



Research paper

Predicting treatment outcome in psychological treatment services by identifying latent profiles of patients



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ABSTRACT

Background: The outcomes of psychological therapies for anxiety and depression vary across individuals and symptom domains. Being able to predict treatment response from readily available patient data at presentation has potentially important benefits in aiding decisions about the most suitable interventions for a patient. This paper presents a method of identifying subgroups of patients using latent profile analysis, and comparing response to psychological treatments between these profiles.

Methods: All outpatients taken into treatment at two psychological treatment services in London, UK and who provided basic demographic information and standardized symptom measures were included in the analysis (n = 16636).

Results: Latent Profile Analysis was performed on intake data to identify statistically different groups of patients, which were then examined in longitudinal analyses to determine their capacity to predict treatment outcomes. Comparison between profiles showed considerable variation in recovery (74–15%), deterioration rates (5–20%), and levels of attrition (17–40%). Further variation in outcomes was found within the profiles when different intensities of psychological intervention were delivered.

Limitations: Latent profiles were identified using data from two services, so generalisability to other services should be considered. Routinely collected patient data was included, additional patient information may further enhance utility of the profiles.

Conclusions: These results suggest that intake data can be used to reliably classify patients into profiles that are predictive of outcome to different intensities of psychological treatment in routine care. Algorithms based on these kinds of data could be used to optimize decision-making and aid the appropriate matching of patients to treatment.

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1. Introduction

Depression and anxiety disorders are the most prevalent mental health disorders, with lifetime prevalence rates approaching 17% and 29% for major depression and anxiety disorders respectively (Kessler et al., 2005). Psychological interventions are a recommended treatment option, but as outcomes vary across patients, there is a need to consider a more personalised approach to treatment selection. An aim of such an approach is to tailor treatments based on key patient variables, thereby identifying which treatment will provide the best outcome for a particular patient (Goldberger and Buxton, 2013). The successful implementation of such a tailored treatment strategy could also lead to better outcomes and increased cost-effective use of resources.

Research aiming to predict response to treatment for

depression and anxiety has been growing. Researchers have adopted a wide array of methods for making predictions, including neuroimaging data (Siegle et al., 2006) and genetic markers (Papakostas and Fava, 2008). However, despite some progress, these have thus far not demonstrated clinical utility and some approaches (e.g. neuroimaging) may not be feasible for routine use (Evans et al., 2006). Using patient information collected as part of routine assessment procedures may have significant potential to aid treatment selection decisions for the clinician and the patient in a way that is realisable at scale across a range of healthcare settings.

Systematic reviews have identified a range of individual patient factors that may predict response to both psychological and pharmacological interventions in depression and anxiety disorders, including variables such as initial symptom severity, relationship status, age, and gender (Mululo et al., 2012; Cuijpers et al., 2008).

Decision support algorithms are increasingly used throughout health care (Sheehan and Sherman, 2012), and although their

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uptake in mental health has been slower, decision support systems are being piloted (Botella et al., 2011; Bowles et al., 2014). Wallace et al. (2013) created a single combined moderator value from weightings of key patient variables, and used this moderator to predict whether pharmacological or psychological treatment would be more effective for a given patient. A significant difference was found between treatment outcomes for patients scoring higher and lower on the combined moderator. DeRubeis et al. (2014) developed the 'Personalised Advantage Index' to predict the final symptom score for a given patient under both psychological and pharmacological treatments. This algorithm showed a significant advantage of one treatment type over the other for 60% of patients in the development sample. However, both methods were developed using samples from small clinical trial populations, and require further evaluation of potential benefits in routine patient samples.

The methods used by Wallace et al. (2013) and DeRubeis et al. (2014) modelled patient variables to create two groups of patients, one responding to antidepressants and the other to psychotherapy. However, it would be of clinical value if algorithms were developed that could predict treatment response to different psychological interventions (Roth and Fonagy, 2006). Previous research has typically used simple regression based analyses to explore the relationship between patient variables and outcomes (Blom et al., 2007), but methods that identify groups of patients with different clusters of intake characteristics may prove more powerful.

Statistical methods for identifying sub-groups of individuals within a diagnostic group such as latent class analysis (Goodman, 1974) and latent profile analysis (Lazarsfeld and Henry, 1968), have been previously used to develop a more refined sub-grouping of patients but these studies did not investigate the implications of this for treatment response, for example, in eating disorders (Duncan et al., 2005; Wade et al., 2006) and personality disorders (Bucholz et al., 2000; Fossati et al., 2001). Further development of these methods has the potential to provide information on groups of patients seeking psychological treatment for depression and anxiety disorders, and the differential response of these groups to psychological interventions. Identifying subgroups of patients at initial presentation could provide valuable information to clinicians and patients which could inform decisions on appropriate treatment choices in routine care.

This study used latent profile analysis on a large dataset of patients with depression and anxiety disorders receiving psychological treatment to attempt to identify statistically distinct groups of patients varying on demographic characteristics and initial symptom severity, and to explore if treatment outcomes differed between these groups.

2. Method

2.1. Setting

The dataset used for this analysis was taken from two psychological treatment services in London, UK and includes all patients accepted for treatment. Both services treat individuals with depression and anxiety disorders, offering a range of evidence-based psychological interventions (IAPT, 2008; NCCMH, 2011). The services adopted a 'stepped care' approach to treatment (IAPT, 2008) with brief interventions provided as the first step of treatment (for example Guided Self-Help, e.g. Williams, 2006), and formal psychological therapies at the second step (such as Cognitive Behavioural Therapy). Patients may be 'stepped-up' to formal interventions if initial treatment with a brief intervention is not successful. A number of patients accepted into treatment will have had a single treatment session for advice and consultation from a clinician, and therefore provided data for only one time point.

2.2. Participants

All patients taken into treatment between September 2008 and March 2012 who had baseline self-rated severity of symptoms information on either the Patient Health Questionnaire - 9 (PHQ-9; Kroenke et al., 2001) or the Generalised Anxiety Disorder assessment (GAD-7; Spitzer et al., 2006), served as the discovery dataset (n=16636) for the latent profile analysis. Of the included sample, 99.78% of patients had an initial PHQ-9 score and 99.62% an initial GAD-7 score.

For the analysis of treatment outcomes, only patients from this dataset who scored above clinical caseness were included, and the cut offs used by the services are scores of 10 and 8 for patients on the PHQ-9 and GAD-7 respectively (IAPT, 2011). Patients who received only one single treatment for advice or consultation were not included in the analysis of treatment outcomes, as these required two time-point scores on the symptom scales to calculate.

A second dataset of patients referred between April 2012 and August 2013 was used as a validation sample (n=4683).

2.3. Measures

The patient characteristic variables included in the analysis are displayed in Table 1, and are all collected routinely as part of the services' standardised dataset of patient information. 90% of patients entering treatment have complete data in routine care (IAPT, 2012).

2.4. Plan of analysis

2.4.1. Latent profile analysis

Latent profile analysis (LPA) is an extension of latent class

Table 1
Patient variables included in the latent profile analysis.

Variable	Type of variable	Description
Age at referral	Continuous	Age of patient
Gender	Dichotomous	'Male' or 'female'
Self-rating of depressive symptoms	Continuous	Score on Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001)
Self-rating of anxiety symptoms	Continuous	Score on Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006)
Level of personal and social functioning	Continuous	Score on Work and Social adjustment Scale (W&SAS; Mundt et al., 2002)
Medication prescription status	Dichotomous	'Prescribed' or 'not prescribed' psychotropic medication at referral.
Welfare status	Dichotomous	'Receiving benefits' or 'not receiving benefits' from UK welfare support.
Ethnic group	Dichotomous	'White' or 'non-white' ethnic group
Phobia self-rating	Dichotomous	'Phobia' or 'non-phobia', classified by a score of 4 or more any one of the three phobia items (IAPT, 2011).

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