THE STRUCTURE OF GOALS: USING CYBERNETIC THEORY TO UNDERSTAND

BEHAVIOR AND FUNCTIONING

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The Supervisory Committee certifies that this **disquisition** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

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ABSTRACT

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While self-determination researchers emphasize the importance of pursuing internally motivated goals for self-regulation, cybernetic theorists instead highlight the structural features of goal systems and the manner in which such structural features should facilitate controlled behavior in daily life. However, it was our intuition that a consideration of both these literatures might best explain self-regulatory processes in daily life. Along these lines, we conducted two studies in which we measured the degree to which a person's goals are organized in hierarchical manner with respect to their intrinsic versus extrinsic properties. In Study 1, we found that individuals with hierarchical goal structures were less likely to experience increased motivation to quit following frustrating events. Consistent with this pattern, in Study 2 we found that negative feedback concerning goal progress adversely affected only those without hierarchical goal structures. Implications of these findings for perspectives on self-regulation are discussed, as well as potential new directions for testing cybernetic concepts within human functioning.

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INTRODUCTION

The topic of motivation has been a persistent one in both historical and modern psychological thought (Fiske, 2008). Multiple perspectives conceptualize behavior as action that is motivated by certain goals. For instance, psychoanalytic perspectives view behavior as being motivated by basic drives related to the fulfillment of pleasure (Freud, 1955), while developmental theories emphasize the motivation to fulfill basic (e.g., food, shelter) and complex (e.g., self-actualization) human needs (Maslow, 1967). The behaviorist movement challenged the idea of intrapsychic needs and instead characterized behavior as the pursuit or avoidance of objects that have been previously rewarded or punished (Pavlov, 1927; Skinner, 1938).

Recent cognitive and social perspectives of motivation have challenged assumptions made by the behaviorist school by emphasizing its lack of explanatory power with respect to fundamentally important concepts such as consciousness and free will (Fiske, 2008). Accordingly, more recent perspectives emphasize the importance of characterizing human behavior in the context of goal-directed action (Shah & Gardner, 2008). That is to say, people's goals are thought to be important in understanding why they act as they do, as well as how they manage or fail to manage stressful events or obstacles (Austin & Vancouver, 1996). One consideration along these lines has focused on whether goals are pursued because they satisfy self-endorsed versus externally-imposed standards.

Autonomy and Self-Regulation

In response to behaviorist and biological theories, Deci and Ryan (1985) have discussed the importance of understanding the complex internal and external forces that motivate behavior. In particular, they emphasize the concept of autonomy, which is an

integrated mode of functioning in which an individual is pursuing only those goals that are consistent and true to one's own wants and wishes (Ryan, Kuhl, & Deci, 1997). In this view, autonomy is central to self-regulation because it facilitates a top-down process in which a person directs attention and action toward those goals that are in coherence with their internal desires while ignoring temptations or distractions that are unrelated to these goals. Additionally, autonomy is thought to increase feelings of commitment and long-term engagement with goals, ultimately leading to goal attainment (Deci & Ryan, 1985).

According to this perspective, an autonomous person is one that is intrinsically motivated to engage in certain activities (Ryan et al., 1997). Intrinsically (i.e., *intrinsic*) motivated goals are those that are pursued simply because they bring a person satisfaction and not because of the outcomes associated them. In contrast to these strivings, extrinsically (i.e., *extrinsic*) motivated goals are those that are pursued because they are valued or praised by external sources (e.g., family, friends, society), but do not necessarily bring a person happiness. Consistent with the perspective that autonomy is central for self-regulation, intrinsic motivation is thought to be essential for goal-directed behavior in daily life because such goals present an optimal level of challenge (Csikszentmihalyi, 1990). Conversely, pursuing extrinsically motivated goals is thought to undermine self-regulation because individuals are quicker to give up on things that are not self-endorsed (Deci & Ryan, 1985).

A great deal of research has been conducted to examine how intrinsic and extrinsic motivation may impact self-regulation and goal persistence, with the general prediction that intrinsic motivation is conducive to purposeful action (Deci, 1971). Many of these researchers assert that on a day to day basis, people pursue certain goals not for personal

satisfaction but because they are socially proscribed activities (Ryan et al., 1997).

Consequently, this type of goal pursuit does not lead to autonomy and ultimately may

compromise long-term happiness and well-being (Deci & Ryan, 2000). Most research of

this type contrasts behavior exhibited in the absence of external reward (thought to result

from intrinsic motivation) versus the presence of external reward (thought to result from

extrinsic motivation).

Several studies of the preceding type have been conducted, which in turn resulted in

a meta-analysis (Deci, Koestner, & Ryan, 1999). The authors state that when performing a

task for the simple pleasure that it brings, children are more likely to enjoy what they are

doing and perform better as a result. However, the introduction of a reward (e.g., money,

verbal encouragement) introduces an external pressure and the goal being pursued becomes

something that is externally reinforced rather than something that is pursued for one's own

enjoyment. In support of these ideas, Deci et al.'s (1999) meta-analysis showed that the

provision of external rewards and/or feedback does indeed tend to undermine enjoyment in

activities and the likelihood of children completing tasks.

Research using college-aged students and older adults has found similar

performance related benefits associated with intrinsic motivation. For instance, students

studying at a medical school for intrinsic reasons were more likely to display competence

and mastery in their professional performance (Williams & Deci, 1996). Additionally,

college students who were trying to achieve their goals for intrinsic reasons displayed more

persistence and were more likely to attain their goals (Sheldon & Elliot, 1999). Finally,

Sheldon and Kasser (1998) have found that pursuing intrinsically motivated goals predicts

a number of positive well-being outcomes in college students. Together, the literature on

autonomy makes a convincing case for the idea that intrinsic motivation is beneficial for self-regulation, goal pursuit, and optimal functioning.

Despite this empirical support, however, the body of literature related to autonomy and intrinsic motivation has been criticized in recent years. Particularly, many have critiqued this work and the positive psychology movement in general with prioritizing the theoretical aspects of the work over systematic investigation of the ideas (Kashdan & Steger, 2011). Additionally, many theorists have argued that, intuitively, people may pursue and obtain objects that are not intrinsically motivated without detrimental effects for well-being and self-regulation (Carver & Baird, 1998). In support of this idea, studies have found that individuals who pursued goals that are generally thought of as socially motivated (e.g., wealth, prestige) did not report deficits in happiness or well-being, so long as these goals were pursued because the individual genuinely wanted them (Srivastava, Locke, & Bartol, 2001).

Together, this research introduces the idea that while intrinsic motivation is important for goal pursuit and functioning, there may be instances in which pursuing goals that are less intrinsically motivated is not as problematic for achievement and well-being as previously thought. That is to say, while intrinsic motivation may be especially important for broader goals that people work toward over the course of a lifetime, intrinsic motivation might be less important for performing many mundane tasks in day to day life that have to be performed (e.g., taking out the garbage). Thus, the tendency for this literature to stress the importance of intrinsic motivation for *all* goals leaves out this important consideration and does not take into account the fact that goals may operate as hierarchical systems (Carver & Scheier, 1998). A discussion of the theories that seek to understand the

hierarchical nature of behavior may be informative for understanding the role of intrinsic motivation in self-regulation.

Cybernetic Theory and Self-Regulation

Some modern views of motivation and self-regulation emphasize the idea that humans and machines may process information from the environment in a similar manner. This cybernetic view of behavior was first introduced by Wiener (1948) and expanded upon by Miller, Galanter, and Pribram (1960). In the latter framework, the authors argue that behavior can be understood in terms of a unit called a TOTE (Test-Operate-Test-Exit). The operation of a TOTE unit involves repeated comparisons between ideal and current states and the reduction of any discrepancies between these two states through purposeful action (Miller et al., 1960). More recent cybernetic views of behavior have emphasized the hierarchical nature of TOTE units (Carver & Scheier, 1998; Powers, 1998). Namely, these views assert that people have very broad goals that they are working toward over the course of a lifetime and in order to make progress regarding these broad goals, they reduce discrepancies by pursuing relevant smaller goals on a day to day basis (Powers, 1973, 1998).

This proposed hierarchical system is thought to have important consequences for behavior and self-control (Miller et al., 1960). In relation to purposeful behavior, the composition of goal structures should predict how well individuals control behavior over the course of time. Cybernetic theorists assert that an effective goal structure is one in which the broadest goals are ones that are long-term and related to more abstract concepts such as happiness and self-actualization (Powers, 1998). In contrast, the goals that are viewed as more immediate should be ones that are concrete in nature, can be quickly

achieved, and facilitate progress toward the larger goals that they typically serve (Carver & Scheier, 1998). While these concepts have not been tested by cybernetic theorists, ideas consistent with cybernetic theories – such as the benefits of complementary goals and the importance of having concrete strategies for obtaining more abstract goals – do appear to be functional for goal pursuit and well-being (e.g., Emmons, 1986; Gollwitzer, 1999).

Beyond goal pursuit in general, self-regulation researchers have argued that daily stressful events pose a significant problem for purposeful behavior as they can prompt a number of impulses which derail goal pursuit (Baumeister & Heatherton, 1996). For instance, a person who is dieting may attempt to control their on a day to day basis but following a frustrating or stressful event, the impulse to resist tempting foods is too difficult to override and the individual eats a particularly fattening dessert. And while views of self-regulation diverge on the individual differences and situational contexts which may mitigate these effects, cybernetic views of self-regulation assert that the extent to which individuals conceptualize and organize their goals in a hierarchical manner will predict how well they resist impulses and persist in their goals following frustrating events in their daily lives (Carver & Scheier, 1981, 1998).

A hierarchical arrangement of goals is thought to better facilitate self-regulation in two particular ways (Carver & Scheier, 1996). First, individuals who pursue their goals in a hierarchical fashion are somewhat necessarily pursuing smaller, shorter term goals on a day to day basis. This movement toward smaller goals, in turn, is thought to be more effective for dealing with obstacles and stressful events because when difficulties arise, a person is better able to return to the "nuts and bolts" of action and continue working on their goals (Carver & Scheier, 1996). A person without such a hierarchy is thought to get

lost in the abstract ideas associated with their larger goals and find it difficult to instantiate them, particularly following negative events (Emmons, 1992).

The second way in which goal hierarchies are thought to be important for self-regulation involves the importance of higher level goals. From a cybernetic perspective, the broadest goals a person has are thought to organize and energize day to day pursuits (Carver & Scheier, 1996). Specifically, when daily negative events happen, individuals with a hierarchical goal structure can remind themselves of the importance of overcoming obstacles precisely because doing so serves larger, meaningful goals (Carver & Scheier, 1996). Individuals who do not have such a hierarchy are less able to see the long-term benefits of working toward goals even after setbacks and are more likely to give into temptations when things are not working out (Baumeister & Heatherton, 1996).

While the cybernetic view of self-regulation is consistent with other well-validated psychological theories of control, such as those related to self-awareness (Duval & Wicklund, 1972) and affect (Carver & Scheier, 2008), empirical evidence to support the idea that goal structures are an important predictor of self-regulation is surprisingly sparse. One reason for this might be that cybernetic theorists refer to many dimensions (e.g., abstractness, duration, importance, intrinsicness, etc) when they seek to characterize high level goals. As a result, it is not clear which specific quality is most related to self-regulation. Because there is a substantial body of research on intrinsic versus extrinsic motivation and its functional consequences, it was deemed best to focus on this quality in the present studies.

The Present Research

The literature related to autonomy has emphasized the importance of goals being intrinsically motivated, but there has been criticism in relation to claims that effective self-regulation may only occur to the extent that a person is intrinsically motivated in all that they do (Carver & Baird, 1998; Deci & Ryan, 2000). The literature related to cybernetic and control theory has emphasized the importance of structure when it comes to goal pursuit and self-regulation following stress, but no work has been done to examine along which dimensions goals should be hierarchically arranged (Baumeister & Heatherton, 1996; Carver & Scheier, 1996). The present work sought to consider the merits of both literatures and merge the two perspectives of self-regulation in order to better understand goal pursuit and control in the context of daily life.

In order to test our ideas, we first gathered information about people's goals and, central to our prediction, participants ranked how much they pursue these goals for intrinsic reasons. Then, we used these scores to differentiate people based on degree to which their goals follow a hierarchical arrangement, with levels of intrinsic motivation increasing from low level to high level goals. In line with our interest in understanding self-regulatory behavior, we then used these difference scores to predict behavior in daily life. In Study 1, we measured motivation to quit while in Study 2, we measured a collection of variables related to persistence under troubling circumstances. In both studies, we also measured the frequency of frustrating or negative events that might compromise self-regulatory action.

As discussed above, cybernetic views assert that a hierarchical arrangement of goals facilitates self-regulation because it allows people to make progress on smaller goals while still motivating them to achieve their larger goals. In relation to the present studies, we

believe that intrinsic motivation is especially important at the highest goal level because it will encourage people to persist following setbacks. However, because smaller goals that are pursued on a day to day basis should be the ones that are concrete and quickly achieved, we think that intrinsic motivation at these levels is less consequential for self-control. In other words, we think it is more important to be intrinsically motivated in a hierarchical manner than to be just intrinsically motivated in general. Thus, for both studies, we predicted that individuals with a hierarchical goal structure would be less influenced by negative events and would display self-regulation in the face of setbacks.

STUDY 1

Self-regulatory behavior is perhaps best understood by examining how individuals generally react following stressful or unexpected events (Baumeister, Heatherton, & Tice, 1994). Along these lines, we deemed it best to measure the frequency of common negative events that are likely to characterize most people's daily lives. To measure self-regulation in relation to such events, we assessed motivation to quit on a daily basis. As an individual difference variable, we had individuals list and rate the goals that they were generally trying to accomplish, and quantified the extent to which goal intrinsicness varied in a hierarchical manner. Consistent with our cybernetic perspective, we hypothesized that individuals who have a hierarchically arranged goal structure would be better able to maintain control following events that may increase a person's desire to quit or give up.

Method

Participants

One hundred and six undergraduates from North Dakota State University participated in this study. Ten participants chose not to report demographic information. As expected, the sample was of typical college age (*M* age = 19.18) and largely Caucasian (*N* Caucasian Participants = 85). Of those who reported demographic information, fifty-seven were female while thirty-nine were male. Only those participants who agreed to participate in all aspects of the study were allowed to sign up.

Procedures

This study involved both a laboratory assessment and a daily reporting component. The laboratory used to collect this data is equipped with six personal computers that are surrounded by wood dividers to ensure responses are kept private from other participants

and the experimenter. In this laboratory session, participants completed a computer program that collected information about their current goals. This laboratory assessment took one hour and all participants received four research credits for their participation. After the session was finished, participants were instructed to complete a daily experience reporting protocol.

In this daily reporting component, participants logged in to Sona Systems for fourteen consecutive days and completed a brief questionnaire about events and motivations that occurred throughout their day. The same daily survey was completed each day and each questionnaire remained online from 5 PM that night until 8 AM the following morning. A reminder e-mail was sent to the participants every night in an effort to increase the completion rates for the daily surveys. This method was effective and yielded particularly high compliance rates for the daily protocol (*M* number of surveys completed = 12.5). After the daily experience reporting concluded, participants were compensated with one research credit or two dollars for each daily survey they completed.

The Goal Hierarchy Measure

We created a measure that quantifies the hierarchical nature of a person's goal structure and the data were collected using MediaLab software (Jarvis, 2006). This computer program (see Appendix A) began by asking participants to list six goals they are currently trying to achieve (i.e., Mid Level goals). The instructions for this portion of the task were adapted from the well-validated measure of Emmons (1986) and we were thus confident that the mid level goals were those that the participants were currently striving for in the day to day life. Following this, participants were asked to list three ways in which they are trying to achieve each mid level goal (i.e., Low Level goals). Finally,

participants were asked to report the larger goals that they hoped to achieve by successfully completing each mid level goal (i.e., High Level goals). In this qualitative portion of the task, participants reported a total of thirty goals: six high level, six mid level, and eighteen low level.

In the next portion of the computer program, participants made a number of quantitative ratings about their goals. Of most relevance to the present work were ratings of the degree to which each goal is intrinsically motivated. Prior to these ratings, participants were instructed that people sometimes work toward goals because they feel like they should (i.e., extrinsically motivated) while at other times people work toward goals because doing so is something they simply want to do (i.e., intrinsically motivated). Using a scale of 1 (Should) to 5 (Want), participants rated the extent to which each of their goals was intrinsically motivated, producing a total of thirty ratings.

We first calculated intra-class correlations (ICCs) for each goal level (e.g., high, mid, and low) to justify averaging across the goals within each level. These coefficients ranged from .30 to .78. We could therefore average across ratings for a particular goal level (for this normative information, see Table 1). A one-way ANOVA was then performed to assess the extent to which intrinsicness varied by goal level. There was a significant main effect in this analysis, $F(2, 315) = 30.50$, $p < .001$, and pairwise tests confirmed that differences between each pair of levels were significant, all $ps < .01$. As shown in Table 1, and as might be expected from a cybernetic perspective, low level goals were the least intrinsic, high level goals were the most intrinsic, and mid level goals fell in between.

Goal Level	Mean	Standard Deviation
High	3.95	0.69
Mid	3.48	0.72
Low	3.05	0.69

Table 1. Normative information for the goal measure in Study 1.

We wanted to have a difference score that would represent the hierarchicality of a person's goal structure. Ideally, this score would be positive for an individual with a hierarchical goal structure (high level = most intrinsic), negative for an individual with an inverted goal structure (low level = most intrinsic), and zero for an individual with an undifferentiated goal structure (low level = high level). We first used a straightforward difference score that simply subtracted each smaller level from the larger one (i.e., High-Mid-Low). However, this score was problematic because almost all individuals would receive a negative score, including undifferentiated individuals. To solve this problem, we subtracted the lower levels from each other and then subtracted this value from the high level (i.e., High-[Mid-Low]). This score was also problematic, though, because undifferentiated people received a positive score when they should have received a score of zero.

A difference score that involves calculations in relation to the mid level (i.e., [High-Mid] + [Mid-Low]) was also computed because it produces a score of zero for undifferentiated people. However, this score was problematic because the ratings related to the mid level do not have an impact on the score. We then attempted to return to the first score (i.e., High-Mid-Low) but fixed the problem related to undifferentiated people by adding a constant (i.e., 5). This worked fairly well, but unfortunately, not perfectly.

We discerned that centering each person's ratings would solve the numerous problems listed above. Specifically, for each participant separately considered, we calculated their average rating of intrinsic motivation across all goal levels. We then subtracted this average from each of the ratings for the three goal levels. Finally, we created a difference score (i.e., High – Mid – Low) based on these centered values. As desired, participants with positive scores were individuals whose ratings increased as goal level also increased, participants with negative scores were individuals whose ratings decreased as goal level increased, and participants with a score of zero were those that did not differentiate ratings across goal levels.

To gain some appreciation of the rating pattern of high versus low scorers on the centered difference score, we split the distribution at the median and then performed two one-way ANOVAs, one for each group (i.e., High vs. Low). In relation to individuals in the top half of the distribution (i.e., High), there was a significant main effect of goal level, $F(2, 157) = 98.39$, $p < .001$. Pairwise comparisons indicated that for individuals in the top half of the distribution, mean scores significantly differed at each level, all $ps < .001$, and these means favored a *hierarchical* arrangement (see Table 2). For individuals in the bottom half of the distribution (i.e., Low), this main effect was not significant, $F(2, 157) = 1.79$, $p > .10$, and all pairwise comparisons between levels were also nonsignificant, all $ps > .30$. Thus, low individuals are best thought of as *undifferentiated* rather than inverted.

Daily Functioning

The goal of the present work was to understand how goal structures would predict differences in self-regulation in daily life, with the hypothesis that individuals who conceptualize their goals as hierarchical would be better self-regulators following

frustrating events. Along these lines, using a daily experience protocol, participants

characterized their day in two separate ways. Participants first indicated the extent to

which they were motivated to quit or give up. Participants then reported on how many

frustrating events occurred on a given day. It was deemed useful to report on frustrating

events second to preclude inferences about motivation that might occur had frustrating

events been reported on first (Ode, Hilmert, Zielke, & Robinson, 2010).

Group	Low Level	Mid Level	High Level
Low	3.22	3.49	3.50
High	2.88	3.47	3.95

Table 2. Mean scores of intrinsic motivation within each group, Study 1.

Two items were used to assess motivation to quit with the reasoning that high

scores would reflect a general lack of self-regulation or persistence in the face of frustration

(Eccles & Wigfield, 2002). Participants rated the extent to which two statements ("I was

motivated to give up on something" and "I was motivated to quit trying") characterized

their day. They made these ratings using a scale of 1 (Not at all true today) to 4 (Very

much true today). Reliability across the two items was high (ICC = .83) and therefore

responses were averaged within each day to represent a general motivation to quit ($M =$

1.61, $SD = 0.79$).

After reporting on motivation, participants then rated the frequency with which

certain events characterized their day. Two items were used to measure the occurrence of

frustrating events with the idea that such events would undermine self-regulatory and

control processes (Carver & Scheier, 1998). Along these lines, participants rated the extent to which two statements ("My plans were blocked" and "I deserved something and did not get it") represented their day. These ratings were made using the same scale described above (1 = Not at all true today, 4 = Very much true today). Once again, reliability across the two items was sufficient (ICC = .66) and responses were averaged within each day to represent the frequency of frustrating events ($M = 1.53$, $SD = 0.71$).

Results

Preliminary Considerations

In Study 1, daily motivation to quit was the outcome of interest and daily frustrating events were nested within individuals. Given this nested structure, and the consideration of missing data from the daily experience portion of the study, multilevel modeling (MLM) techniques were used (Raudenbush & Bryk, 2002). Specifically, the PROC MIXED procedure in SAS was utilized (Singer, 1998) to model how both daily frustration and hierarchical goal structures would predict daily motivation to quit, both as main effects and as an interaction. As recommended in the literature (Aiken & West, 1991; Nezlek, 2008), daily frustrating events was person-centered and the intrinsic difference scores were standardized prior to the analysis. Additionally, both the intercepts and slopes were treated as random effects as they were thought to vary between persons (Nezlek, 2008; Singer, 1998).

Multilevel Modeling Results

The predictors accounted for significantly more variance than the null model, χ^2 (3) = 429.34, $p < .0001$. The results of this multilevel model are presented in Table 3. Intuitively, and as one might expect, there was a main effect for daily frustrating events

such that motivation to quit was higher on days in which more frustrating events occurred. Interestingly, there was no main effect for the difference score, indicating that hierarchical arrangement of goals does not predict motivation to quit irrespective of levels of daily frustration. Of most interest to the present study, and as predicted, there was a significant interaction between frustrating events and the intrinsic difference scores in predicting daily motivation to quit.

Predictor	b	t	p
Intercept	1.62	31.84	< .0001
Frustrating Events	0.20	4.53	< .0001
Difference Score	-0.00	-0.01	0.9916
Frustrating Events x Difference Score	-0.13	-3.08	0.0021

Table 3. Multilevel model results, Study 1.

Estimation of Means and Simple Slopes

In order to better understand the nature of the significant interaction, we estimated means for low (-1 *SD*) and high (+1 *SD*) frustrating events and low (-1 *SD*) and high (+1 *SD*) intrinsic difference scores (Aiken & West, 1991). The estimated means for the interaction can be seen in Figure 1. For individuals with a small difference score (i.e., those who have the same amount of intrinsic motivation at each level of the goal hierarchy), motivation to quit was higher on days in which more frustrating events occurred, relative to days in which there were fewer frustrating events. However, for individuals with a larger difference score (i.e., those who are most intrinsically motivated at

the high level but less so at lower levels), motivation to quit did not differ greatly based on the number of frustrating events that occurred.
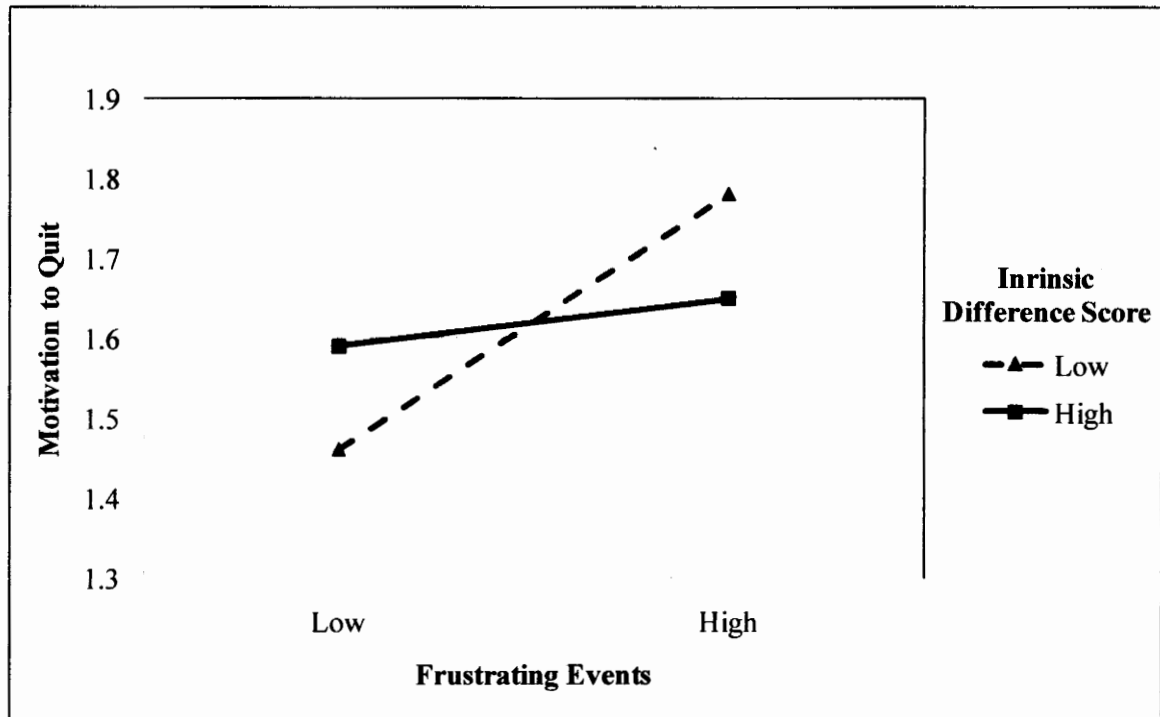
Figure 1. Motivation to quit as a function of daily frustrating events and intrinsic difference scores, Study 1.

In addition to estimating means, simple slopes tests were conducted (Aiken & West, 1991; Preacher, Curran & Bauer, 2006). For undifferentiated individuals, motivation to quit was higher on days with more frustrating events, relative to days low in frustrating events, t (104) = 5.41, p < .01. However, for hierarchical individuals, there was no motivation to quit did not significantly differ based on the frequency of frustrating events, t (104) = 1.04, p > .20. Thus, consistent with our self-regulatory hypothesis, a hierarchical arrangement of one's goals was functional in buffering the amotivational effects of frustrating events.

Comparing Difference Scores

The difference score used in the primary analysis included all three levels of the goal hierarchy (High, Mid, Low) as all are thought to be theoretically meaningful. It was deemed useful to create three new difference scores (i.e., High-Mid, High-Low, and Mid-Low) to further understand whether a particular contrast of levels is most beneficial in self-regulation. We repeated the analysis described above three times, once for each of the pairwise difference scores.

Once again, it was not the case that any difference score predicted motivation to quit, all $ps > .30$. However, difference scores which involved the top level (High-Mid and High-Low) both significantly interacted with frustrating events to predict motivation to quit, $ps < .01$. Estimated means, while not graphed here, replicated the pattern seen above. However, the difference score related to the lower levels (Mid-Low) did not interact with frustrating events to predict motivation to quit, $p > .50$. Thus, it appears that intrinsic motivation is most consequential for self-regulation when it comes to a person's broadest goals but is less related to self-regulation at the lower levels of a goal hierarchy.

Contrasting Hierarchical and Average Scores

Self-determination theorists have emphasized the importance of autonomy in daily life (Ryan et al., 1997). In this view, self-regulation and well-being are thought to be facilitated by pursuing goals that are intrinsically motivated. In our view, and consistent with theories of cybernetic control, we believe that intrinsic motivation should facilitate self-regulation particularly to the extent that the goal system is arranged hierarchically. Indeed, support for the benefits of such a hierarchical arrangement was reported above.

In an effort to contrast these two views of motivation and self-regulation, we repeated our multilevel model analysis using an average score of intrinsic motivation across all levels of the goal hierarchy. In this analysis, we found that average intrinsic motivation did not predict general motivation to quit, $p > .30$, nor did it interact with frustrating events to predict self-regulatory behavior, $p > .05$. In other words, a cybernetic perspective of intrinsic motivation was better able to predict self-control following frustrating events than general intrinsic motivation.

Discussion

The results of Study 1 provided initial support for our hypothesis that hierarchical goal structures should be associated with better self-regulation in everyday life. Namely, individuals who had a hierarchically arranged goal structure did not report feeling a higher motivation to quit on days in which many frustrating events occurred. Conversely, individuals who were undifferentiated in their goal structures reported feeling more motivation to quit on days in which more frustrating events occurred. Follow-up analyses showed that greater intrinsic motivation at the high level, relative to either of the lower levels, facilitated self-regulation. By contrast, the difference score contrasting mid and low levels was not as predictive. Additionally, and in contrast to self-determination theorists, high levels of intrinsic motivation, per se, were less consequential for self-regulation.

STUDY 2

The purpose of the Study 2 was to replicate and extend our initial findings. We first wanted to replicate the self-regulatory pattern from Study 1 by showing that individuals who have a hierarchical goal structure are better able to control behavior following a setback. However, in Study 2, we wanted to measure an outcome related to increased, rather than decreased, goal striving. Accordingly, participants reported on the extent to which each day was associated with goal-threatening negative feedback, as well as how persistent they were in pursuing their goals. Consistent with our hypothesis and the findings of Study 1, we predicted that negative feedback would derail goal pursuit processes among undifferentiated individuals, but not hierarchically arranged individuals.

Method

Participants and Procedures

One hundred and eleven undergraduates from North Dakota State University participated in the second study. Fifteen participants chose not to report demographic information. Similar to Study 1, the sample was of typical college age (*M* age = 20) and mostly Caucasian (*N* Caucasian Participants = 83). Of those who reported demographic information, fifty-three were female and forty three participants were male. As in Study 1, only those participants who agreed to participate in both the laboratory session and the daily protocol were allowed to sign up for the study.

The procedures for this study were parallel to those of Study 1. Participants first completed a one hour laboratory session in which they reported information about their current goals and they received four research credits for this portion of the study. Following this laboratory assessment, participants completed a fourteen day protocol in

which they reported information about behaviors and events that occurred throughout their day. The same daily survey was completed each day and the questionnaire remained on Sona Systems from 5 PM that night until 8 AM the following morning. To increase the completion rate of the daily surveys, a daily e-mail reminder was sent out every night. As in Study 1, this technique was effective and yielded a high compliance rate for the daily surveys (*M* number of surveys completed = 12.4). At the conclusion of the daily protocol, participants were given the option of receiving one research credit or two dollars for each survey they completed.

The Goal Hierarchy Measure

The goal measure used in this study was identical to that of Study 1. Using a MediaLab program (Jarvis, 2006), participants first reported six of their current goals (i.e., Mid Level) and then reported, for each of these mid level goals, three ways in which they try to achieve that goal (i.e., Low Level). Subsequently, for each of the mid level goals, the participants listed the larger goal that the mid level goal ostensibly served (i.e., High Level). Then, for each of these thirty goals, the participants rated the extent to which they work toward that goal because it is something they should do or it is something they want to do using a rating scale of 1 (Should) to 5 (Want).

We first calculated intra-class correlations (ICCs) for the goal ratings in each level. These ICCs were similar in magnitude to those in Study 1 and ranged from .41 to .76, indicating a good degree of reliability. Given the reliability of the scores, we averaged ratings of intrinsic motivation for the goals within each level of the hierarchy (see Table 4 for this normative information).

Goal Level	Mean	Standard Deviation
High	3.72	0.84
Mid	3.45	0.78
Low	3.09	0.67

Table 4. Normative information for the goal measure in Study 2.

As can be seen in Table 4, the average person displayed a hierarchical pattern with regard to their levels of intrinsic motivation. To confirm this impression, we conducted a one-way ANOVA, in which there was a significant main effect of goal level, $F(2, 330) =$ 18.82, $p < .001$. In addition, pairwise comparisons revealed that each level was significantly different from each other level, all $ps < .05$. Next, to calculate the difference score for each individual, we first centered each person's ratings of intrinsic motivation across goal levels. Then, a three level difference score was calculated to reflect the extent to which the three levels were hierarchically organized (i.e., High – Mid – Low).

To gain a further appreciation of individual differences in relation to the difference score, we split the sample into two groups by the median, one group characterized by low scores and the other group characterized by high scores. We then performed two one-way ANOVAs with goal level as the predictor for each group. Among high scorers, there was a significant main effect for goal level, $F(2, 166) = 47.76$, $p < .001$. Pairwise comparisons further indicated that intrinsic motivation systematically increased from low to mid to high goal levels, all $ps < .05$ (see Table 5). In a departure from Study 1, the test for individuals in the bottom half of the distribution was also significant, $F(2, 163) = 3.37$, $p < .05$. Pairwise comparisons revealed that intrinsic motivation increased from the low level to the mid level, $p < .05$, but that there was no difference between the mid level and the high

level, nor between the low level and high level, *ps* > .05 (see Table 5). Because the low and high levels were systematically different among high scorers, we refer to these individuals as hierarchically organized. By contrast, because the low and high levels were equivalent among low scorers, we refer to these individuals as undifferentiated.

Group	Low Level	Mid Level	High Level
Low	3.27	3.63	3.34
High	2.92	3.28	4.10

Table 5. Mean scores of intrinsic motivation within each group, Study 2.

Daily Functioning

In an effort to replicate and extend our initial findings, the daily outcomes of Study 2 were changed to reflect more goal-specific behaviors. To gather this information, participants would first report on the extent to which they worked toward their goals that day (see below for items) and then they reported the frequency with which they received negative feedback about their progress. As in Study 1, the items related to goal persistence were presented first to limit the influence that recalling negative events might have on responding (Ode et al., 2010).

Three items were used to assess persistence in working toward goals. These items, labeled as "grit", were adapted from a well-established measure that is thought to reflect purposeful goal-directed behavior (Duckworth, Peterson, Matthews, & Kelly, 2007). Participants selected a response ranging from 1 to 5 in relation to three bipolar items, all of which started with the phrase "While I was working on my goals today...": "...I was not

discouraged by setbacks" versus "...I was discouraged by setbacks"; "...I often quit after starting" versus "...I finished what I started"; and "...I was rather lazy" versus "...I worked very hard". The responses for the first item were reverse-scored and reliability for all the items was calculated (ICC = .57). Given this consistency across items, scores were averaged to represent a single score of daily grit ($M = 3.33$, $SD = 0.90$).

Negative feedback is thought to be particularly problematic for goal pursuit because it decreases feelings of competence and expectations of future success (Senko & Harackiewicz, 2005). Accordingly, we hypothesized that the ability to continue working toward goals even after negative feedback would highlight adaptive functioning of the type often discussed by self-regulation theorists (Bandura, 1996). Participants were instructed to rate the extent (1 = Very untrue; 4 = Very true) to which they received negative feedback ("I received negative feedback"; $M = 1.80$, $SD = 0.86$).

Results

Preliminary Considerations

The outcome of interest was daily grit when pursuing goals and daily negative feedback was nested within individuals. As in Study 2, we used multilevel modeling (MLM) procedures (Raudenbush & Bryk, 2002) and analyzed the data using the PROC MIXED procedure in SAS (Singer, 1998). Daily negative feedback was person-centered and the hierarchical difference scores were standardized before being entered as predictors of daily grit. Because they were thought to vary between individuals, both the intercepts and slopes were treated as random effects (Nezlek, 2008).

Multilevel Modeling Results

Once again, the predictors accounted for significantly more variance than the null

model, $\chi^2 = 342.18$, $p < .0001$. The results of the multilevel model are presented in Table

6. There was a marginally significant main effect of negative feedback on daily grit.

Namely, on days in which there was more negative feedback about goal progress, grit

levels tended to be reduced. As in Study 1, there was no main effect for the difference

score, which instead predict outcomes in a more dynamic manner. Consistent with such a

dynamic perspective, negative feedback interacted with hierarchical difference scores to

predict daily grit.

Predictor	*b*	*t*	*p*
Intercept	3.33	62.40	< .0001
Negative Feedback	-0.06	-1.65	0.0995
Difference Score	-0.00	-0.01	0.9890
Negative Feedback x Difference Score	0.08	2.33	0.0198

Table 6. Multilevel model results, Study 2.

Estimation of Means and Simple Slopes

To aid in the interpretation of the significant interaction, means were estimated for

individuals low (-1 *SD*) versus high (+1 *SD*) in the intrinsic difference score for days

associated with low (-1 *SD*) versus high (+1 *SD*) negative feedback (Aiken & West, 1991).

These means are graphed in Figure 2. For undifferentiated individuals, relative to days

with less negative feedback, daily grit was lower on days in which they received more

negative feedback about their goal progress. On the other hand, for hierarchical

individuals, daily grit did not appear to differ in response to negative feedback.
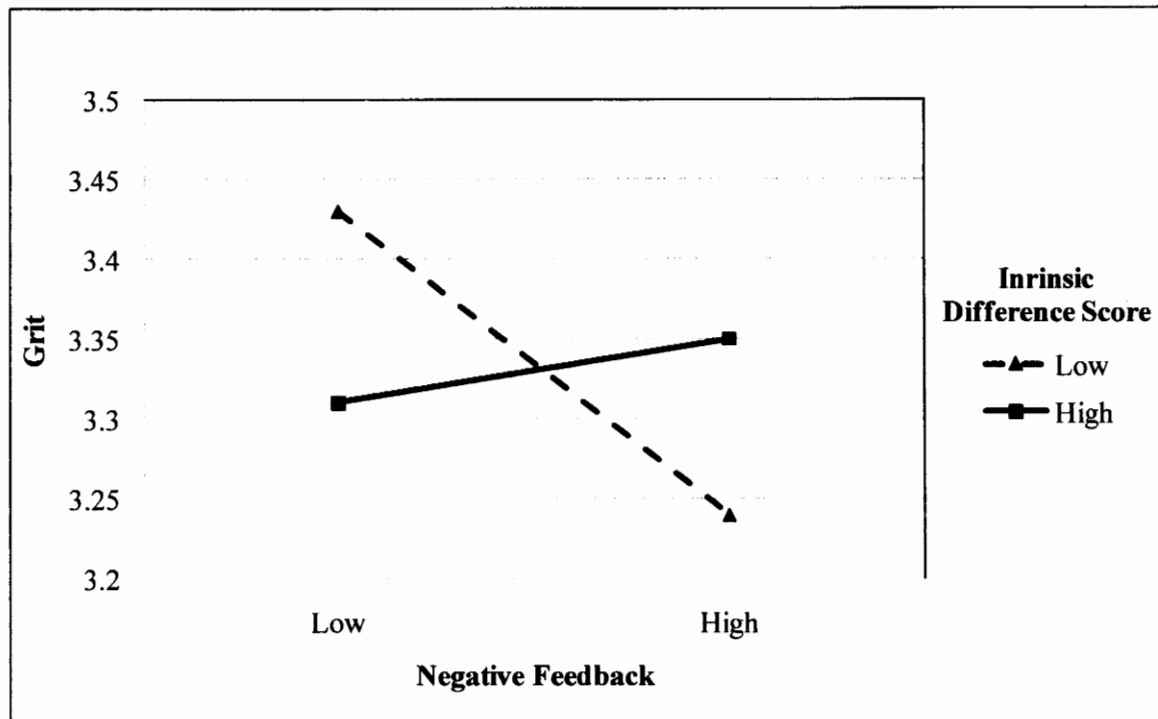
Figure 2. Grit as a function of daily negative feedback and intrinsic difference scores, Study 2.

Simple slopes analyses were then conducted (Aiken & West, 1991; Preacher et al.,

2006). As one might expect based on the means, negative feedback undermined daily grit

among undifferentiated individuals on days with more negative feedback, relative to days

with low negative feedback, t (109) = 2.83, $p < .01$. For individuals with a hierarchically

arranged goal structure, on the other hand, daily grit scores did not vary by less or more

negative feedback, t (109) = 0.46, $p > .60$. In other words, undifferentiated (but not

hierarchical) individuals had difficulty controlling behavior following negative feedback.

Comparing Difference Scores

To once again test whether intrinsic motivation was more consequential at a certain level of the goal hierarchy, we calculated three new difference scores (High-Mid, High-Low, and Mid-Low). Parallel to the model described above, we conducted three independent multilevel models in which each difference score was entered as a main effect and as a moderator of the effect of negative feedback on goal persistence. As in our primary analysis, it was not the case in any model that there was a main effect for the hierarchical difference scores, all $ps > .80$.

The difference score contrasting the high and low levels interacted with negative feedback to predict grit, $p < .05$. Estimated means, while not graphed here, replicated the pattern seen with the three level difference score (High-Mid-Low) described above. The difference score contrasting the high and mid levels was marginally significant in its interactive effect, $p < .10$. Finally, and as in Study 1, a contrast of mid and low levels was inert in moderating the effects of goal obstacles, $p > .30$. Overall, these findings highlight the importance of intrinsic motivation being greatest at the high goal level.

Contrasting Hierarchical and Average Scores

Finally, we again wanted to compare how an average score of intrinsic motivation might also predict goal-related behavior (Deci et al., 1999). Accordingly, we averaged ratings of intrinsic motivation across all levels of the goal hierarchy and then repeated the multilevel model described above. In this case, average intrinsic motivation predicted daily grit such that higher intrinsic motivation was related to higher goal persistence, $p < .01$. This main effect supports the perspective that intrinsic motivation does generally increase goal persistence in daily life (Deci & Ryan, 2000). However, there was no significant

interaction with negative feedback, $p > .50$. Thus, as in Study 1, a cybernetic perspective of intrinsic motivation was somewhat unique in its ability to predict giving up versus persisting in the context of goal obstacles.

Discussion

The results of Study 2 provided additional support for our hypothesis that a hierarchical arrangement of goals serves to lessen the impact of negative events in daily life. We found that following negative feedback about goal progress, individuals who were undifferentiated reported working less toward their goals. On the other hand, individuals with a hierarchical arrangement were able to persist in goal pursuit following negative feedback. Additionally, in follow-up analyses, we were also able to replicate the patterns seen in Study 1 by demonstrating that intrinsic motivation is most consequential for self-regulation to the extent that the highest goals are also those that are most intrinsically motivated. Finally, also consistent with Study 1 and our cybernetic hypothesis, we demonstrated that the hierarchical difference score was a better predictor of self-regulation than average intrinsic motivation.

GENERAL DISCUSSION

The present work sought to merge two perspectives of self-regulation in the context of goal pursuit in daily life. Deci and Ryan (2000) have argued that pursuing goals for the simple satisfaction that they bring will facilitate self-regulation and persistence following stressful events. However, cybernetic theorists have argued that while intrinsic motivation is important for self-control, it will only predict regulation following setbacks to the extent that people are intrinsically motivated in a hierarchical manner (Miller et al., 1960). In other words, while autonomy theorists argue for the benefits of high intrinsic motivation in general, cybernetic theorists assert that the hierarchical arrangement of intrinsically motivated goals is more predictive of self-regulation (Carver & Scheier, 1996).

In two studies, we proposed that hierarchical goal structures would facilitate self-regulation in daily life. In Study 1, we found initial support for this idea as individuals with a hierarchical goal structure were uninfluenced by frustrating events while undifferentiated individuals reported feeling more motivated to quit following such events. We were able to replicate and expand upon this pattern of findings using items more specific to goal pursuit in Study 2. Specifically, we found that individuals with a hierarchical goal structure were uninfluenced by negative feedback while undifferentiated individuals reported feeling less motivated to continue pursuing their goals following such feedback. The implications of this work for the multiple literatures it involves are discussed below.

Intrinsic Motivation and Self-Regulation

The literature related to autonomy has stressed the importance of intrinsic motivation, perhaps at the expense of considering the potential benefits of pursuing

extrinsically motivated goals (Kashdan & Steger, 2011; Srivastava et al., 2001). These theorists argue that external factors, such as rewards and positive feedback, undermine task enjoyment and persistence of multiple types (Deci et al., 1999). Further, over the course of time, lack of intrinsic motivation is thought to undermine happiness and self-actualization (Deci & Ryan, 2000). Additionally, in studies related to affective forecasting, individuals have reported that they expect to experience less happiness following the achievement of extrinsically motivated goals and expectations of higher well-being following the achievement of intrinsically motivated goals (Sheldon, Ryan, Deci, & Kasser, 2004).

The present work, however, challenges the idea that self-regulation can only occur to the extent that a person is purely motivated by intrinsic goals. We found that individuals who are most intrinsically motivated in their broadest goals, but less so in their smaller, day to day goals, were more likely to maintain control following setbacks. In contrast, individuals who did not differentiate levels of intrinsic motivation across the goal hierarchy reported feeling less motivated to pursue their goals following these negative events. Additionally, follow-up analyses revealed that the difference score of intrinsic motivation was a better predictor of self-regulation than just intrinsic motivation in general. Together, these findings suggest that pursuing less intrinsically motivated goals does not undermine self-regulation, so long as those goals are serving broader desires that are intrinsic in origin.

The findings from these two studies also suggest that the autonomy and cybernetic perspectives of self-regulation may not be as incongruent as once thought. Intrinsic motivation theorists have criticized cybernetic theory for its processing approach to human behavior (Sheldon & Kasser, 1995). In this critique, self-determination researchers have asserted that the tendency for control theorists to emphasize mechanical concepts, such as

feedback loops and hierarchies of control, glosses over important human concepts such as happiness, fulfillment, and self-actualization (Sheldon & Kasser, 1995). Particularly, they argue that while cybernetic ideas may explain important aspects of goal pursuit and efficiency, how these processes map onto general well-being and human development is not as readily apparent (Deci & Ryan, 2000).

From our perspective, the best method for understanding self-regulation in daily life is to combine the processing approach of cybernetic theory with literatures that have examined the consequences of pursuing goals of a certain type. In relation to the present studies, and quite consistent with an autonomy perspective, we view intrinsic motivation as an important goal quality that should affect goal pursuit and general motivation. However, consistent with the cybernetic perspective, we believe that a certain amount of flexibility in intrinsic motivation is best for self-regulation as it allows people to pursue more concrete goals on a day to day basis, which are not likely to be highly intrinsic. And, importantly, we believe that it is this pursuit and achievement of smaller goals that aids in the fulfillment of broader goals that are likely to satisfy internal desires and needs for self-fulfillment. Indeed, the results of our two studies demonstrate that the literatures related to autonomy and cybernetic theory may be considered jointly when attempting to understand motivation and engagement with goals in daily life.

Toward a Cybernetic Perspective of Self-Regulation

For decades, cybernetic and control theory has been proposed as a way of conceptualizing self-regulation (Miller et al., 1960; Powers, 1981). Yet, there has been little to no work done that systematically tests how cybernetic processes may predict self-control and daily functioning. Rather, much of the work to date has focused on

reconceptualizing human motivation from a cybernetic perspective and much of this work has been theoretical (e.g., Carver & Scheier, 1998; van Egeren, 2009). We view the present work as important because we quantified an aspect of hierarchical control important to cybernetic theory but hitherto unmeasured.

One of the challenges related to researching cybernetic theory presumably lies in the lack of measurement tools that are sensitive to characterizing the degree to which individuals operate according to cybernetic principles (van Egeren, 2009). In this regard, the development of a measure that is sensitive to understanding the structural manner in which goals operate makes a significant contribution to this literature. We combined both qualitative (free response) and quantitative (ratings) methods of data collection to collect important information about people's goals. Notably, we found that this measure was reliable in characterizing scores of intrinsic motivation across goals for each level of the hierarchy, lending itself to the calculation of a difference score that can differentiate individuals based on the vertical nature of their goal structure. Additionally, on a normative level, the measure produced very consistent patterns across the two samples, further attesting to its sensitivity to cybernetic processes. Thus, we view this measure as important for future studies that seek to relate goal structures to important outcomes.

The results of the interactive tests are also important for validating the cybernetic perspective of self-regulation. Specifically, this theory asserts that a hierarchical arrangement of goals is most consequential for controlled action following a problematic event that might disrupt goal-directed behavior (Carver & Scheier, 1981, 1998). Indeed, our findings support this idea in two important ways. First, it was not the case that hierarchical arrangement of goals predicts motivation to quit or goal persistence in general,

as indicated by the lack of a significant main effect in both studies. Therefore, as emphasized by cybernetic theorists, goal hierarchies serve to buffer the negative outcomes that are typically associated with encountering obstacles and negative events (Carver & Scheier, 1996).

Along these lines, and specific to the second way in which our data support cybernetic theory, we found a significant interaction between daily negative events and intrinsic difference scores in both studies. We found that regardless of whether we were examining motivation to quit or goal persistence, individuals with a hierarchical goal structure were less affected by daily events which might interrupt goal-directed behavior. In other words, individuals with a hierarchical goal structure were able to more flexibly deal with daily obstacles and pursue their goals. Conversely, individuals without such a hierarchy were more influenced by these obstacles and, across both studies, reported feeling more motivated to give up and less likely to engage in behaviors that would help them to accomplish their goals. Thus, our findings present some of the first empirical support for the idea that hierarchical goal structures buffer the negative effects of daily obstacles and facilitate goal pursuit and self-regulatory action.

Additional Considerations

Our studies were able to demonstrate a general self-regulatory pattern of behavior for individuals with a hierarchical goal structure. The replication of this finding across two studies, using different outcomes measures and items related to daily events, along with the impressive replication of the follow-up analyses, speaks to the stability of this pattern of results. However, a number of considerations should be discussed in an effort to modify and improve future work along these lines. First, both studies involved college students,

who are generally of higher intelligence and arguably better at functioning in a challenging environment compared to their peers in the general population (Sears, 1986). In this regard then, repeating this work using a wider cross-section of the population would likely yield more variability in self-regulation and goal pursuit.

Additionally, while we believe our measure to be a valid and reliable way in which to characterize an individual's goal structure, this method of data collection restricts the number of goals that can be used to characterize a person's structure. In an effort to increase reliability without taxing the energy of the participants, we limited the goals listed and number of ratings made to thirty, and created the difference scores in relation to three levels (high, mid, low). However, it is likely that an individual's goal hierarchy is more complicated than what we could capture through self-report and involves many more levels, some of which likely function below conscious awareness (Powers, 1998). A measure which is capable of tapping into such goals and levels would provide a more powerful test of cybernetic theory and may predict even stronger self-regulatory effects.

Another consideration involves the measurement of self-regulation. In an effort to understand controlled, goal-directed behavior in daily life, we deemed it best to use a daily diary protocol which is capable of capturing the richness of behavior in response to unexpected events, as well as important individual differences that moderate the impact of such events (e.g., Bolger & Schilling, 1991; Nezlek, 2007). Indeed, this manner of data collection revealed the importance of hierarchical difference scores in predicting motivation and goal pursuit following frustration and negative feedback. However, some research has found that behavior in the short term and the long term may differ. For instance, expressive writing has been found to increase negative feelings in the short term

but decrease these emotions in the long term (Pennebaker & Chung, 2007). Thus, we view it as important to also understand how hierarchical goal structures may continue to predict controlled behavior as it relates to the pursuit of broader goals that take longer to achieve.

Future Directions

Future work should further our understanding of cybernetic processes as they relate to self-regulation and functioning. One way in which this could be done is by examining how goal structures may predict self-control in the laboratory. We found that hierarchical intrinsic motivation predicted self-regulation in daily life and it is our view that individuals with these goal structures are better able to control their behavior in a number of different ways. Along these lines, we view it as important to examine how goal structures may buffer the negative impact of both well-validated laboratory stressors (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998) and external pressures (e.g., Deci, 1971).

Another important extension of this work will be to understand how hierarchical goal structures may relate to more general well-being. Given that the hierarchical nature of one's goals is thought to facilitate self-regulation and buffer the effect of negative events, it should be the case that individuals with a hierarchical goal structure report many of the mental and physical benefits that come with self-regulation (for a discussion of these outcomes, see Baumeister et al., 1994). Along these lines, understanding how goal structures relate to affective stability (Larsen & Prizmic, 2004), as well as mental and physical health (Aspinwall & Taylor, 1997), seems a worthwhile endeavor. Beyond this, we also believe it is important to gather information about more general life outcomes which may be indicative of problematic self-regulation, such as criminal behavior (Hirschi, 2004) and frequency of problematic impulsive acts (e.g., Faber & Vohs, 2004).

In the present work, we focused on the importance of intrinsic motivation as it relates to goal hierarchies. However, the cybernetic perspective emphasized a number of different goal qualities that should follow a hierarchical arrangement, such as success likelihood, abstractness, approach motivation, and importance (Carver & Scheier, 1998; Powers, 1998; Miller et al., 1960). Additionally, cybernetic theorists have argued that cohesion of these goal qualities is also an important predictor of self-regulation. That is, the goals a person views as important should also be those ones that are intrinsically motivated and likely to be achieved (Carver & Scheier, 1996). Tests that investigate how these other dimensions, as well as within-subject correlations between the dimensions, would predicts similarly controlled behavior would provide an important test of cybernetic theory, as well as provide a more novel, idiographic approach to understanding goal pursuit (Sheldon & Elliot, 2000).

Finally, recent theoretical models have proposed that personality traits may be reconceptualized in the context of cybernetic theory. Along these lines, van Egeren (2009) has described how the Five-Factor Model (FFM; Costa & McCrae, 1992) may be understood in cybernetic terms and particularly, how individual differences in the FFM traits may relate to specific control processes. Additionally, the personality trait of action orientation (Kuhl, 1992) asserts that individuals differ in their tendency to take action following a stressful event versus ruminating on the event. This difference in action following stress is thought to closely relate to cybernetic processes (Austin & Vancouver, 1996). Consideration and integration of these multiple perspectives would further our understanding self-regulation and make great strides in developing a cohesive model of controlled behavior that has been called for by countless theorists in the personality and

social psychology literatures (Baumeister & Heatherton, 1996; Berkowitz, 1996; Block, 1996).

Conclusions

This project was motivated by the desire to consider the theoretical and empirical contributions of two literatures related to self-regulation. We considered the substantial research related to autonomy and predicted that pursuit of intrinsically motivated goals would be important for self-control. However, based on the theoretical arguments of cybernetic theory, we also felt it was the case that intrinsic motivation would only be predictive of self-regulation to the extent that the goals pursued are intrinsically motivated in a hierarchical manner. We hypothesized that individuals with goal structures that were hierarchically arranged would display adaptive functioning in response to obstacles in daily life. We found evidence for this pattern across two studies using daily reporting protocols that measured both motivational and goal-specific outcomes. These findings help to further our understanding of the impact of autonomy on goal pursuit, as well as validate some of the important ideas that make up the cybernetic view of self-regulation.

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APPENDIX A. GOAL QUESTIONNAIRE

Qualitative Responses

<u>Instructions</u>

In the following study, we are very interested in learning about the goals of college students. This type of research is very important for understanding a person's personality and behavior. Because this is such an important topic to researchers and students alike, we ask that you think carefully about all of your responses.

In this study, we're trying to learn more about you and your personality by asking you to list things you are currently trying to do. One way to describe someone's personality is to consider the purposes or goals that the person seems to be seeking in his or her everyday behavior. We are interested in the things that you typically or characteristically are trying to do. We might call these objectives "goals".

We do NOT want you to use trait adjectives to describe yourself, such as ambitious or honest. Rather, we want you do describe the things you are currently doing and goals you are currently working towards. Since you may have never thought of yourself in this way before, think carefully about what we are asking you to do before you type anything.

You might find it useful to think about your goals in different areas of your life: work and school, home and family, social relationships, and leisure/recreation. Think about all of your desires, goals, wants, and hopes in these different areas.

Please keep your attention focused on yourself. Do not mentally compare the things that you typically do with what other people do. Think of yourself and your purposes alone. Be as honest and as objective as possible.

Mid Level

1. What is one thing you are currently trying to do? **(Mid Level Goal 1)**
2. You said you are currently trying to **(Mid Level Goal 1)**. What is another thing you are currently trying to do? **(Mid Level Goal 2)**
3. You said you are currently trying to **(Mid Level Goal 1)** and **(Mid Level Goal 2)**. What is another thing you are currently trying to do? **(Mid Level Goal 3)**
4. You said you are currently trying to **(Mid Level Goal 1)**, **(Mid Level Goal 2)**, and **(Mid Level Goal 3)**. What is another thing you are currently trying to do? **(Mid Level Goal 4)**
5. You said you are currently trying to **(Mid Level Goal 1)**, **(Mid Level Goal 2)**, **(Mid Level Goal 3)**, and **(Mid Level Goal 4)**. What is another thing you are currently trying to do? **(Mid Level Goal 5)**
6. You said you are currently trying to **(Mid Level Goal 1)**, **(Mid Level Goal 2)**, **(Mid Level Goal 3)**, **(Mid Level Goal 4)**, and **(Mid Level Goal 5)**. What is another thing you are currently trying to do? **(Mid Level Goal 6)**

Low Level

7. You said you are currently trying to **(Mid Level Goal 1)**. How do you do this? **(Low Level Goal 1)**

8. You said you are currently trying to **(Mid Level Goal 1)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

9. You said you are currently trying to **(Mid Level Goal 1)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

10. You said you are currently trying to **(Mid Level Goal 2)**. How do you do this? **(Low Level Goal 1)**

11. You said you are currently trying to **(Mid Level Goal 2)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

12. You said you are currently trying to **(Mid Level Goal 2)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

13. You said you are currently trying to **(Mid Level Goal 3)**. How do you do this? **(Low Level Goal 1)**

14. You said you are currently trying to **(Mid Level Goal 3)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

15. You said you are currently trying to **(Mid Level Goal 3)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

16. You said you are currently trying to **(Mid Level Goal 4)**. How do you do this? **(Low Level Goal 1)**

17. You said you are currently trying to **(Mid Level Goal 4)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

18. You said you are currently trying to **(Mid Level Goal 4)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

19. You said you are currently trying to **(Mid Level Goal 5)**. How do you do this? **(Low Level Goal 1)**

20. You said you are currently trying to **(Mid Level Goal 5)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

21. You said you are currently trying to **(Mid Level Goal 5)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

22. You said you are currently trying to **(Mid Level Goal 6)**. How do you do this? **(Low Level Goal 1)**

23. You said you are currently trying to **(Mid Level Goal 6)**. One way you do this is **(Low Level Goal 1).** How else do you do this? **(Low Level Goal 2)**

24. You said you are currently trying to **(Mid Level Goal 6)**. Two ways you do this is **(Low Level Goal 1)** and **(Low Level Goal 2).** How else do you do this? **(Low Level Goal 3)**

High Level

25. You said you are currently trying to **(Mid Level Goal 1)**. Why do you do this? **(High-Level Goal 1)**

26. You said you are currently trying to **(Mid Level Goal 2)**. Why do you do this? **(High-Level Goal 2)**

27. You said you are currently trying to **(Mid Level Goal 3)**. Why do you do this? **(High-Level Goal 3)**

28. You said you are currently trying to **(Mid Level Goal 4)**. Why do you do this? **(High-Level Goal 4)**

29. You said you are currently trying to **(Mid Level Goal 5)**. Why do you do this? **(High-Level Goal 5)**

30. You said you are currently trying to **(Mid Level Goal 6)**. Why do you do this? **(High-Level Goal 6)**

<center>Quantitative Ratings</center>

<u>Instructions</u>

In the first part, you listed a number of your personal goals (things that you are currently trying to accomplish). In this part of the task, we want you to make a number of ratings about each goal on your list. We will present the goal that you listed and ask you to rate it on a number of different dimensions.

Intrinsic Motivation

> 1 = Should
> 2
> 3
> 4
> 5 = Want

<u>Instructions</u>

You may work toward certain goals because you feel you should or because you want to. For example, you may work towards a goal of "Going to church regularly" because you feel you should or ought to do it, regardless of whether you actually want to. Alternatively, you may work towards a goal of "Going to church regularly" because you simply like doing it, regardless of whether it leads to something else. You should use the scale provided to rate if you work towards each goal because you feel you SHOULD or you feel you WANT to.

31. You said you are currently trying to **(Mid Level Goal 1)**. How much do you work toward this goal **(Mid Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

32. You said you are currently trying to **(Mid Level Goal 2)**. How much do you work toward this goal **(Mid Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

33. You said you are currently trying to **(Mid Level Goal 3)**. How much do you work toward this goal **(Mid Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

34. You said you are currently trying to **(Mid Level Goal 4)**. How much do you work toward this goal **(Mid Level Goal 4)** because you feel you should do it or, alternatively, you feel you want to do it?

35. You said you are currently trying to **(Mid Level Goal 5)**. How much do you work toward this goal **(Mid Level Goal 5)** because you feel you should do it or, alternatively, you feel you want to do it?

36. You said you are currently trying to **(Mid Level Goal 6)**. How much do you work toward this goal **(Mid Level Goal 6)** because you feel you should do it or, alternatively, you feel you want to do it?

37. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 1)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

38. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 1)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

39. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 1)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

40. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 2)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

41. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 2)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

42. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 2)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

43. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 3)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

44. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 3)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

45. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 3)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

46. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 4)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

47. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 4)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

48. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 4)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

49. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 5)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

50. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 5)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

51. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 5)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

52. You said you are currently trying to **(Low Level Goal 1)** so that you can **(Mid Level Goal 6)**. How much do you work toward this goal **(Low Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

53. You said you are currently trying to **(Low Level Goal 2)** so that you can **(Mid Level Goal 6)**. How much do you work toward this goal **(Low Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

54. You said you are currently trying to **(Low Level Goal 3)** so that you can **(Mid Level Goal 6)**. How much do you work toward this goal **(Low Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

55. You said you are currently trying to **(Mid Level Goal 1)** so you can **(High Level Goal 1)**. How much do you work toward this goal **(High Level Goal 1)** because you feel you should do it or, alternatively, you feel you want to do it?

56. You said you are currently trying to **(Mid Level Goal 2)** so you can **(High Level Goal 2)**. How much do you work toward this goal **(High Level Goal 2)** because you feel you should do it or, alternatively, you feel you want to do it?

57. You said you are currently trying to **(Mid Level Goal 3)** so you can **(High Level Goal 3)**. How much do you work toward this goal **(High Level Goal 3)** because you feel you should do it or, alternatively, you feel you want to do it?

58. You said you are currently trying to **(Mid Level Goal 4)** so you can **(High Level Goal 4)**. How much do you work toward this goal **(High Level Goal 4)** because you feel you should do it or, alternatively, you feel you want to do it?

59. You said you are currently trying to **(Mid Level Goal 5)** so you can **(High Level Goal 5)**. How much do you work toward this goal **(High Level Goal 5)** because you feel you should do it or, alternatively, you feel you want to do it?

60. You said you are currently trying to **(Mid Level Goal 1)** so you can **(High Level Goal 6)**. How much do you work toward this goal **(High Level Goal 6)** because you feel you should do it or, alternatively, you feel you want to do it?