

Ups and downs: A dynamical systems model of human affective fluctuations.

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Studies of subjective well being often result in counterintuitive findings. For instance, studies of subjective well being have shown that it has little to do with life circumstance. The subjective well being of individuals with severe disabilities is little different from those without such disabilities (Diener & Diener, 1996), while even small events in the immediate past can alter an individual's estimate of his or her subjective well being (Kahneman, Diener & Schwartz, 1999).

In this paper we will link these empirical findings to a simple mathematical model, in which individuals react to the changes in affect-ups and downs-rather than their "objective" external state. Others, on the other hand, see our overall state, noting such variables as our income and socio-economic status. We place this model in the form of a simple mathematical equation, in which we see the first derivative of a function describing our condition, while others see the function itself. While the model is related to those of Carver and Scheier (1999) and Hsee and Abelson (1992), in which individuals monitor their rate of progress toward a goal, we link these ideas both to subjective well-being and to systematic differences in understanding between observers and those observed.

This model helps to explain the remarkable resiliency of human subjective well-being because short-term changes are likely to include both increases and decreases regardless of one's overall external situation; thus, that situation will have little impact on one's subjective well being. Previous authors have seen subjective well being as determined by a genetic "set point" (Lykken, 1999). However, the set point theory does not appear to explain the combination of situational volatility and overall high levels of subjective well being that the literature details.

The dynamical model also carries rich implications for understanding interpersonal interactions and clinical practice. The fact that individuals notice changes in state implies that they will adapt to almost any external situation; this has obvious implications for client motivation. The first derivative of a function will be rougher than the function itself. In our context, this implies that outside observers, whether they be clinicians or acquaintances, will systematically underestimate the volatility of an individual's emotions. When a function changes, the first derivative rises rapidly, but then eventually returns to zero once the change is complete. In our context, this implies that clients, when compared to therapists, are likely to overestimate the significance of initial changes in therapy while underestimating longer-term changes. Finally, a subjective focus on the first derivative implies that unit root dynamics will characterize most clinical time series (Hamilton, 1994). Thus, we cannot expect these time series to be stationary.

This presentation will include empirical evidence in support of this theory, drawn from time series analysis and from previous studies. It will also, in line with the theme of the conference, include computer-generated graphical illustrations of the implications of this theory.

References

Carver, C. S. & Scheier, M. F. (1999). Themes and issues in the self-regulation of behavior. In Wyer, R. S. (ed.) *Perspectives on behavioral self-regulation: Advances in social cognition, Volume XII* (pp. 1-105). Mahwah, NJ: Lawrence Erlbaum Associates.

Diener, E. & Diener, C. (1996). Most people are happy. *Psychological Science*, 7(3) 181-185.

Hamilton, J. D. (1994). *Time series analysis*. Princeton, NJ: Princeton University Press.

Hsee, C. K. & Abelson, R. P. (1991). Velocity relation: Satisfaction as a function of the first derivative of outcome over time. *Journal of Personality and Social Psychology*, 60, 341-347.

Kahneman, D., Diener, E. & Schwartz, N. (Eds.) (1999). *Well-Being: The foundations of hedonic psychology*. New York: Russell Sage Foundation.

Lykken, D. (1999). *Happiness: The nature and nurture of joy and contentment*. New York: St. Martin's Press.