

INTRODUCTION

Every individual has multiple influences on their health, these often being a complex mixture¹ of lifestyle and dietary choices as well as practitioner-associated interventions.

Randomised controlled trials (RCTs) typically aim to eliminate the effects of factors other than a single specific therapeutic effect. This can dramatically underestimate the 'total effect' from multiple factors as experienced by individuals in the real world.²

Health and resilience in the real world thus manifest as a multi-layer systems model (Fig. 1).

There is an acute need for 'health apps' that motivate individuals towards self-improvement in health status, while also allowing researchers to establish specific combinations of factors that contribute to improved health outcomes and resilience.³

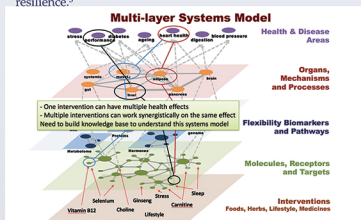


Fig. 1 TNO Multi-layer system model

OBJECTIVES

1. The Hawthorn Tracker is being developed as a mobile-first web app that collects and interprets 3 channels of self-reported data: (1) anthropometrics; (2) perceived health status; and, (3) specific aspects of healthcare and lifestyle choices.
2. Data channels (1) and (2) are used by the individual (user) to track health status and as a motivational tool for self-improvement. Additionally, researchers will be able to establish associations between specific healthcare/lifestyle choices (data channel 3) and self-reported health trajectories (data channels 1 and 2) using anonymised data that users have opted to share with the research consortium.
3. Analysis of 'big data' will help to establish robust associations between health status and multi-factorial healthcare and lifestyle choices. Processed data (data- and expert-driven knowledge) can be relayed back to users to offer personalised advice via the Hawthorn health platform to drive further self-improvement of health status. It can also be shared with the wider research community to inform expert-driven knowledge systems with the aim of informing and improving public health policy.
4. Such big data approaches may provide more informative real-world data on effectiveness of specific healthcare and lifestyle choices in relation to their effects on resilience and the development of multi-factorial, chronic diseases, as compared with RCTs, that typically determine efficacy of single or limited interventions within the confines of experimental conditions.

METHODS

A beta-test version of a web-based app (the Hawthorn Tracker) has been developed as a means of collecting patient-reported objective and subjective health data alongside information that characterises key elements of the individual's health and care system.

Data are collected in three data channels: 1) anthropometric parameters, 2) self-reported physical and mental health, and 3) characteristics about the individual's health and wellbeing management system.

Data from the first two categories are aggregated and displayed under 5 categories, namely metabolic risk, health feel, functional health, emotional health and pain. These data also yield a composite score (%) that is a measure of self-reported health status⁴ or resilience.

The app allows historical data and trends to be viewed and the user can choose to share health data with his/her practitioner(s) and, anonymously, with the research consortium. Pattern recognition analysis will allow associations between self-reported health outcomes and usage of different healthcare approaches to be revealed.

The GoHawthorn website (gohawthorn.org; Figs. 2 and 3) is now live. The web-based, mobile-first app is being developed for beta-testing and so will be accessible on any smartphone, regardless of platform. The minimum number of users with full compliance (monthly data input) over a 12-month period will be 1000. Users will be targeted specifically in the UK, Netherlands, USA and Australia especially via interested healthcare professionals (integrative, mainstream, etc.).

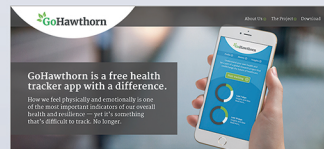


Fig. 2 Homepage of GoHawthorn website (gohawthorn.org)



Fig. 3 Design of Hawthorn health platform summary page, as displayed on GoHawthorn website (gohawthorn.org)

Beta-testing is estimated to begin in late 2017 and will be notified via the GoHawthorn.org website and collaborating practitioners.

DATA CHANNELS / RESULTS

Algorithms have been developed to transform anthropometric data (chest, weight, hip and height measurements) into 9 possible body shapes, 5 for women, 4 for men (Fig. 4). An additional algorithm translates these body shapes (with specific emphasis on central adiposity) into one of four categories of metabolic disease risk, each represented by a 'smiley face' icon (Fig. 5).

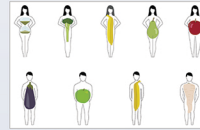


Fig. 4 Body shape displays for women and men

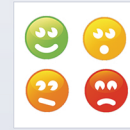


Fig. 5 Metabolic risk icons

Self-reported perceived health status data will be collected using questions based on the research-validated SF-12 Health Survey (Optum, Canada). Users will be prompted (via text and email) on a monthly basis to submit data for channels 1 and 2, and quarterly for channel 3.

Channel 1 and 2 data will be summarised (Fig. 6A) and aggregated to provide a surrogate measure of resilience (health status) (Fig. 6B).

Data will be collected from users interacting with a broad range of different healthcare systems to allow future evaluation of comparative effectiveness of different healthcare systems or choices.



Fig. 6 User interface designs. A: summary anthropometrics; B: summary tracking of health feel, functional health, emotional health and pain freedom (upper graph), as well as aggregated data (resilience) (lower graph)

DISCUSSION

The Hawthorn Tracker has the potential to be a potent motivator for individuals, helping to guide the user towards multi-therapeutic health strategies and interventions that deliver positive health outcomes.

Iterative interaction by users with analysed data is expected to influence behaviours, which in turn affects the biology of the individual. This iterative process among large numbers of individuals will yield big data capable of facilitating the development of health data services and personalised health advice (Fig. 7).

In addition, the collection and analysis of big data may help elucidate associations between positive outcomes and particular lifestyle and dietary choices or systems of medicine that may inform or guide healthcare recommendations and policy in the future.

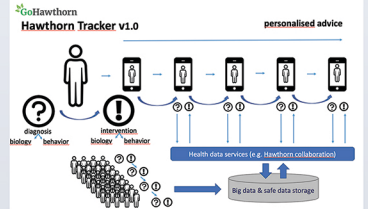


Fig. 7 Hawthorn Natural Health Initiative: Big data gathering and iterative knowledge-building system (based on TNO NISyBox system)

Data and expert-driven knowledge systems, such as Hawthorn, have the potential to significantly improve phenotypic and metabolic flexibility, known to be of paramount importance in the prevention of pathologies related to inappropriate dietary and lifestyle choices.⁵

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ACKNOWLEDGMENTS

This project has been co-funded by Balens Ltd, Alliance for Natural Health International and TNO. The authors would like to thank the following for their expert input (the late) Prof. George Lewith (University of Southampton, UK), Prof. David Peters (University of Westminster, UK), Prof. Sarah Stewart-Brown (University of Warwick, UK) and Dr Peter Davies (formerly of University of Westminster, UK).