

# Building The Recovery Ratchet

## Formative research on identifying readiness-to-change in support platforms using multi-modal behavioural markers

### INTRO

- Digital Health Support Networks (DHSNs) can empower patients to manage long term conditions, but, in real world settings, they do not achieve their potential due to poor engagement; the science of attrition must be advanced to mitigate this.
- Formative research into phenotyping DHSN interactions led us to consider the importance of 'Identifiable Context' (patterns of verbal behaviour which connect modal operators to personalised goals) in clarifying an individual's relationships (frames) with their self, others and their health.

### METHODS

- Under guidance of clinical research practitioners, labels were generated on a sample of the peer-peer conversation data to represent readiness to change in a binary manner (0/1).
- A dictionary of regular expressions (RegEx) was created based on Motivational Interviewing (MI) textbook definitions and practical descriptions of Change Talk (CT) in the form of bigrams chosen to best represent components that indicate patient willingness and commitment to change.
- Exploratory Data Analysis: The data was clustered via K-means, which gave an indication of hidden homogeneity within it. Individual full sentences and utterances were labelled to provide full context. Results were visualised using word clouds to indicate common features native to each class.
- A classification tool was engineered for the purpose of identifying unlabelled cases within unexplored data. The best performing model consisted of a neural network with a component transformer block, to provide more precise results via means of attention heads. This method weighted each part of the input data for significance, enabling the generation of more robust internal rules.
- Patients and clinicians experienced in working in mutual aid for behaviour change were invited to review the model outputs and refine classifications. This 'human-in-the-loop' approach provided valuable feedback and validation of model reasoning by exposing their tacit knowledge regarding the process and markers of recovery.

### INITIAL RESULTS

- Inherent similarities in the structure of *ready* and *unready* examples made them difficult to distinguish; important pronouns and conjunctions are so common in general dialogue they are often removed in standard Natural Language Processing (NLP).
- Readiness to change relies more on 'identifiable contexts' than related problems such as sentiment analysis.
- Empirical analysis of data revealed 'openness' as a precursor to MI CT, suggesting expanding the psychological constructs informing the language markers to include mindfulness.
- The danger of false positives when labelling for Sustain Talk (continuance of existing, often less healthy, behaviours) prompted discussion surrounding a new concept: 'Maintain Talk' - maintenance of positive behaviours, that could be mistaken for psychological inflexibility or unreadiness i.e. low patient activation.
- Pre-screening records via RegEx returned positive results in an initial sample: From 300 labelled records this method removed 60 records, with only 3 positive cases being incorrectly disqualified.
- The classifier tools returned an average of 70% accuracy during small scale runs, indicative of good potential at scale with an ideal training dataset size for more varied holdout data.

### DISCUSSION

- Preliminary findings suggest this method for distilling practitioner expertise and combining it with artificial intelligence can elucidate the Identifiable Context of change (matching recorded and inferred user goals and values). This allows the crucial distinction between sustenance of undesired coping mechanisms and maintenance of new wellness routines.

### The 'Recovery Ratchet'



The vision: *If* we can create a reliable enough classifier, we can potentially assess an individual's readiness to change and then match suitable health coaching approaches and resources, reducing reactance and disengagement. Personalised reinforcing nudges can promote and maintain progress towards sustainable self-management.

### Connection to Patient Activation

Level 1	Level 2	Level 3	Level 4
Disengaged and overwhelmed	Becoming aware, but still struggling	Taking action	Maintaining behaviours and pushing further
Individuals are passive and lack confidence. Knowledge is low, goal-orientation is weak, and adherence is poor.	Individuals have some knowledge, but large gaps remain. They believe health is largely out of their control, but can set simple goals.	Individuals have the key facts and are building self-management skills. They strive for best practice behaviours, and are goal orientated.	Individuals have adopted new behaviours, but may struggle in times of stress or change. Maintaining a healthy lifestyle is a key focus.
Their perspective: "My doctor is in charge of my health".	Their perspective: "I could be doing more".	Their perspective: "I am part of my health care team".	Their perspective: "I am my own advocate".

Increasing level of activation

PAM<sup>®</sup> activation characteristics by level  
Adapted from Insignia Health PAM<sup>®</sup> practice manual

### Next Steps:

Triangulate against relevant in-platform progress measures & explore linkage to electronic health & social care records to measure impact on resource consumption and patient experience

Leverage ethical and technical expert assistance through ongoing collaboration with Manchester Metropolitan University via the GM AI Foundry, and Salford University via Innovate UK KTP scheme.

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