

Pre-Analysis Plan

The Effects of Reflection on Mental Health and Learning Outcomes

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Abstract

Mental health problems are common among college students worldwide and are associated with poorer academic performance and lower overall well-being. In India, although student mental health issues are gathering policy attention, there is limited evidence on low-cost preventive interventions that could improve student outcomes. This study uses a randomized controlled trial to evaluate the effect of a brief daily reflection exercise on the mental health, well-being, and academic performance of undergraduate management students. Participants are drawn from three cohorts of an undergraduate degree at an Indian Business School. Participants assigned to the treatment group complete a short daily reflection exercise through a mobile/desktop application for four weeks, while participants assigned to the control group complete a comparable, non-reflective activity through the same application. The study measures changes in multiple outcomes related to mental health and self-regulated behaviours using validated instruments at baseline and at multiple follow-up points, together with administrative records on academic performance. The results will provide evidence on whether a simple, scalable reflection intervention can improve student mental health and academic outcomes in an Indian higher-education setting.

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1. Introduction

Many college students face mental health issues, which in turn hamper their academic outcomes and overall well-being (Alonso et al., 2019; Auerbach et al., 2016; Bruffaerts et al., 2018). Moreover, literature suggests that lifelong mental illnesses often commence before or at the college-entering age (Auerbach et al. 2016; Kessler et al. 2005). In the case of India, there is attention paid to the following two aspects: First, college students' perspectives on factors contributing to mental health challenges; Second, potential initiatives that could address their mental health challenges (Wasil et al., 2022). We hypothesise that one potential solution to cope with mental health issues is to inculcate the practice of self-reflection. Reflection as a process of contemplation and information processing, which helps individuals to review their beliefs and foster the creation of new knowledge about themselves, contributing to better self-awareness and understanding (Bhan et al, 2024; Baranov et al., 2020; Boud et al., 2013; Coulson and Harvey, 2013; Dymont and O'Connell, 2011; Radović et al., 2023; Ryan, 2013). Reflection, through which individuals review their experiences, beliefs, and emotions, is a low-cost way to support mental health and well-being. By prompting individuals to consciously register their actions, emotions, and goals, reflection exercises may help build self-awareness, which could support better stress management, interpersonal relationships, self-efficacy, and overall well-being (Bandura, 1993; Phan, 2014; Czyżowska and Gurba, 2021; Gilani, 2025). Thus, realizing the importance of reflection in dealing with mental health challenges, we propose this study.

In this study, we conduct a randomized controlled trial (RCT) to assess the efficacy of mental reflection on improving students' personal well-being, mental health, and academic outcomes. The study involves a short soft-touch intervention in which participants integrate reflection in their daily lives. The study will be based on the primary data collected from the undergraduate students at an Indian Business School.

We expect students undergoing a reflection exercise every day to show improved mental health (as measured using a follow-up battery of psychometric tests) and academic outcomes (reflected in their end-term marks). Through the results, we expect to communicate the benefits of simple reflection exercises on better life standards by contributing to the literature in the Economics of Education and Mental Health.

2. Research Strategy

2.1. Research Question

Our primary research question is whether reflection improves mental health and well-being. To do so, we check if a brief daily reflection exercise, delivered through a mobile/desktop application over four weeks, improves the mental health, well-being, and academic outcomes of undergraduate students.

2.2. Sample

The sampling frame consists of students from three cohorts- Trimester I, Trimester IV, and Trimester VII, totalling around 450 participants from a Business School in Indore, India. Including students from multiple stages of the programme allows the study to examine whether the intervention's effects vary across different points in students' academic careers.

For treatment assignment, randomization is conducted at an individual level using students' enrolment numbers. For this, the participants' enrolment numbers are randomly assigned to treatment and control for each cohort.

2.3. Intervention

2.3.1. Treatment Arm

Participants assigned to the treatment group are asked to complete a brief daily reflection exercise through a dedicated mobile application for a period of four weeks. Each day, participants are prompted to reflect and write three small achievements (from the previous day), three items for which they are grateful and set three intention to implement for that day.

Control (placebo) arm

Participants assigned to the control group complete a comparable, simple, non-reflective engagement activity (e.g., a short exercise) through the same application, for the same duration. This placebo activity is designed to match the treatment arm in terms of time commitment and use of the application (and relying on *system 1/automatic thinking* activation), while not involving treatment's reflective content (*system 2/deliberative thinking* [Kahneman, 2011]).

Apart from these two, we will also allocate some participants from the control group into the treatment group for a brief period. These participants will be separate from the pure control group. We can compare students who may be allocated to C or T but not participate as a pure control group at the end of the study, and do an additional round of comparison. This will be with

adherence to Treatment and only suggestive, while Treatment versus Control will give us causal ITT treatment effects from being assigned to a treatment group. Besides, we administer baseline and follow-up surveys on the Semester XI students, which will act as a pure control for a robustness check.

2.4. Delivery Platform

Both arms are delivered through the same digital application, accessed by participants on a mobile phone or desktop computer. Use of a common platform for both arms helps to equalize participants' exposure to and familiarity with the technology itself, isolating the effect of the reflective content.

2.5. Duration and Timing

The intervention is planned to run for 4 weeks, when the trimester begins, tentatively from 17th August 2026 to 13th September 2026. The data collection for the baseline survey will be conducted by 10th August, the first follow-up on 20th September, and the second follow-up in October 2026.

3. Outcome Variables

3.1. Primary Outcomes:

- Depressive symptoms: This variable is measured via the eight-item Patient Health Questionnaire (PHQ-8). Each question includes four response options from 'Not at all' to 'Nearly every day' (Kroenke et al., 2009).
- Perceived stress: Stress is captured through the Perceived Stress Scale (PSS) score, with six response options each (from 'never' to 'very often') (Cohen et al., 1994).
- Academic performance: It is assessed through the end-of-term examination scores/grades and attendance records from IPM administrative records

3.2. Secondary Outcomes

- Mindfulness and self-care behaviors: Gauged using the 4-item Mindful Self-Care Scale (MSCS) score. Each question includes six response options ranging from "none of the time" to "all the time. We also use a 4-item Reflection scale, with response options ranging from "none of the time" to "All the time".
- Resilience: Resilience is measured using the 6-item Resilience scale, with response options varying between "strongly disagree" and "strongly agree".

- Life satisfaction: We include the question to rate life satisfaction on a scale from 0 ('completely dissatisfied') to 10 ('completely satisfied') used in the Socio-Economic Panel (Kantar Public, 2021).
- Class Attendance: It is assessed through the attendance records from IPM administrative records

The measurement instruments and timing for their administration are summarised as follows:

Table 1: Measurement Instruments and Administration Points

Instrument/source	Construct measured	Administration points
Patient Health Questionnaire (PHQ-8)	Depressive symptoms	Baseline, Follow-up 1, Endline
Perceived Stress Scale (PSS)	Perceived stress	Baseline, Follow-up 1, Endline
Mindful Self-Care Scale (MSCS)	Mindfulness / self-care behaviors	Baseline, Follow-up 1, Endline
Satisfaction with Life Scale (SWLS)	Life satisfaction	Baseline, Follow-up 1, Endline
In-app daily reflection/engagement logs	Engagement and compliance with the assigned daily activity	Continuous, during the intervention period
IPM administrative records	Demographics (age, name), attendance, end-of-term scores	Collected post-intervention

4. Empirical Strategy

4.1. Estimating equation

For each outcome of interest, the average treatment effect will be estimated using an ANCOVA specification that conditions on the baseline value of the outcome:

$$Y_{it} = \alpha + \beta \cdot Treatment_i + \gamma \cdot Y_{i,0} + X_i' \delta + \theta_c + \varepsilon_i$$

Y_{it} denotes the outcome for student i (namely mental health and academic performance) measured at different follow-up waves (Follow-up 1, Follow-up 2, or Endline). $Treatment_i$ is binary indicator equal to one if student i was assigned to the daily reflection exercise and zero if assigned to the control activity; $Y_{i,0}$ is the baseline value of the same outcome; X_i is a vector of baseline covariates (e.g., gender, age, family income, parental occupation); θ_c denotes trimester-cohort (I, IV, VII) fixed effects; and ε_i is an idiosyncratic error term. Standard errors will be computed using heteroskedasticity-robust estimators. The coefficient of interest, β , captures the intention-to-treat (ITT) effect of assignment to the daily reflection exercise.

We also use the OLS to analyse the post-intervention data to estimate the change in the outcome variables. We perform three main robustness checks: With and without controls; testing multiple hypotheses to measure multiple outcomes of interest; and randomised inference.

4.2. Heterogeneity and subgroup analyses

In addition to the average treatment effects described above, we will further examine treatment effect heterogeneity along the dimensions:

- By trimester cohort (Trimester I vs. IV vs. VII), by interacting the treatment indicator with cohort fixed effects.
- By gender, by interacting the treatment indicator with a gender indicator.
- By baseline mental health severity, using an indicator for above- versus below-median baseline PHQ-8 (or PSS) scores.
- By engagement/compliance with the daily activity among treatment group participants

5. Data sources

Data are collected from three sources: (i) self-reported survey data on socio-economic characteristics, mindful behaviour, and mental health and well-being, collected online at baseline and at follow-up points; (ii) daily reflection or engagement entries recorded through the application during the two-month intervention period; and (iii) administrative records from the IPM office, including academic outcomes (attendance and overall end-of-term scores).

5.1. Confidentiality and data management

The study is designed as a double-blind experiment, and the collected data will be accessible only to the Principal Investigator and the research team. The research team will follow access-control procedures and secure-disposal practices for all collected data, including administrative records. Participants will be informed about the study during a debriefing session before the baseline survey, and will be asked to sign a consent form before participating. No sensitive personal information beyond the demographic and academic information described above is collected.

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