ANALYSIS PLAN VERSION 2

Title:	Assessing the relationship between intrinsic motivations, personality traits and mental health.
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1 FOREWORD

This document contains an analysis plan for the project entitled "Assessing the relationship between intrinsic motivations, personality traits and mental health."

The project will utilise measures of intrinsic motivation, personality traits and mental health from a volunteer study that will be conducted at the University of Otago. The project will contain data from 247 volunteers who will complete an online questionnaire composed of a range of assessments. These assessments include the International Personality Item Pool – Neuroticism, Extraversion & Openness (IPIP-NEO-120) and Implicit motives task (IPM), while mental health assessments will score individuals for anxiety and depression. Previous publications have analysed the relation between personality and mental health but have assessed their relationship with intrinsic motivations.

The purpose of this analysis plan is to provide a brief background for the proposed work, formulate the research question(s), explicitly describe planned and potential post-hoc analyses, and give the rationale for each analysis step. All code created over the course of the project will be version-controlled and documented on the internal GitHub page (https://github.com/IMAGEotago) of the IMAGEotago research group.

2 INTRODUCTION

Mental health issues are on the rise, with a nearly 40% of New Zealanders experiencing difficulties at some point in their life (Wells et al., 2006). Psychology theories tell us that there are basic needs (such as physical and social needs) that must be met for human wellbeing (Lester et al., 1983; Saunders et al., 1998). Recently, the Institute for Personality-oriented Management (IPM) has come up with a way of measuring basic needs (or 'intrinsic motivations' such as self-assertion, integration, security, individuality, cognition, and empathy) from analysis of written text, and this analysis can also tell us whether our current behaviours are meeting these needs. Therefore, we propose to test whether an over- or under-representation of our intrinsic motivations are related to mental health traits such as anxiety and depression. Furthermore, the relative size of these basic needs are thought to relate to an individual's personality (Murray, 1964). As personality traits such as neuroticism are known to be important risk factors for conditions such as anxiety and depression (Jylhä & Isometsä, 2006; Widiger & Oltmanns, 2017), we will therefore also investigate the relationship between intrinsic motivations and personality types, as well as their individual and combined associations with mental health. Understanding the links between (unfulfilled) basic needs, personality and mental health will help us to better evaluate and treat conditions such as anxiety and depression in New Zealand.

3 RESEARCH QUESTIONS AND HYPOTHESES

The project aims to assess the following main questions and hypotheses:

Experimental Question 1: Can we observe the previously reported relationship between personality and mental health scores of anxiety and depression?

> *Hypothesis 1:* Similar to previous research, there will be a relationship between the International Personality Item Pool – Neuroticism, Extraversion and Openness (IPIP-NEO-120) and mental health assessments.

Experimental Question 2: Do the personality assessment measures quantified by the IPIP-NEO-120 relate to the measures collected by the Implicit motives task (IPM)?

> *Hypothesis 2:* There will be a relationship between the IPIP-NEO-120 measures and the IPM measures.

Experimental Question 3: Do the absolute values of intrinsic motivations and behavioural expressions relate to anxiety and depression scores?

> *Hypothesis 3:* Larger absolute values of a subset of intrinsic motivations (e.g. security, self-assertion and individuality) will correlate with higher scores for anxiety and depression.

Experimental Question 4: Do the differences between intrinsic motivations and behavioural expressions of these motivations relate to mental health scores of anxiety and depression?

> *Hypothesis 4:* Larger differences between intrinsic motivations (self-assertion, integration, security, individuality, knowledge and empathy) and current expressions of these motivations will correlate with larger anxiety and depression scores.

Experimental Question 5: Can the difference between intrinsic motivations and their behavioural expression further explain the relationship between personality traits and symptoms of anxiety and depression?

> *Hypothesis 5:* Differences between intrinsic motivations and their expression will explain further variance in anxiety and depression scores when personality measures are also accounted for.

EXPLORATORY EXPERIMENTAL QUESTIONS

In this analysis we will also use the opportunity to investigate the following exploratory questions:

Exploratory Experimental Question 1: Do any of the variables relate to each other? We will conduct a full exploratory analysis to assess the relationships between each of the following variables: intrinsic motivations, personality traits, anxiety scores and depression scores.

4 DATASET

To address the research questions highlighted above, we will use a volunteer data from the public and Otago University Psychology students. 421 individuals will be recruited to complete an online questionnaire. Recruitment will be rewarded by either course credit, or a prize draw which will offer $100 of supermarket vouchers given to one in every hundred participants.

Each participant will complete one online questionnaire. The questionnaire will consist of personality assessments: Implicit motives task (IPM) and the International Personality Item Pool – Neuroticism, Extraversion & Openness (IPIP-NEO-120) and mental health assessments: the Anxiety Sensitivity Index-3 (ASI-3), the Centre for Epidemiologic Studies Depression Scale (CES-D), the General Anxiety

Scale (GAD-7), and the State-Trait Anxiety inventory for Adults (STAI). Demographic information will also be collected.

5 EXCLUSION OF DATA SETS

Data sets of all participants will be carefully checked for adequate quality. Any missing data from incomplete tasks will be omitted from the analysis.

6 ANALYSIS

Following data quality control measures, IPIP-NEO, anxiety and depression questionnaires will be scored according to their respective manuals. The IPM personality data will be scored using the IPM deep learning algorithm. A full exploratory correlation matrix will be calculated between all measures to answer Exploratory Experimental Question 1, in addition to specific regression analyses on anxiety and depression measures using the IPIP-NEO, IPM and demographic information as predictors (Experimental Questions 1-5, each described below).

Experimental Question 1: To investigate the potential relationships between personality and mental health scores, we assessed whether any measures of IPIP-NEO-120 and mental health scores related to one another. The correlation significance was taken as a Pearson's R coefficient with $p < 0.05$ using false-discovery rate correction for the number of multiple correlation comparisons within the research question.

Experimental Question 2: To investigate whether IPM and personality measures are related, we assessed whether any domains of IPIP-NEO-120 and IPM related to one another. Furthermore, we completed an exploratory analysis of the relationship between IPM measures and each of the facets from the IPIP-NEO-120 domains. The correlation significance was taken as a Pearson's R coefficient with $p < 0.05$, using false-discovery rate correction for the number of multiple correlation comparisons between the IPIP-NEO-120 domains and IPM scores within the research question.

Experimental Question 3: To investigate whether measures of intrinsic motivations and their behavioural expression are related to measures of mental health, we firstly assessed these relationships via correlation coefficients (as above). We then performed four separate regression analyses for each of the measures of trait anxiety, anxiety severity, depression and anxiety sensitivity. Measures of intrinsic motivation and behavioural expression were used as regressors within the general linear model (GLM), and we also included regressors for age and sex. Regression parameter significance was taken as coefficients with $p < 0.05$ within this question.

Experimental Question 4: To investigate whether differences between intrinsic motivations and their behavioural expression relate to measures of mental health, we performed both correlations and four separate regression analyses for each of the measures of trait anxiety, anxiety severity, depression and anxiety sensitivity. The difference between each of the intrinsic motivations and their behavioural expressions were calculated from the IPM data, and these were used as regressors within the GLM. We also included regressors for age and sex. Regression parameter significance was taken as coefficients with $p < 0.05$ for this question.

Experimental Question 5: To investigate whether the difference between intrinsic motivations and their expression can further explain the relationship between personality traits and mental health, we performed a final four separate regression analyses for each of the measures of trait anxiety, anxiety severity, depression and anxiety sensitivity. Variables from the intrinsic motivations, IPIP-NEO-120

and demographic information were selected to be used as regressors within each GLM. Regression significance for this question was taken as coefficients with $p < 0.05$.

7 SUMMARY OF CHANGES

Version 2: We have added experimental question one to replicate previous findings in the literature between personality and mental health. We have added exploratory correlations between personality facets and IPM measures. Additional minor corrections.

8 REFERENCES

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