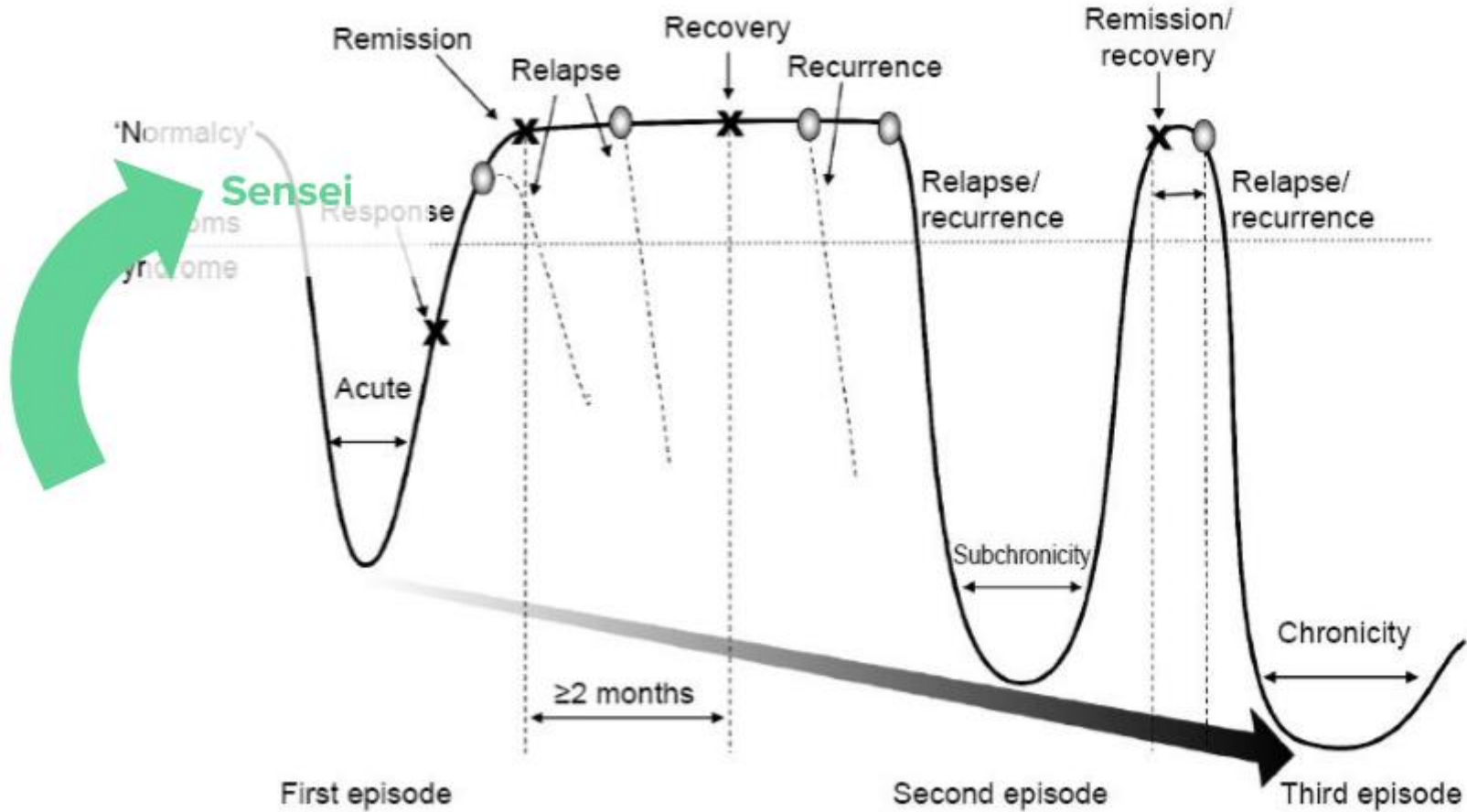
http://www.dbsalliance.org/site/PageServer?pagename=education_statistics_depression

The Stats on Depression

Types of Depressive Disorders (DSM-5)

- Major Depressive Disorder
- Persistent Depressive Disorder (Dysthymia)
- Disruptive Mood Dysregulation
- Premenstrual Dysphoric Disorder





Team



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Technology, Research Overview

- Mobile phone / wearable sensors
 - GPS
 - Accelerometer
 - Gyroscope

- Machine Learning / Data Science
 - Micro-intervention authoring
 - Intervention recommender system

PopTherapy: Coping with Stress through Pop-Culture

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ABSTRACT

Stress is considered to be a modern day “global epidemic”; so given the widespread nature of this problem, it would be beneficial if solutions that help people to learn how to cope better with stress were scalable beyond what individual or group therapies can provide today. Therefore, in this work, we study the potential of smart-phones as a pervasive medium to provide “crowd therapy”. The work melds two novel contributions: first, a micro-intervention authoring process that focuses on repurposing popular web applications as stress management interventions; and second, a machine-learning based intervention recommender system that learns how to match interventions to individuals and their temporal circumstances over time. After four weeks, participants in our user study reported higher self-awareness of stress, lower depression-related symptoms and having learned new simple ways to deal with stress. Furthermore, participants receiving the machine-learning recommendations without option to select different ones showed a tendency towards using more constructive coping behaviors.

several of the challenges, the interventions often suffer from two delivery problems: low adherence and low engagement rates. Research into how to improve these efficiency metrics is actively being pursued in the psychological community. In practical terms, the challenge to deliver effective interventions in real life can be summarized with the following question: how can we design the “right” intervention(s) to be delivered at the “right” time(s)?

In this paper we focus on the first half of this challenge, i.e., “what” should a mobile app recommend when the user needs an intervention in any real life setting; leaving the “when” as future research. We conducted a study to verify three main questions:

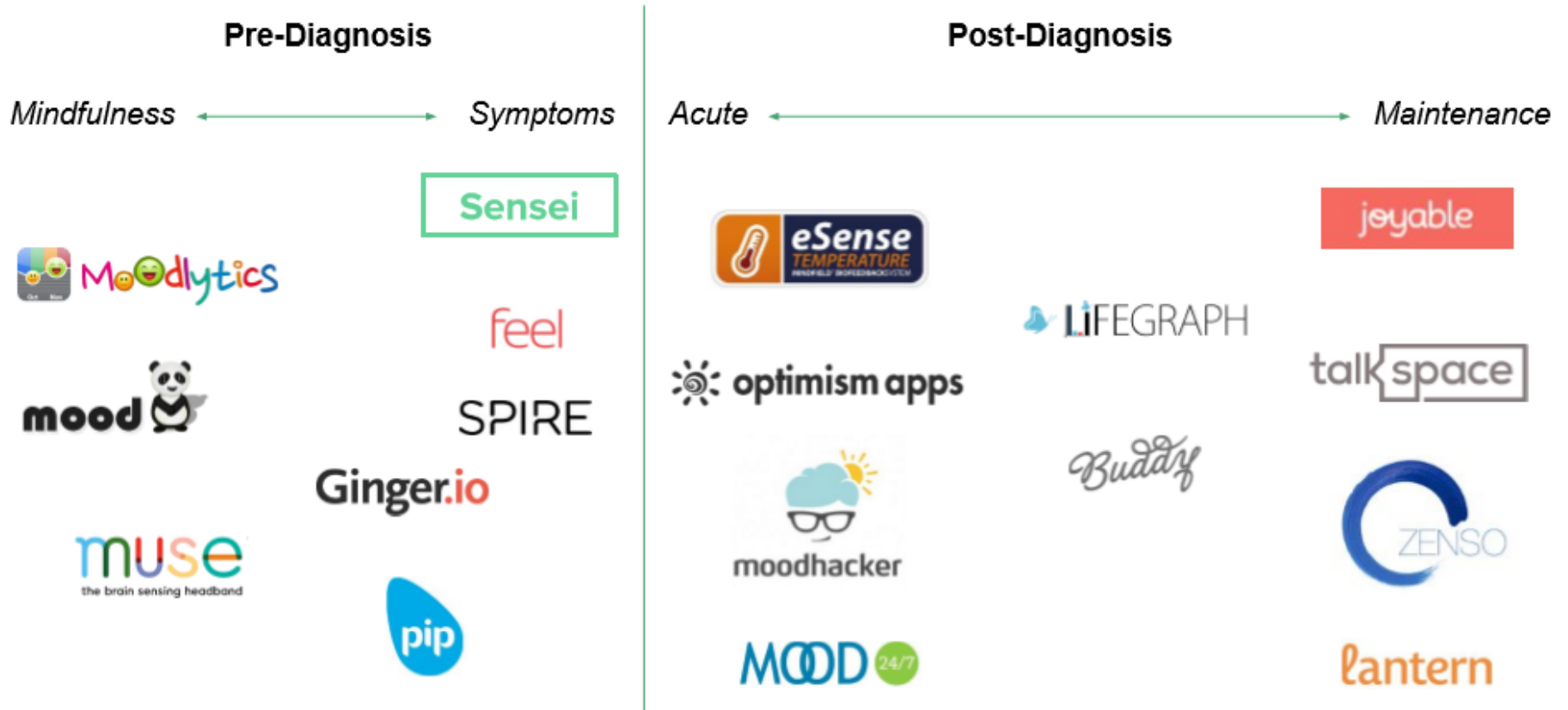
1. Can we repurpose popular applications and web-sites as stress management micro-interventions?
2. Can the efficiency of such interventions be greatly improved by personalizing them to each individual and their context?
3. Can we gently move people’s stress coping tendencies from destructive to constructive ones over time?

We designed a system based on an adaptive “learn-by-doing”

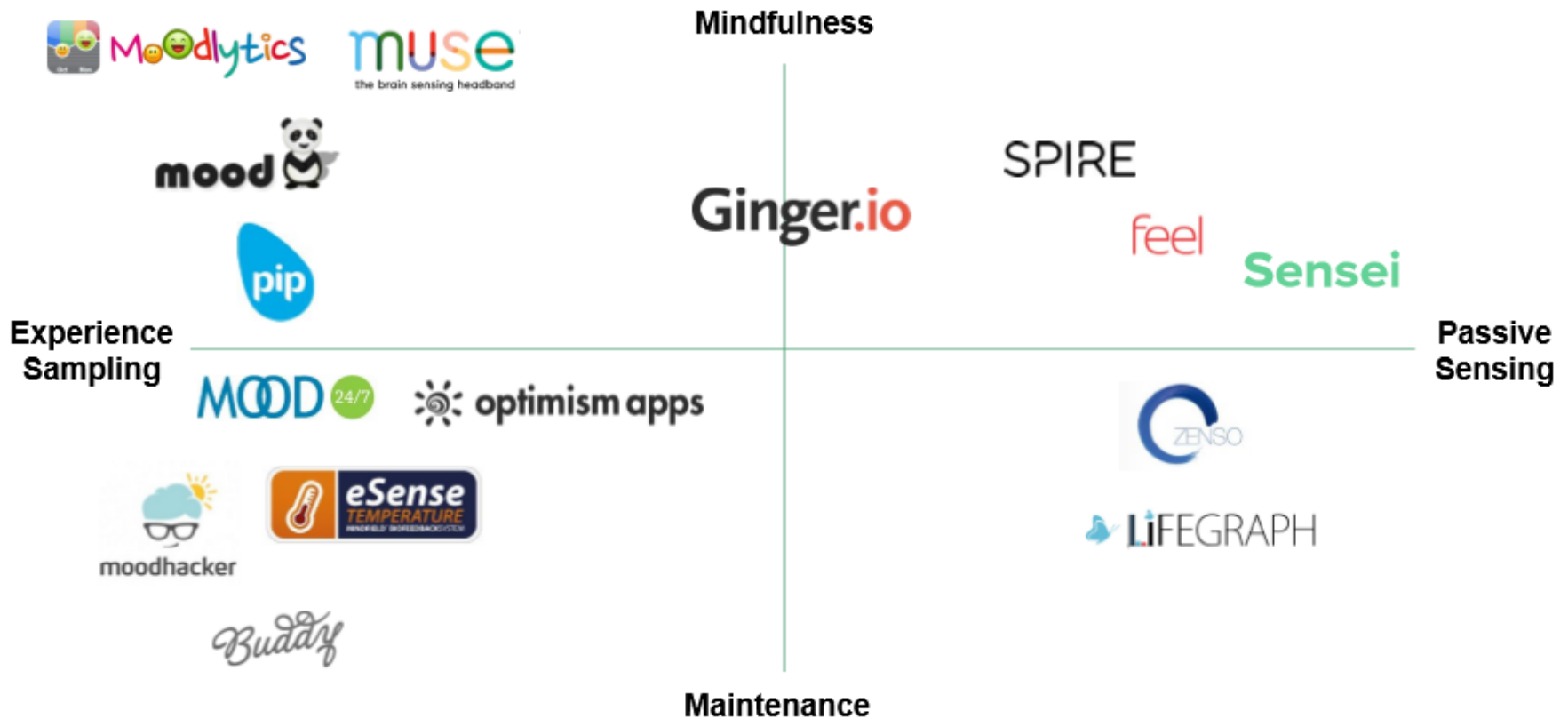
Sensing Indicators of Depression

- Sleep patterns
- Mobility
- Social interaction
- Phone usage
- Nocturnal temperature

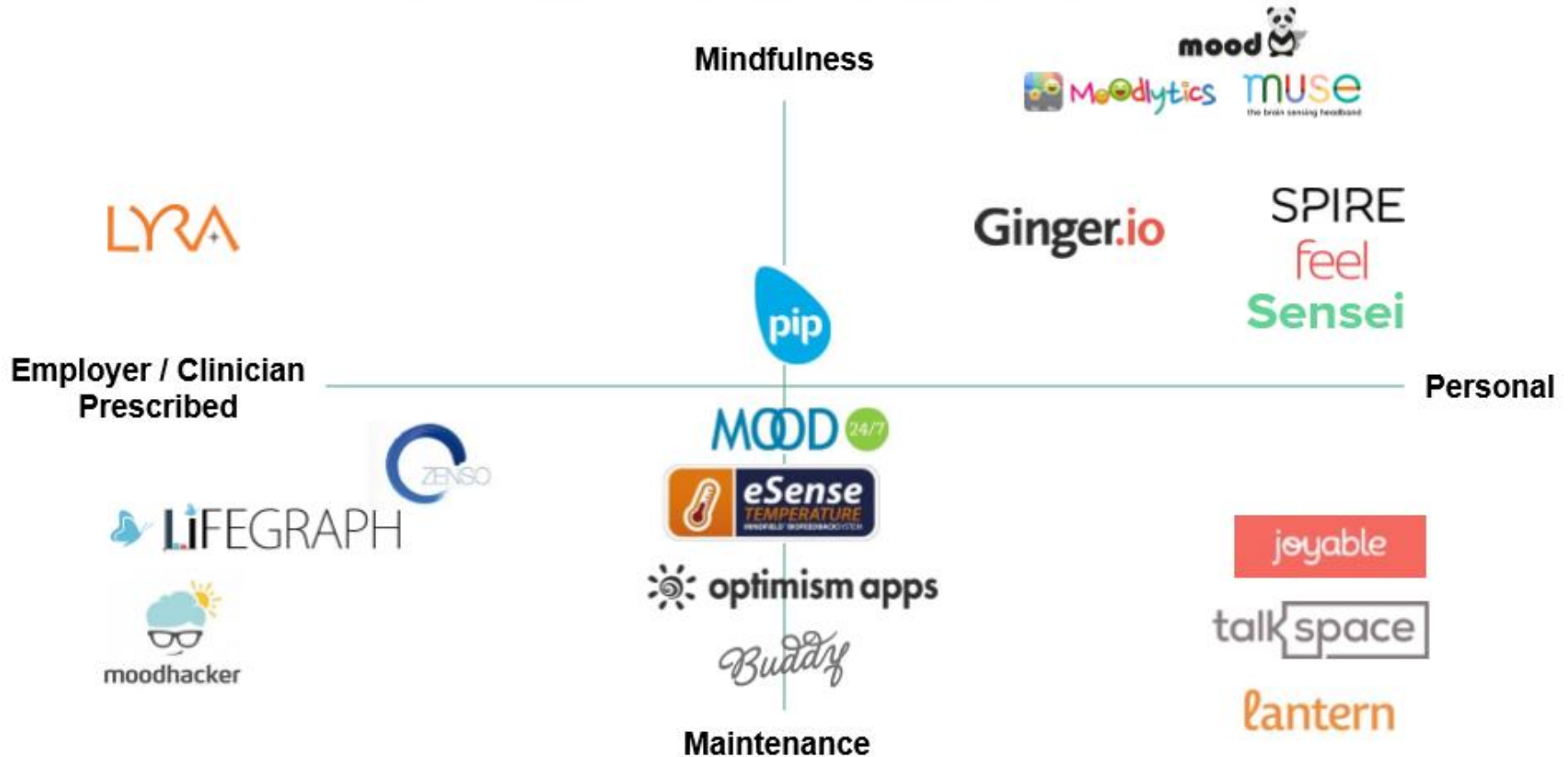
Competitive Landscape - Stage of Depression



Competitive Landscape - Data Collection



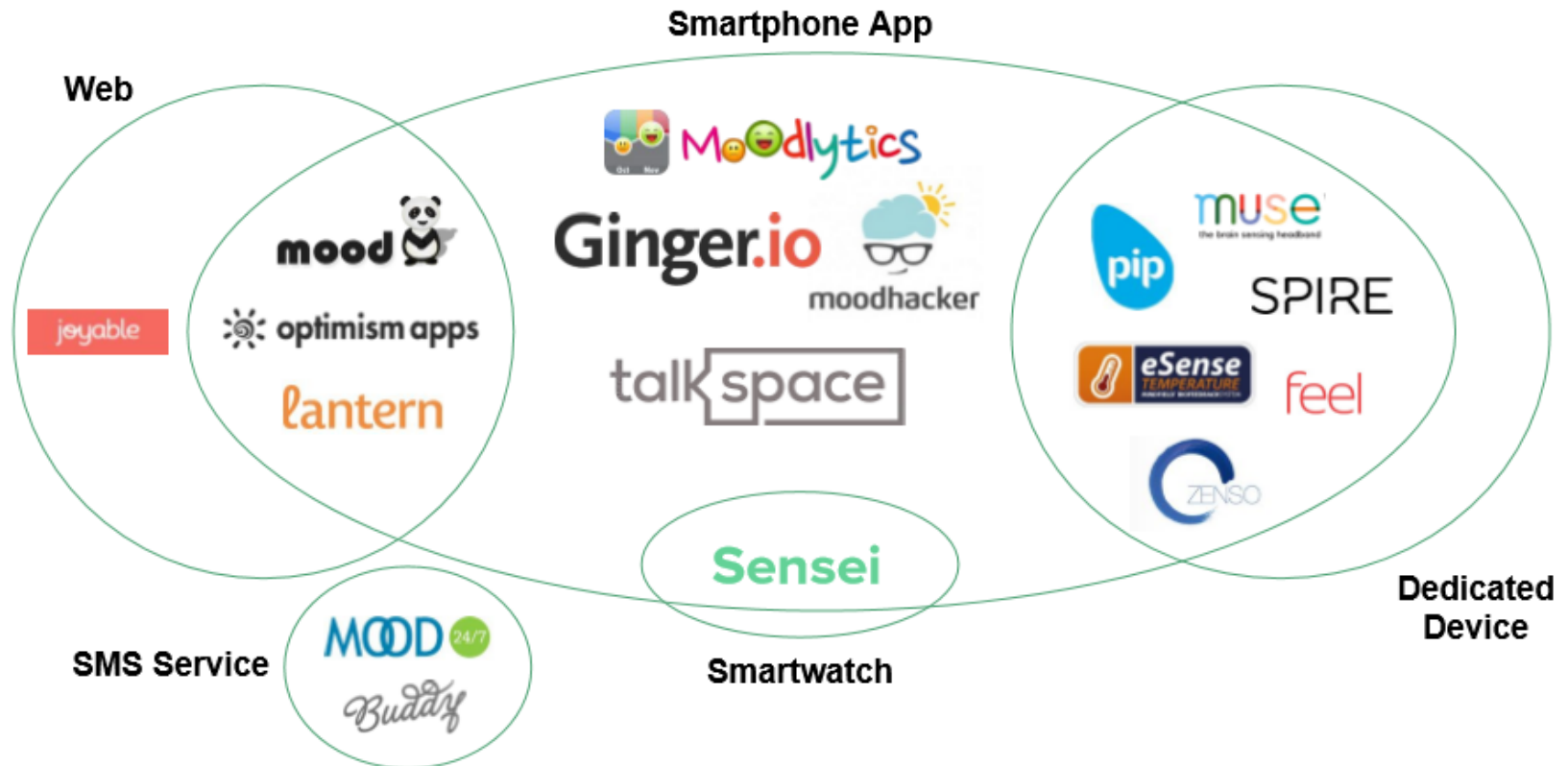
Competitive Landscape - Distribution Channel



Competitive Landscape - Level of Intervention



Competitive Landscape - Tech Platform



feel



57%

of wearable users lose
interest of wearing the
device within 12 months

<http://www.techrepublic.com/article/wearables-have-a-dirty-little-secret-most-people-lose-interest/>

Sensei

1 Passive data collection through smartwatch biosensors

2 Machine learning algorithm to learn and detect symptoms of depression (Paredes)

3 Micro-interventions

- Text from friend
- Call to hang out
- Song from playlist
- Meditation
- Breathing
- Fun games
- Youtube video
- Inspirational quote
- Cute animal photos



Value Proposition

- **Unobtrusive**
 - No additional device to purchase, leverages user's existing smartphone and smartwatch
 - Invisible passive data collection; user does not need to consciously input data
- **Accurate**
 - Usage of multiple sensors on devices to collect multiple data points
 - Larger amount of data to train machine learning algorithms
- **Personal**
 - History of user's personal data across multiple devices
- **Timely Micro-Interventions**
 - Usage of machine learning to prompt the user at the appropriate time for small, simple behavioral interventions

Future Vision & Plans

Product

- Connect more micro-interventions
- Optimizing algorithm to better detect emotions and time micro-interventions
- Platform expansion to multiple devices

Market & Business Model

- Exploration of potential target users - childhood depression, existing therapist-patient relationships, etc.
- Development of revenue model - pay per click, subscription, etc.

Appendix

Risks

- Inaccurate formula / logic
 - False positives
 - False negatives
 - Misdiagnoses
 - Mistreatment
- Privacy
- Notifications resulting in drop-off or uninstalling (annoyances)
- Suicide risk (duty to report)

Segmentation of Types of Depression

- Major Depression
- Dysthymia
- Postpartum Depression
- Persistent Depressive Disorder
- Seasonal Affective Disorder
- Atypical Depression
- Psychotic Depression
- Bipolar Disorder
- Premenstrual Dysphoric Disorder
- Situational Depression

<http://www.everydayhealth.com/depression-pictures/different-types-of-depression.aspx>

<http://www.webmd.com/depression/guide/depression-types>

Mood Disorders (DSM-4)



Schematic of the main different types of depression
(copyright www.toodepressed.com)

Business Model

- Pay-per-click
 - Application platform refers user to other applications in micro-interventions
- Subscription / Freemium
 - User pays an extra amount to unlock deeper analysis of data or more sophisticated micro-interventions
- B2B
 - Health insurance companies or employers may look into paying for the usage of the platform for their employees; consider industries or line of work susceptible to depression