# Limbr BackRx: mHealth for the management of Chronic Low Back Pain

## A Small Data Lab, Foundry, and WITNY Collaboration

CORNELL TECH

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## Background

According to the NIH, lower back pain is pervasive and is experienced by ⅘ people at some point in their lives. It accounts for 3.15% of all emergency visits in the US, contributing the superfluous rises in health care costs of up to 635 billion in 2011 [4,5].

Reviews of patient targeted smartphone applications for pain management [22], despite the large availability of applications for pain tracking, self-management, and exercise training, the science of implementation of mHealth technologies and self-management of chronic conditions are important areas for further research [2,23]. There has been little research regarding methods associated with continued user engagement, or the effectiveness of adherence to certain health platforms [6,12,24] for improving outcomes among those living with chronic diseases,

## Objective

This study investigated the role that Limbr, a modular mHealth compliance enhancement intervention, can play in a patient's self-management of lower back pain. Patients' adherence to a self-directed rehabilitation program and user engagement in self-reporting Activities of Daily Living (ADLs), medication, affect, and pain function was assessed while using Limbr in 30 patients with LBP. **Limbr** is comprised of self-directed rehab tutorial videos, personalizable, visual self-report tools, health coach support, and sensor-assisted passive tracking of activity levels.

Compliance was measured by analyzing frequency of interaction with Limbr apps, and rehabilitation outcome was measured based on the Oswestry Low Back Pain Questionnaire (ODI Index) which quantifies pain and disability level. We aim to determine whether proxies of compliance with **Limbr** are correlated with participant reported improvements in pain.

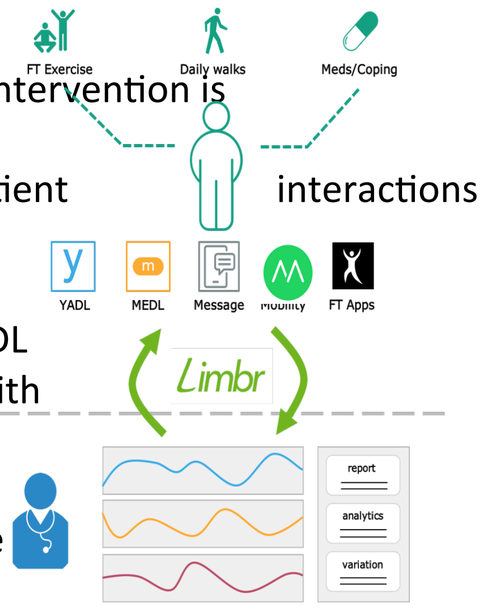
## Methods and Materials

The **Limbr** intervention framework:

1. Self-report for actively collecting in situ user data: YADL, MEDL, PAM
2. Passive logging: MOVES
3. Real-time feedback and counseling – LIMBR Coach
4. BackRx mobile physical therapy: FORCE Therapeutics

The efficacy of this intervention is evaluated by:

a) Frequency of patient interactions
b) Patient reported
c) outcomes
d) Correlation of ADL pain reporting with Oswestry Disability Index (ODI) score




## Results

| | Total Participants | Percentage |
|---|---|---|
| Female | 22 | 62.86% |
| Male | 13 | 37.14% |
| Total | 35 | |

**Table 1.** Total participant numbers

It was found that Limbr promoted engagement in self-monitoring and management of pain through the use of the mobile applications. The 35 participants who completed the full 3 months of engagement demonstrated a sustained use of the Limbr system, with 65% of participants interacting at least once a week. About 60% of participants found YADL helpful in keeping track of ADLs. About 70% of the participants agreed that the daily notifications were beneficial in reminding them to complete the daily surveys and exercises. 50% of participants perceived the engagement features as higly motivating and useful. It was also found that the Limbr self-assessment YADL is correlated to the ODI Index ($P < .001$)

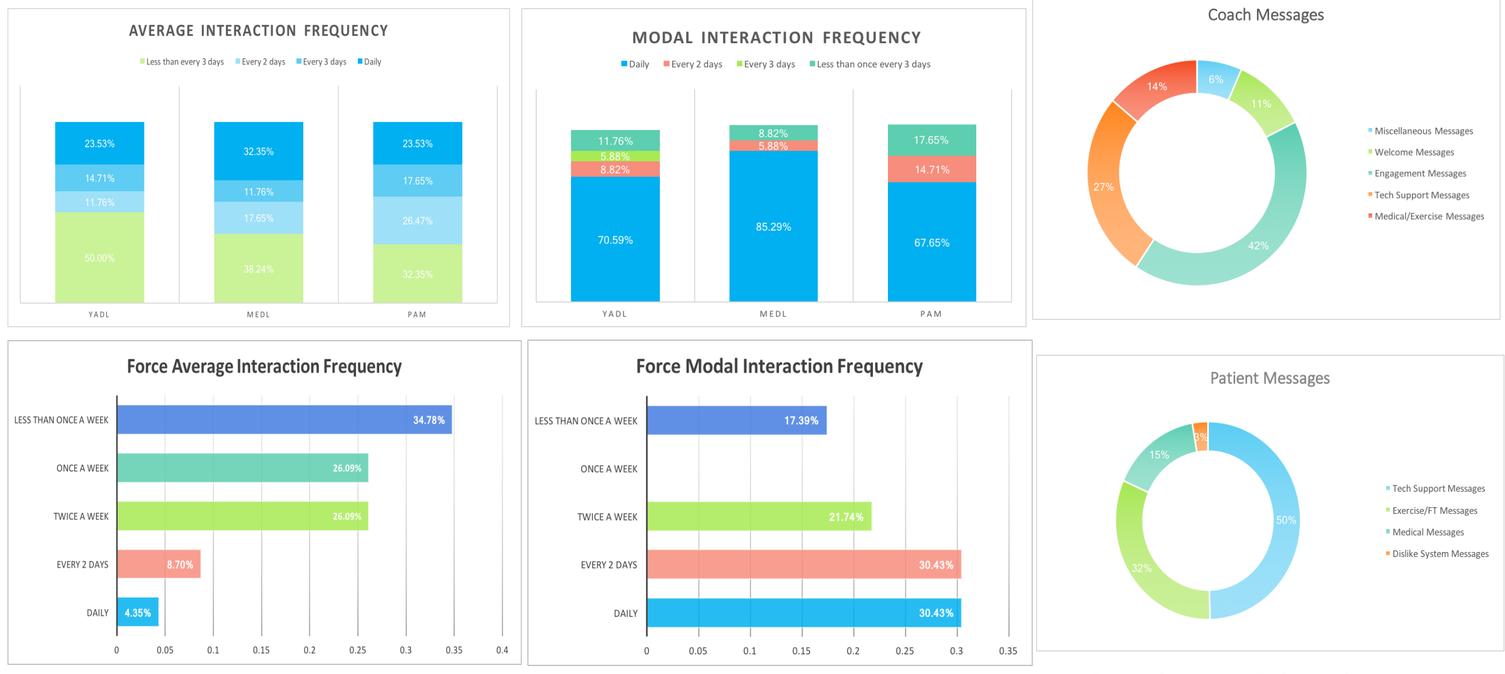



**Figure 1.** Frequency of User Interactions on YADL, MEDL, PAM, and FORCE

**Figure 2.** Type of Limbr Coach messages from & to patients

### Interaction across all apps

### Limbr Messaging

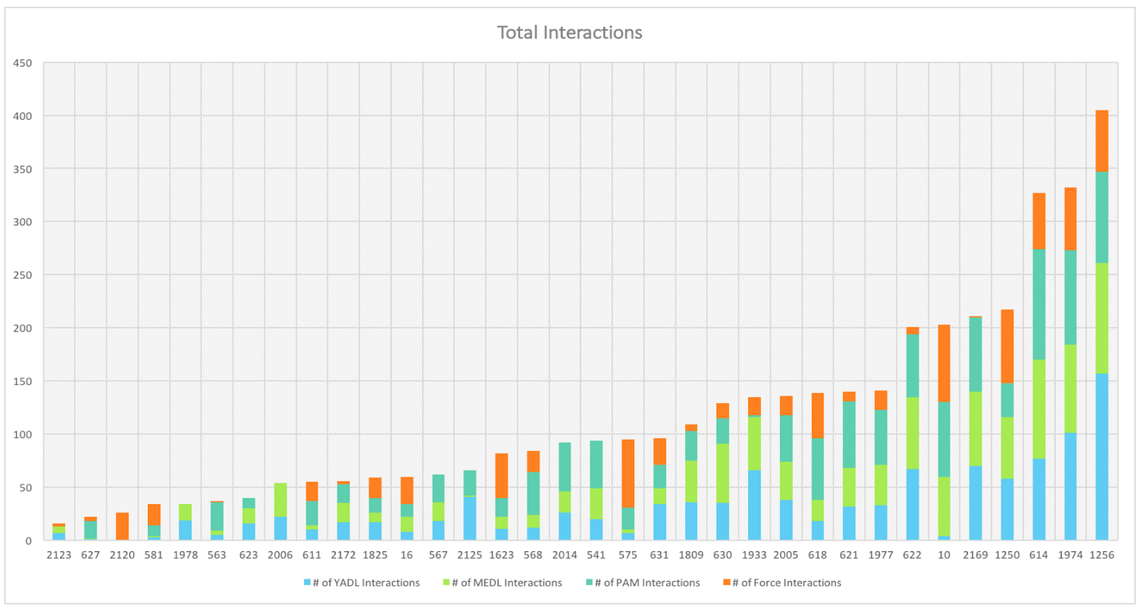



**Figure 3.** Total interactions across YADL, MEDL, PAM, FORCE


**Figure 4.** Scores on ODI survey administered at baseline & study completion

### Patient Reported Outcomes

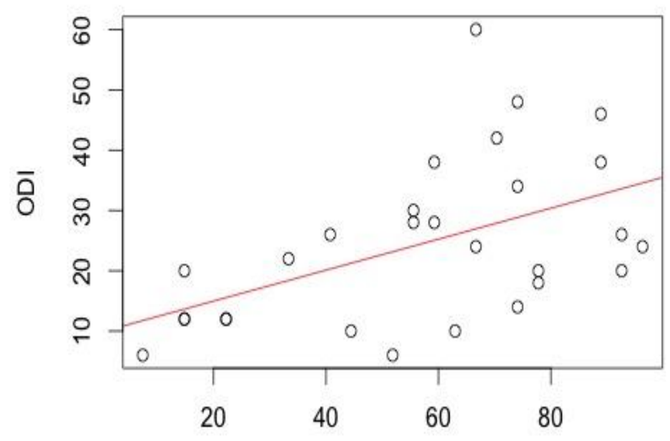



**Figure 5.** Correlation between YADL and ODI using full assessment YADL and baseline ODI scores ($R^2 = 0.2542$, $P = 0.0062$ )

Analysis, displayed in Figure 5, demonstrates that YADL is a statistically significant predictor of ODI score – for every one unit increase in YADL, the ODI score increases by 0.25 units

### YADL & ODI

## References

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