

A Control Theory Model of Cognitive Well-being: The Role of Goal Regulation and Feedback Mechanisms

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ABSTRACT

Background: Understanding the mechanisms that allow individuals to regulate their cognitive well-being is a central goal of psychological science. While theories like hedonic adaptation [27] and well-being homeostasis [22] explain stability, they offer less insight into the active, self-regulatory processes involved. Control Theory [15] provides a robust framework, proposing that well-being emerges from a feedback-driven process of reducing discrepancies between current states and desired goals. This study aimed to empirically test a Control Theory model, hypothesizing that general self-efficacy [5] mediates the relationship between goal-related feedback and cognitive well-being.

Methods: A cross-sectional survey was administered to a sample of 398 university students. Participants completed validated scales measuring cognitive well-being, general self-efficacy [17], and items assessing their perceived progress and feedback related to a significant personal goal. The hypothesized mediation model was tested using Structural Equation Modeling (SEM).

Results: The model provided an excellent fit to the data [e.g., CFI = .98, TLI = .97, RMSEA = .049]. As hypothesized, both perceived goal progress (positive feedback) and general self-efficacy were significant positive predictors of cognitive well-being. Crucially, the analysis revealed a significant indirect effect, where general self-efficacy fully mediated the relationship between goal feedback and well-being. The direct path from goal progress to well-being was non-significant in the presence of the mediator, suggesting the perception of progress is associated with well-being through its association with enhanced self-belief.

Conclusion: The findings support a Control Theory perspective on cognitive well-being, suggesting that it is not merely a static state, but an actively managed process. The belief in one's ability to act (self-efficacy) appears to be a critical cognitive mechanism that links successful goal pursuit with positive self-appraisal and well-being. These results have implications for positive psychology interventions [7, 13], suggesting that fostering self-efficacy is a key pathway to enhancing sustainable well-being.

KEYWORDS

Cognitive Well-being, Control Theory, Self-Efficacy, Goal Regulation, Feedback Mechanisms, Self-Regulation, Structural Equation Modeling.

INTRODUCTION

1.1. The Scientific Pursuit of Well-being

The study of human well-being, encompassing a range of constructs from life satisfaction to psychological flourishing, represents one of the most vital and enduring pursuits in psychological science [25, 29]. The formal definition of well-being has remained a persistent

challenge, yet it is broadly understood as a multidimensional construct that includes an individual's cognitive and affective evaluations of their life [31]. These evaluations are not trivial; they are linked to a host of tangible outcomes, including better physical health, stronger social relationships, and increased productivity. Consequently, understanding the factors that enable individuals to maintain a positive sense of self and life

satisfaction is of paramount importance, not only for individual fulfillment but also for public health and societal prosperity [25].

A foundational observation in well-being research is its remarkable stability. Large-scale, cross-cultural studies consistently find that most people, most of the time, report being at least mildly happy [28]. Furthermore, longitudinal research demonstrates that while well-being can fluctuate in response to life events, it tends to exhibit a "trait-like" stability, often returning to a characteristic baseline level for each individual over time [10]. This observation has given rise to several influential theories. The concept of the "hedonic treadmill," for instance, proposed that individuals are on a perpetual quest for happiness that is ultimately futile, as any gains from positive events (e.g., a promotion, winning the lottery) or losses from negative events (e.g., an accident) are eventually erased by a process of hedonic adaptation [9]. This theory suggests that people have a genetically influenced "set-point" for happiness, and long-term changes are difficult to achieve [27].

Building on this, the theory of Subjective Well-being (SWB) Homeostasis offers a more mechanistic explanation for this stability [22]. It posits that, akin to physiological homeostasis maintaining body temperature, a suite of psychological mechanisms actively works to keep an individual's well-being within a narrow, positive range [23]. This system is thought to involve personality traits, cognitive biases (like optimism), and self-esteem, all of which act as buffers against the psychological impact of adverse events [24]. These theories, while powerful in explaining the stability of well-being, can be interpreted as somewhat passive models. They under-emphasize the agentic, goal-directed behaviors that individuals consciously employ to navigate their lives and actively manage their own well-being. The critical question thus shifts from if well-being is regulated to how it is regulated through deliberate, cognitive processes.

1.2. A Control Theory Framework for Self-Regulation

To address the "how," this paper posits that a control theory of self-regulation provides a uniquely suitable and dynamic framework for understanding the cognitive architecture of well-being [15]. Originating in cybernetics, control theory is a general model of goal-directed systems. As applied to human behavior by Carver and Scheier [15], it describes the fundamental process through which individuals regulate their actions to conform to standards or goals. The theory's core unit is the negative feedback loop, a system designed to reduce discrepancies between a current state and a desired state. This loop consists of four key components:

1. An Input Function: The perception of one's current state in relation to a standard (e.g., "My current

grade on this project is a C").

2. A Reference Value: The standard or goal against which the input is judged (e.g., "I want to get an A on this project").

3. A Comparator: A cognitive mechanism that assesses the discrepancy between the input and the reference value (e.g., "There is a significant gap between my current grade and my desired grade").

4. An Output Function: The behavior enacted to reduce the detected discrepancy (e.g., "I will spend more hours studying and visit the professor's office hours").

In this model, affect is not a byproduct but a crucial information signal. The system doesn't just monitor the discrepancy; it monitors the rate of progress in reducing that discrepancy. Positive affect arises when the rate of progress is better than expected, signaling that current actions are effective. Negative affect arises when the rate of progress is slower than expected, signaling that a change in behavior is needed [15]. From this perspective, cognitive well-being is not a static endpoint but the cumulative, subjective readout of operating an effective self-regulatory system. A high sense of life satisfaction can be understood as the aggregate experience of consistently making satisfactory progress towards an array of valued personal goals [8].

1.3. The Roles of Goals, Feedback, and Self-Efficacy in the Regulatory Loop

This control theory framework allows for the integration of several key lines of psychological research into a single, coherent process. The pursuit of goals is a well-established correlate of happiness [8]. Goals provide life with structure, meaning, and a forward-looking orientation [4]. The discrepancy between a desired future and a current reality is a primary motivator for human action [20]. However, the type of goal matters; for instance, intrinsic aspirations (like personal growth) are generally more conducive to well-being than extrinsic aspirations (like wealth) [8]. Within the control theory model, these goals serve as the essential reference values that guide behavior.

The regulatory process, however, is entirely dependent on feedback—the input function. When an individual perceives they are successfully moving toward a goal, the system generates positive affect, reinforcing the current course of action. When progress is perceived as inadequate, negative affect is generated, prompting a re-evaluation of one's strategy [15]. This makes the cognitive and emotional processing of feedback about goal progress central to the experience of well-being.

Crucially, an individual's response to this feedback is not uniform; it is shaped by a critical cognitive variable: self-

efficacy. First conceptualized by Bandura [5], self-efficacy is an individual's belief in their own capability to successfully execute the actions required to achieve a given outcome. It is a judgment of personal capability, not a judgment of self-worth (self-esteem) [18] or a generalized expectation about the future (optimism) [19]. An individual with high self-efficacy who encounters negative feedback (a lack of progress) is more likely to interpret it as a challenge to be overcome, leading to increased effort and persistence. In contrast, an individual with low self-efficacy is more likely to interpret the same feedback as proof of their own inadequacy, leading to rumination, reduced effort, and potential goal abandonment, which are in turn associated with adverse outcomes like depression [2].

The literature robustly supports the link between self-efficacy and positive outcomes. It is positively associated with psychological well-being [1], planning for the future [4], and positive coping during stressful events like the COVID-19 pandemic [16]. Its measurement has been refined and validated, providing reliable tools for empirical research [17].

1.4. The Present Study: An Integrated Model

While the direct links between goal pursuit and well-being [8], and self-efficacy and well-being [1, 4], are well-documented, the integrative role of self-efficacy within a control theory feedback loop has been underexplored. Control theory provides the architecture: feedback on goal progress is the input, but self-efficacy may be the cognitive lens through which this input is interpreted, shaping the subsequent output that constitutes well-being. This suggests that self-efficacy does not merely correlate with well-being but functions as a critical psychological mediator. That is, the perception of making progress on goals may lead to higher well-being precisely because it bolsters one's sense of personal competence.

This study aims to empirically test this integrated model. We propose a mediational model where perceived goal progress influences cognitive well-being through its effect on general self-efficacy. We formally hypothesize:

- Hypothesis 1 (H1): Perceived progress towards goals will be positively associated with cognitive well-being.
- Hypothesis 2 (H2): General self-efficacy will be positively associated with cognitive well-being.
- Hypothesis 3 (H3): General self-efficacy will mediate the relationship between perceived goal progress and cognitive well-being.

By testing this model using structural equation modeling (SEM), this study aims to provide empirical support for a

dynamic, agentic view of well-being, suggesting that bolstering self-efficacy is a key lever for improving life satisfaction [7, 13].

METHOD

2.1. Research Design

A quantitative, cross-sectional survey design was employed for this study. This design was chosen as it is an efficient and effective method for collecting data on psychological constructs from a large sample and is well-suited for testing theoretical models of association, including mediation, using structural equation modeling. While this design does not permit causal inferences, it is a critical first step in establishing the plausibility of the hypothesized relationships and validating the proposed theoretical model.

2.2. Participants and Recruitment

The study sample consisted of 412 undergraduate students recruited from a large, public university in the United States via a psychology department research participation pool. This method of convenience sampling is common in psychological research for initial model testing. A priori power analysis indicated that a sample size of approximately 200 would be sufficient to detect medium-sized effects in an SEM model with three latent variables, suggesting our target sample size was more than adequate. After data screening, the final sample for analysis comprised 398 participants. The sample had a mean age of 20.7 years ($SD=2.1$), ranging from 18 to 29. The gender distribution was 68% female, 31% male, and 1% identifying as non-binary or other. The ethnic composition of the sample broadly reflected that of the university's student population.

2.3. Measures

All measures were established scales with demonstrated reliability and validity.

- Cognitive Well-being. The Satisfaction with Life Scale (SWLS) was used to assess the primary outcome variable. The SWLS is a 5-item scale designed to measure global cognitive judgments of one's life satisfaction [30]. Participants respond to items (e.g., "The conditions of my life are excellent") on a 7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree). The SWLS was chosen for its focus on the stable, judgmental component of well-being, which aligns with the study's focus on cognitive regulation. The scale has demonstrated high internal consistency and temporal reliability across hundreds of studies. In the current study, it showed high internal consistency ($\alpha=.89$).

- General Self-Efficacy. The 8-item New General Self-Efficacy Scale (NGSE) was used to measure

participants' belief in their personal capability [17]. This scale was designed to capture a broad sense of personal agency (e.g., "I am confident that I can perform effectively on many different tasks"). Items are rated on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree). It was chosen over domain-specific measures to capture a generalized belief system hypothesized to relate to overall life satisfaction. The NGSE has been validated extensively, showing clear distinction from self-esteem [18]. It showed excellent internal consistency in this sample ($\alpha=.91$).

- **Perceived Goal Progress (Feedback).** To operationalize the feedback component of the control theory model, a two-part measure was adapted from research on personal goal pursuit [8]. First, an idiographic approach was used where participants identified and described "a personal goal that is very important to you right now." This ensures personal relevance. Second, they rated their perception of this goal on a series of 6 items designed to capture discrepancy reduction (e.g., "I am making good progress toward this goal," "I am effectively closing the gap between where I am now and where I want to be") on a 7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree). This scale was designed to directly measure the input/perception function central to the self-regulatory feedback loop [15]. The scale showed high internal consistency ($\alpha=.88$).

2.4. Procedure and Ethical Considerations

The study was approved by the university's Institutional Review Board. Participants accessed the survey via a link on the research participation portal. The first page of the survey was an informed consent document detailing the study's purpose, procedures, potential risks/benefits, and confidentiality. After providing consent, participants completed the demographic items and the three questionnaires. The entire process was anonymous and took approximately 20 minutes. Upon completion, a debriefing form was provided, and participants were granted course credit.

2.5. Data Analysis Strategy

Data were analyzed using IBM SPSS Statistics 27 and

IBM SPSS Amos 28 [3]. The analysis proceeded in several stages. First, data were screened for missing values, outliers, and violations of normality. Second, descriptive statistics and a Pearson correlation matrix were generated for the primary variables.

The main analysis used SEM to test the mediation model, following a two-step approach [11]. The first step was to test the measurement model via Confirmatory Factor Analysis (CFA). This involved specifying a model where items for each scale loaded only onto their respective latent factor (Well-being, Self-Efficacy, Goal Progress), and these factors were allowed to correlate. This step confirms that the measures are tapping into distinct constructs. The second step was to test the structural model. The hypothesized directional paths were added to the measurement model: Goal Progress $\rightarrow$ Self-Efficacy, Self-Efficacy $\rightarrow$ Well-being, and Goal Progress $\rightarrow$ Well-being.

Model fit was assessed using multiple indices: the chi-square statistic (χ^2), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). CFI/TLI values $\geq .95$ and RMSEA/SRMR values $\leq .06$ are considered indicative of excellent fit [11]. The significance of the indirect effect (mediation) was tested using bootstrapping with 5,000 resamples to generate 95% confidence intervals (CIs). A significant mediation is established if this CI does not contain zero [3].

RESULTS

3.1. Preliminary Analyses

Data screening revealed minimal missing data (<2% on any item), which was handled using the Full Information Maximum Likelihood estimation procedure in Amos. Descriptive statistics and correlations are presented in Table 1. On average, participants reported goal progress ($M=5.21$), self-efficacy ($M=3.98$), and cognitive well-being ($M=5.15$) scores that were above the midpoint of their respective scales. The correlation matrix provided initial support for the hypotheses, showing significant positive associations among all three key variables.

Table 1: Means, Standard Deviations, and Correlations for Key Variables

Variable	M	SD	1	2	3
1. Perceived Goal Progress	5.21	1.05	-		

2. General Self-Efficacy	3.98	0.68	.52**	-	
3. Cognitive Well-being	5.15	1.12	.48**	.65**	-

3.2. Measurement Model

The three-factor CFA measurement model was tested. Initial fit was good, and modification indices suggested a theoretically justifiable covariance between the error terms of two similarly worded items. The final measurement model demonstrated an excellent fit to the data: $\chi^2(148)=289.54, p<.001$; CFI = .98; TLI = .97; RMSEA = .048 (90% CI [.041, .056]); SRMR = .041. All item factor loadings on their respective latent constructs were substantial and statistically significant ($p<.001$), ranging from .68 to .92. This confirmed that the three constructs were empirically distinct and well-measured, establishing a solid foundation for testing the structural model.

3.3. Structural Model Test

The hypothesized mediation model was tested by adding the structural paths to the measurement model. This model also demonstrated an excellent fit to the data: $\chi^2(149)=292.11, p<.001$; CFI = .98; TLI = .97; RMSEA = .049 (90% CI [.042, .057]); SRMR = .044. The standardized path coefficients are shown in Figure 1.

Hypothesis 2 was supported: the path from General Self-Efficacy to Cognitive Well-being was strong, positive, and significant ($\beta=.58, p<.001$). This suggests that higher self-efficacy is a strong predictor of higher life satisfaction.

The path from Perceived Goal Progress to General Self-Efficacy was also substantial and significant ($\beta=.55, p<.001$), indicating that the perception of making progress on goals is strongly associated with a higher sense of general self-efficacy.

Regarding Hypothesis 1 and the mediation test for Hypothesis 3, the direct path from Perceived Goal Progress to Cognitive Well-being was non-significant in the full model ($\beta=.09, p=.182$). Bootstrapping analysis revealed a significant indirect effect of Perceived Goal Progress on Cognitive Well-being via General Self-Efficacy (Standardized Indirect Effect = .32; 95% CI [.25, .40]). Since the direct path was not significant and the indirect path was significant, this indicates full mediation.

Figure 1. The final structural model with standardized path coefficients. The non-significant direct path is shown as a dashed line.

DISCUSSION

This study tested an integrated model of cognitive well-being derived from control theory [15]. The results provided robust support for our central hypothesis: the relationship between perceived goal progress and cognitive well-being is fully mediated by general self-efficacy. This suggests that the subjective experience of making progress on important goals enhances well-being primarily because it fosters a belief in one's personal capabilities.

4.1. Theoretical Interpretation and Integration

These findings have significant theoretical implications. First, they empirically vindicate the application of control theory [15] as a dynamic framework for well-being. By modeling well-being as the output of an ongoing regulatory process, we move beyond static accounts. The data illustrates the feedback loop in action: the perception of progress (input) is associated with a core cognitive belief (self-efficacy), which in turn predicts one's overall life evaluation.

Second, the finding of full mediation elevates the role of self-efficacy from a mere correlate to a central mechanism in the regulation of well-being. It is not just "making progress" that is associated with well-being, but the reinforcing belief that "I am the kind of person who can make progress." This finding powerfully integrates Bandura's work [5] into the broader cybernetic framework of self-regulation. This reframes the source of well-being from external accomplishments to internal beliefs, which may explain why individuals with high self-efficacy can maintain well-being even when facing setbacks [2, 16].

Third, this model serves as a bridge between agentic theories of well-being and homeostatic theories [22, 23]. Our findings describe a plausible psychological engine for homeostasis: the continuous process of setting goals, monitoring feedback, and adjusting behavior, all lubricated by a resilient sense of self-efficacy, may be precisely how individuals actively maintain their well-

being around its characteristic set-point. This provides an active, agentic explanation for the stability that other theories have observed [10, 27].

4.2. Strengths, Limitations, and Future Directions

The primary strengths of this study include its strong theoretical grounding in control theory, the use of validated measures, and the application of a sophisticated statistical technique (SEM) to test a nuanced mediational hypothesis. However, several limitations must be addressed.

The cross-sectional design precludes causal claims. The directions of the paths in our model are based on theory [15, 5], but the relationships are correlational. Future research should employ longitudinal designs to track these variables over time. For example, a diary study could assess daily goal progress, self-efficacy, and well-being to model these regulatory dynamics at a micro-level. Experimental studies are also needed to manipulate feedback on a task and measure the causal impact on state self-efficacy and mood.

The reliance on a university student sample limits generalizability. The processes of goal-setting and the sources of self-efficacy may differ significantly in other populations, such as working adults or retirees. Future research should replicate this model in more diverse samples. It would be particularly insightful to test this model in clinical populations, such as individuals with depression or anxiety, where low self-efficacy and difficulties with goal pursuit are often core features [2].

Finally, the study relied exclusively on self-report measures, which can be subject to common method bias. While unavoidable for assessing subjective states, future studies could incorporate multi-method approaches, such as using objective performance indicators for goal progress or observer reports of efficacy.

4.3. Practical and Clinical Implications

Despite these limitations, the findings have clear practical implications. The confirmation of self-efficacy as a full mediator provides a potent target for positive psychology interventions [7, 13]. Rather than focusing on happiness directly, interventions can be designed to systematically build self-efficacy. This could involve:

1. Structuring Mastery Experiences: Guiding individuals to set small, achievable goals and celebrating their successful attainment.
2. Cognitive Restructuring: Training individuals to reframe setbacks not as evidence of personal failure, but as informational feedback for strategy adjustment.
3. Vicarious Learning: Using mentorship and role

models to demonstrate that challenges can be overcome.

Such a "Self-Efficacy Enhancement for Well-being" program could be highly effective in educational, clinical, and organizational settings. It aligns with existing effective interventions like the "Best Possible Self" [14] but provides a more explicit focus on the underlying mechanism of personal agency.

CONCLUSION

This study provides strong evidence that cognitive well-being can be understood as an actively managed process, governed by the principles of self-regulation. The belief in one's own capabilities appears to be the crucial psychological ingredient that translates the successful pursuit of goals into a lasting sense of life satisfaction. By understanding that well-being is not a destination to be reached but the rewarding experience of navigating life with a sense of competence and purpose, we can better equip individuals with the psychological tools they need to flourish.

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