



Figure 1. Standardized Results for the Common Cause Model for the One-Day Beta Test of Feeling Good App.

Rectangles represent observed variables. Circles represent error terms, and ovals represent factors. One-headed arrows are causal effects, and two-headed arrows are correlations. Numbers above rectangles are R-squared values. Numbers next to two-headed arrows are correlations, and

numbers next to one-headed arrows are standardized causal effects. This Structural Equation Model (SEM) was estimated by AMOS 28 (Analysis of Moment Structures) using Direct Full-Information Likelihood (direct FIML).

Variables. Dep4 etc. represent the seven negative emotion variables (depression, hopelessness, inferiority, guilt, loneliness, anger, and anxiety) at the end of the day on a scale from 0 (not at all) to 100 (completely) and hapf represents happiness measured on the same scale. The proposed Common Cause factor (CC) has causal effects on all seven negative feeling variables as well as happiness. The Belief in NT is the last rating of each user's belief in his or her self-critical negative thought on a scale from 0 (not at all) to 100 (completely). The Motivation Factor for each user was assessed by the number of completed lesson ratings throughout the day as well as the number of missing emotion ratings. The Overall Lesson Feedback is the mean of each user's favorability ratings for the app on a scale from 0 (not at all) to 100 (completely).

Results. The CC appears to have strong causal effects on all seven negative feelings, with R-square values ranging from 66% for anger to 98% for anxiety. Since these variables contain measurement error, there is not much room left for additional causes. In contrast, the R-square value for happiness was 30%, indicating that there are strong additional causes of happiness that are completely different from the causes of negative feelings and not directly measured by this model.

The Belief in NT variable has strong direct causal effects on the CC and accounts for 56% of the variance in this factor, with strong indirect causal effects on all eight emotional variables. This is consistent with the claim that negative thoughts do, in fact, cause negative feelings, as proposed by the Greek philosopher, Epictetus, nearly 2,000 years ago, and emphasized in the modern era by many experts, including

The Motivation Factor has strong direct negative causal effects on the Belief in NT, as does the app favorability measure (Overall Lesson Feedback), with indirect causal effects on the CC and all eight emotion variables, but no direct effects on the emotion variables. Together, the Motivation and favorability variables account for 57% of the variance in the NT variable. This suggests that other aspects of the app, not yet included in this model, may also have independent and additive causal effects on changes in the NT variable.

Discussion. The strong causal effects of the Belief in NT on the CC and all of the emotion variables confirms the claim of Epictetus nearly 2,000 years ago, and emphasized by many experts in the modern era, including Drs. Albert Ellis and Aaron Beck, and many others, that our thoughts, and not events, cause our feelings. However, the correlation between the error terms for NT and CC variables (e9 and e10) suggest the existence of some additional variable on both NTs and the CC, or a reciprocal causal effect of the CC on the user's belief in his or her NT. Further studies will be needed to sort out these possibilities, as well as to zero in on what the CC might actually be. Our best guess is that it represents the collection of each user's currently activated negative thoughts.

The CC factor confirms the finding of Burns and Eidelson (1998) that the correlations between measures of depression and anxiety can be explained by the existence of an unknown common cause with simultaneous effects on both depression and anxiety, but extends this model to include all seven negative feelings, as well as happiness. This view of negative feelings is quite different from the efforts of the DSM-5 to

represent different negative emotions as distinct and different “mental disorders,” and explains the strong correlations nearly always observed among the so-called “co-morbid disorders.”

The strong causal effects of the Motivation factor confirm several studies (Burns & Nolen-Hoeksema, 1991; Burns & Spangler, 2000; Burns, Westra, Trockel, & Fisher, 2012) suggesting that motivation also plays a prominent role in recovery from depression in studies involving human therapists. Finally, the moderate causal effects of the app favorability ratings suggests another variable may account for the success or failure of human therapy: namely, the degree to which the patient likes the therapist and views him or her in a favorable manner. This finding is also consistent with the hypothesis that the inclusion of powerful tools to reduce resistance are partly responsible for the rapid effects of TEAM-CBT (Burns, 2020) and suggest that motivational and cognitive factors alike contribute to changes in depression, but that all emotional changes are ultimately mediated by cognitive changes, and that this might be true for all schools of therapy and all therapeutic methods.

The beta test included 37% of beta users who were therapists and 62% who were women. We also measure each participant's familiarity with Dr. Burns or TEAM-CBT, ranging from 0 (not at all) to 100 (extremely familiar). In other tests not included above, none of these variables had causal effects on the Common Cause, on changes in any of the negative feelings happiness. These findings were not consistent with the suggestions by some observers that the rapid effects so frequently observed in the treatment of depression and anxiety with TEAM-CBT might be the result of a sample specification error (patient bias).

Limitations. Causal effects cannot be proven in any branch of science. We can only say that a causal model is consistent with the results of a study. However, we can rule out competing causal models and demonstrate that certain included variables do not appear to have causal effects on the outcomes.

Although our replications of our findings in independent data bases help eliminate the likelihood that findings are due to capitalization on chance, they still do not rule out the possibility of other causal models that might also explain the findings.

References

- Burns, D. D., & Nolen-Hoeksema, S. (1991). Coping styles, homework compliance and the effectiveness of cognitive - behavioral therapy. *Journal of Consulting and Clinical Psychology, 59*(2): 305 - 311.
- Burns, D. D., & Eidelson, R. (1998). Why are measures of depression and anxiety correlated? -- A test of the tripartite theory. *Journal of Consulting and Clinical Psychology, 66*(3): 461 - 473.
- Burns, D. D., & Spangler, D. (2000). Does psychotherapy homework lead to changes in depression in cognitive behavioral therapy? Or does clinical improvement lead to homework compliance? *Journal of Consulting and Clinical Psychology, 68*(1): 46 - 59.
- Burns, D., Westra, H., Trockel, M., & Fisher, A. (2012). Motivation and Changes in Depression. *Cognitive Therapy and Research* DOI 10.1007/s10608-012-9458-3 Published online 22 April 2012.
- Burns, D. (2020). *Feeling Great*. PESI Publishing, Eu Claire, Wisc.