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by

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OPTIMISTIC, BUT NOT IN CONTROL: LIFE-ORIENTATION AND THE THEORY OF MIXED CONTROL

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Abstract

Why are some people more optimistic about their life than others? Literature on locus of control suggests that optimism is associated with the belief that one's life outcomes are controlled by internal factors, such as ability, instead of external factors, such as powerful others or chance. Furthermore, some authors suggest that internal control beliefs interact with self-efficacy beliefs regarding their effects on outcome expectancies and thus optimism. We argue that it is not only self-efficacy that interacts, but efficacy beliefs about external factors, too. We further hypothesize that the effect of perceiving internal rather than external control on dispositional optimism depends on the difference between efficacy beliefs regarding internal and external factors. Since people can influence other people to be helpful, i.e., take proxy control, but are unlikely to influence chance, we extend this internal-versus-external view and suggest that the difference between perceived control by others and perceived control by chance affect dispositional optimism. In fact, we hypothesize that the effect of perceiving that it is other people who are in control, rather than chance, depends on the difference between efficacy beliefs regarding others and chance. A first empirical survey-based test produces substantial support for our theory. This is the first time control-efficacy interaction effects are shown for dispositional variables and for the three-dimensional construct of locus of control. We replicate a gender effect on correlations of dispositional optimism with self-reported risk taking and observe a gender effect for one of our new hypotheses.

JEL-classification: D8, D83, D84

Keywords: Information, Knowledge, Uncertainty, Search, Learning, Information and Knowledge, Communication, Belief, Expectations, Speculations

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INTRODUCTION

Where does a person's general optimism come from? Why do some people expect that good things will happen, while others believe that bad things will happen? These questions have to do with dispositional optimism, which is investigated in various disciplines and has been shown to influence variables of interest to many researchers (Peterson, 2000). Dispositional optimism affects health and impacts physical well-being, perceived stress, and coping mechanisms (Scheier and Carver, 1985, 1987). Since dispositional optimism describes the expectations that good things will happen, it is an individual perception of odds. As such, it is closely related to the perception of risk and thus has triggered interest beyond the psychological research community, especially by economists dealing with economic decisions under risk and uncertainty (Felton et al., 2003; Puri and Robinson, 2007) and with entrepreneurial decision making, where entrepreneurs are considered to have positively biased perceptions of a venture's risk (Simon et al., 2000; Keh et al., 2002; Baron 2004; Baron and Ward, 2004). There is a great deal of extant work on the effects of dispositional optimism; however, considerably less has been done on its sources and antecedents. *Why* is it that one person will be more optimistic than another in a specific situation, or even about life in general?

Some researchers argue that a stable internal locus of control which generalizes across contexts, i.e., the perception that outcomes depend on one's own behavior or one's own characteristics, leads to dispositional optimism (Seligman, 1992). Following Rotter (1966), many researchers focus on this internal-versus-external argument (e.g., Abramson et al., 1978; Simon et al., 2000; Chen et al., 2004; Wijbenga and van Witteloostuijn, 2007). While empirical studies show a positive relationship between dispositional optimism and internal

locus of control (e.g., Seligman, 1992), it is also clear that it is not locus of control alone that drives optimism (Carver and Scheier, 1991). Consistent with this view, Bandura (1997) argues that the final judgment about the likelihood of an outcome is based on two types of expectancies: self-efficacy beliefs—that is, believing that one will be able to successfully implement all actions under one's control, i.e. perform well, necessary to achieve relevant outcomes, and control beliefs, which refer to the degree to which one believes that one's own high performance will be sufficient to cause a specific outcome. Control beliefs, thus, affect the extent to which self-efficacy beliefs shape outcome expectancies (Bandura, 1997). Such interaction effects are reported by Litt (1988) for actually realized performance, by Krueger and Dickson (1994) for opportunity recognition, by Schaubroeck and Merritt (1997) for stress, and by Schaubroeck et al. (2000) for anxiety, depression, and turnover intentions (the intention to quit and to find another employer). This interaction is also the basis of Gist and Mitchell's (1992) model of determinants of self-efficacy.

There is an interesting gap in these efficacy and control theories. If self-efficacy only matters for situations with internal control, what happens if external factors are in control? We argue that in such cases efficacy beliefs about external factors matter and that efficacy and control theories need to incorporate such external efficacy beliefs, which complement self-efficacy beliefs. In fact, the effect of more internal rather than external control depends on the difference between efficacy beliefs about internal and external factors. A change in control beliefs from an internal to an external locus of control will increase optimism if the efficacy belief about the external source of control is more positive than the self-efficacy belief. If the relation between the efficacy beliefs is inverted, then pessimism will be the results of believing more in external control.

Furthermore, based on the analysis of social activists, Levenson (1974) and Levenson and Miller (1976) argue that one needs to make a distinction regarding the external factors that can affect outcomes between those that are based in chance and those that are due to powerful others. This is a critical distinction as powerful others can be influenced by social action but chance cannot. Thus, people might be less pessimistic if their outcomes depend on powerful others instead of on chance because they might see an opportunity to regain internal control by taking proxy control (Bandura, 1997). The specific role of efficacy beliefs about powerful others is supported by Schaubroeck et al. (2000), who show that collective efficacy, which includes efficacy beliefs about other people, can have similar effects as self-efficacy with respect to health and turnover intentions. We therefore suggest extending control and efficacy theories by completely incorporating this three-dimensionality. We hypothesize that the effect of more control by others than by chance will depend on the difference between efficacy beliefs about others, on one hand, and efficacy beliefs about chance on the other.

Our extensions of control and efficacy theories lead us to what we call the *theory of mixed control*. This theory posits that people hold efficacy beliefs about the various drivers of outcomes, e.g., internal factors, powerful others, and chance, and that these efficacy beliefs interact with their control beliefs as to final outcome expectancies and thus dispositional optimism. In this paper we develop the theory of mixed control at a dispositional level to explain potential antecedents of dispositional optimism.

In the first part of this study, we outline the theory of mixed control and its application to dispositional optimism. In addition to replicating the internal-versus-external locus of control hypothesis and its extension to Levenson's three-dimensional approach, we derive two new hypotheses on the interaction between efficacy beliefs related to one's own performance, others, and chance, and control beliefs as to these same factors. In the second part of the

study, we report a first empirical test of the new theory. Based on a survey-based dataset of 414 undergraduate university students, we find substantial support for our theory. Furthermore, we observe a gender effect in the potential drivers of dispositional optimism. The third part of the study discusses the results and some limitations of our work, as well as suggests paths for future investigation.

MIXED CONTROL AND DISPOSITIONAL OPTIMISM

At the core of our theory are several types of expectancies and we therefore take a look at these first: performance expectancies, outcome expectancies, and expectancies regarding other events. Based on this discussion, we present an extended theory that closely links locus of control with dispositional optimism and expectancies regarding the various sources of control, following which we derive specific hypotheses.

Expectancies, optimism, and control beliefs

The term "expectancy" has different meanings in different contexts. The expectancy-value model of attitudes deals with the expectancy that an object is associated with specific attributes (Fishbein and Ajzen, 1975; Feather, 1982). Scheier and Carver (1987) discuss the expectancy that good things rather than bad things will happen. Rotter (1966) discusses the expectancy that a specific behavior will lead to a specific outcome. The most general interpretation of expectancy is that it is a belief about the likelihood that a certain event or a combination of events will occur. We need to differentiate between two types of expectancies: *unconditional expectancies* and *conditional expectancies*. When Scheier and Carver (1987) define optimism, they refer to the expectancy that a desirable event will occur—we call this as an unconditional expectancy. Unconditional expectancies are further distinguished with respect to whether they refer to the expectancy that a particular antecedent or source will be

helpful or useful in getting a positive outcome or whether they refer to the expectancy that a particular positive outcome will occur. Throughout this article, we label the former type of unconditional expectancies as *efficacy beliefs*, while we refer to the latter type as *outcome expectancies*. When Rotter (1966) defines locus of control, he refers to the expectancy that an event, desired or not, will occur given the occurrence of another event or specific behavior — we call this a conditional expectancy, i.e., there is believed to be a dependency between two events. In this paper, we focus on events that are linked by a causal dependency and we use the term *control belief* to mean a belief about the perceived causal relation between events. An event is considered to "control" another event if the occurrence of the first event affects the likelihood of the second event occurring.

A second distinction deals with the difference between *general expectancies* and *specific expectancies*. This distinction is not binary and has no absolute cut point; it is therefore most appropriate to refer to a more or less general or more or less specific expectancy. Generalized expectancies involve a wide class of related events, whereas specific expectancies encompass a smaller class of events or even a single event. The generalization can be done along different dimensions. For instance, Chen et al. (2001) generalize outcome expectancies and self-efficacy beliefs across different settings; when discussing social optimism, Schweizer and Koch (2001) generalize expectancies across different individuals and across settings by asking people whether society will improve and whether it is able to solve current problems. Spector (1988) measures control beliefs in the workplace and thus at a less general level than do Rotter (1966) or Levenson (1974), who include a person's entire life. Regarding control beliefs, Chen et al. (2004) distinguish between control beliefs and self-evaluation and control beliefs as a worldview, where the worldview represents a generalization beyond the individual to all people within an organization. In our study, we deal with generalized expectancies, conditional and unconditional, across contexts. In fact, we

generalize across all contexts of a person's life. We do not consider expectancies that generalize across people, thus focusing on personal expectancies (self-evaluations), i.e., generalized personal outcome expectancies, generalized personal control beliefs, and generalized personal beliefs regarding the efficacy of three sources of success—internal factors, powerful others, and chance.

Dispositional optimism

Dispositional optimism is a generalized expectation that good things will happen (Scheier and Carver, 1987). Dispositional optimism is the most general personal expectation regarding the occurrence of favorable events and it is a general unconditional expectation. It can be directly measured by the revised life-orientation test (Scheier et al., 1994). According to Peterson (2000), the items in this measurement instrument clearly reflect the definition of optimism. Among these items are: "In uncertain times, I usually expect the best" and the reverse-coded item, "If something can go wrong for me it will."

Locus of control and control beliefs

Locus of control describes generalized beliefs about the extent to which various factors affect the occurrence of an outcome. The original work on locus of control distinguishes between internal and external factors (Rotter, 1966). A person with an internal locus of control tends to believe that all relevant outcomes are more dependent on his or her own performance than on factors not under the person's control. Rotter (1966) measures this construct by asking people to agree or disagree with statements about internal or external sources of success and failure across various life situations. While Rotter (1966) focuses on expectancies about general causal relations, including future dependencies, Abramson et al. (1978) and Peterson et al. (1982) focus on past causal relations with their introduction of the construct "attributional style." To measure attributional style, a past event is described and

then the person is asked whether the cause of the event was due to internal or external factors, whether these factors are stable over time, and whether they generalize to other situations. One might expect that people maintain a somewhat consistent belief structure and that beliefs about causal relations of past events extend to future events. Schulman et al. (1989) and Peterson (1991) explicitly argue that dispositional optimism can be measured by attributional style, which represents a generalized locus of control. Those with a stable internal locus of control that carries over to different contexts are characterized as displaying dispositional optimism. Empirical work supports the hypothesis that an internal locus of control is associated with dispositional optimism (Seligman, 1992). Furthermore, Judge et al. (1998) find that an internal locus of control positively correlates with life satisfaction, a result consistent with Weinstein (1980) and many other researchers who associate an internal locus of control (focus on future) with optimism. This leads to our first hypothesis.

H1: The more people believe that internal factors rather than external factor control their life, the greater their dispositional optimism.

Originally, the construct of locus of control only distinguishes between internal and external factors that contribute to one's success. Levenson (1974) extends the concept by distinguishing between powerful others and chance as external factors. She argues that people will become socially active if they believe that powerful others control outcomes, but will not so engage if they believe that outcomes are purely dependent on luck. Levenson's social activists try to convince others to behave in a way desired by these activists. Bandura (1997)

describes such behavior as taking proxy control.[1] Generalizing the idea that internal control increases optimism, we hypothesize that perceiving control by powerful others (social control) decreases optimism less than perceiving control by luck (chance control). The potential to take proxy control can cause control by powerful others to appear less negative than chance control. Incorporating Levenson's distinction, Darke and Freedman (1997) report that dispositional optimism is roughly equally negatively correlated with perception of social control and perception of chance control. Their empirical findings admittedly do not support our hypothesis; however, given the strong theoretical rationale for our position, we do not abandon this idea and put forth the following as our second hypothesis.

H2: The more people believe that powerful others and social factors other than pure chance control their life, the greater their dispositional optimism.

Efficacy beliefs as factor-specific expectancies

Dispositional optimism is defined as generalized outcome expectancy across various contexts. The likelihood of the favored outcome occurring, however, will no doubt depend on various factors. Based on the above-discussed theories on locus of control, there are three fundamentally different factors that may, together or separately, influence an outcome: internal factors, powerful others, and chance. Beliefs regarding these factors should affect one's expectations about the outcome. For instance, a person might believe that he or she is able to take the action necessary to produce a good outcome, i.e., self-efficacy beliefs, that

[1] Skinner et al. (1988) develop a similar argument by stating that people hold beliefs about their access to means and beliefs about whether or not these means will support the occurrence of some outcome. Their agent-means-end beliefs describe what Bandura (1997) calls proxy control.

other people who have the power to help the person to succeed actually will help, i.e., other-efficacy, or that the person is just lucky when it comes to things outside his or her and others' control, i.e., chance-efficacy. If dispositional optimism is a generalized outcome expectancy, then there should be a positive correlation between such generalized efficacy beliefs and the generalized outcome expectancy. The following discussion focuses on generalized efficacy beliefs related to the three factors suggested by the locus of control literature: internal factors, powerful others, and chance.

General self-efficacy is an unconditional expectancy that one will be able to take the action necessary to improve one's life. Our conceptualization of generalized self-efficacy deviates slightly from Bandura's original idea of self-efficacy as a context-specific belief about the dependency between effort put into a task and the resulting behavior or performance (Bandura, 1997), and is more similar to the tack taken by various other researchers who investigate a more general construct of self-efficacy (Judge et al., 1998, 2002; Chen et al., 2001; Schweizer and Koch, 2001) and find that generalized self-efficacy can indeed contribute to understanding human behavior. For instance, Chen et al. (2001, 2004) show that generalized self-efficacy affects task performance. The difference between specific and generalized self-efficacy is discussed in the literature, but it is less clear whether generalized self-efficacy is a conditional expectancy depending on the effort expended on a task, as it was defined for specific self-efficacy by Bandura (1997). Looking at how general self-efficacy is measured by Judge et al. (1998) and Chen et al. (2001), for instance, reveals that general self-efficacy can indeed be treated as an unconditional expectancy regarding internal factors. Following this view, Schweizer and Koch (2001) consider general self-efficacy as a general optimism about internal factors. One would therefore expect that general self-efficacy is positively correlated with dispositional optimism and, in fact, this has been found the case

(Bryant and Cvengros, 2004; Karademas, 2006). General self-efficacy is also positively correlated with life-satisfaction (Judge et al., 1998). This leads us to our third hypothesis.

H3: The more strongly people believe that they can perform well, the greater is their dispositional optimism.

To our knowledge, Judge et al. (1997, 1998) were among the first to explicitly address beliefs about external sources of success, they call them "external core evaluations" as to complement "core self evaluations", which includes self-efficacy. They report that regarding their dependent variables, job and life satisfaction, these beliefs do not have a unique contribution beyond core self evaluations, which includes self-efficacy. They use, however, a measurement instrument created ad hoc that does not focus on personal evaluation of efficacy of external factors, but on expectations that generalize across people. Furthermore, their results are not unambiguous, the analysis does not distinguish between beliefs about the efficacy of other powerful people and beliefs about the efficacy of chance, and life satisfaction is not identical to dispositional optimism. We thus continue to consider external efficacy beliefs as highly relevant across many contexts. We will conceptualize them as self-evaluations and distinguish beliefs about efficacy of others from beliefs about the efficacy of chance...

Other-efficacy is an expectancy that those who have the power to either help or hinder one's own outcomes will actually help and not hinder. Other-efficacy reflects the construct of perceived social support, which is broadly defined as the availability of help in times of need from supervisors, coworkers, family members, and friends (Rahim, 1997). House (1981) reports that social support positively affects workers' physical and mental health. Kanner et al. (1978) report that social support reduces strain, including burnout. Doeglas et al.'s (1996) results support the fact that perceived social support affects human behavior and judgments.

Closely related to other-efficacy is collective-efficacy. Schaubroeck et al. (2000) define collective-efficacy as the confidence one holds in a work group to which one belongs.[2] When investigating sources of anxiety and depression, which are related to dispositional optimism, Schaubroeck et al. (2000) find that in collectivistic countries such as Hong Kong, where collective, rather than individual, values are more salient, self-efficacy matters less, but collective-efficacy, which is defined as the belief that a group of people will be able to perform well, matters more. Since collective-efficacy is comprised of both self-efficacy and other-efficacy and since it decreases depression and anxiety, one might speculate that other-efficacy will increase dispositional optimism. In fact, Karademas (2006) reports that perceived social support (other-efficacy) positively correlates with dispositional optimism.

Chance-efficacy describes people's beliefs about events outside their own and others' control, i.e., whether they believe in good luck. The empirical evidence on the link between such beliefs and dispositional optimism is not clear. In developing a psychometric scale for measuring belief in good luck, Darke and Freedman (1997) report that this scale has virtually no correlation with dispositional optimism but a significantly positive correlation with the belief that life is controlled by luck. Because Darke and Freedman (1997) establish that belief in good luck correlates positively with external control, and the literature on locus of control finds that external control correlates negatively with dispositional optimism, one would expect belief in good luck to correlate negatively with dispositional optimism. This is not the

[2] Note that Bandura (1997) and Fernández-Ballesteros et al. (2002) define collective-efficacy as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments," while Schaubroeck et al. (2000) consider beliefs on collective-efficacy to be individual beliefs. We adopt Schaubroeck et al.'s definition in this paper.

case in Darke and Freedman's (1997) study; rather, it is insignificant. In Maltby et al. (2008), the correlation is also insignificant, but has a negative sign. However, Day and Maltby (2003, 2005) find significantly positive correlations between belief in good luck and dispositional optimism (r = 0.399 and r = 0.28, respectively). We suspect that these heterogeneous results are due to the fact that Darke and Freedman's (1997) scale mixes control beliefs about luck, e.g., "Luck plays and important part in everyone's life," with expectancies as to events, e.g., "I consider myself to be a lucky person."[3] Regardless of problems with the belief in good luck scale, however, Day and Maltby's (2003) empirical study does suggest that optimism mediates the relation between belief in good luck and psychological well-being, which in turn suggests that belief in good luck is a positive driver of dispositional optimism.

We summarize our discussion in our fourth hypothesis.

H4: The more strongly people believe that others will support them, and that they have good luck (chance-efficacy), the greater is their dispositional optimism.

Moderation between control and efficacy beliefs

The two previous subsections briefly summarized the literature on control beliefs and efficacy beliefs. However, a careful reading of Bandura (1997) raises the possibility of an interaction between the effects of the two constructs on outcome expectancies:

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[3] By including items on external control beliefs, the scale contains elements hypothized to be negatively correlated with optimism, but by also including items on belief in good luck, the scale also contains items hypothized to be positively correlated with optimism. Depending on measurement errors and contextual influences, the scale might thus correlate positively with dispositional optimism, as in the case of Day and Maltby (2003, 2005), negatively, or might not correlate at all, as in the case of Darke and Freedman (1997).

> *Controllability affects the extent to which efficacy beliefs shape outcome expectancies. (Bandura, 1997: 23)*

There have been few tests of such interaction effects. Litt (1988) shows that self-efficacy and control interact with respect to a person's actual performance and incentive to take control. Schaubroeck and Merritt (1997) report that self-efficacy and control beliefs interact with respect to their effect on stress as measured by blood pressure. Krueger and Dickson (1994) report an interaction for opportunity recognition and Gist and Mitchell (1992) build their framework for determinants and malleability of self-efficacy on such interaction effects. However, these authors' focus on internal locus of control and self-efficacy as an expectancy about internal factors of success leaves open a crucial question: If efficacy beliefs about internal factors only matter when internal factors are perceived to control outcomes, what, then, drives outcome expectancies when internal factors are not in control? We suggest that efficacy beliefs about external factors of success are at least as important as self-efficacy beliefs. We expect that the effect of self-efficacy and of efficacy regarding external factors on outcome expectancies is moderated by the locus of control. The more internal control a person believes himself or herself to have, the more important is self-efficacy and the less important are efficacy beliefs about external factors such as powerful others and chance. We argue that the above-mentioned interaction hypothesis is incomplete and that control beliefs do not only interact with efficacy beliefs about internal factors, but instead interact with the difference in efficacy beliefs about internal and efficacy beliefs about external factors.

To illustrate, assume that a person is equally optimistic about internal and external factors. For this person, the final expectancy regarding an outcome should not depend on which factors, internal or external, have a larger impact on the final outcome because he or she is equally optimistic about both. If one believes more in the efficacy of external than in

internal factors (e.g., the person does not feel competent herself, but has a helpful partner), then believing in more control by external factors should increase outcome expectancy and thus make one more optimistic. However, if one is substantially more optimistic regarding internal factors, an internal locus of control should lead to more optimistic outcome expectancies. Our fifth hypothesis covers this idea and provides a generalized version of Bandura's (1997) interaction hypothesis.

H5: The effect of internal versus external locus of control on dispositional optimism will increase, i.e., become more positive or less negative, when the difference between a person's efficacy beliefs about internal versus external factors increases.

We also develop an equivalent hypothesis about the interaction between other- and chance-efficacy on the one hand, and other versus chance control beliefs on the other.

H6: The effect of social versus chance locus of control on dispositional optimism will increase, i.e. become more positive or less negative, when the difference between a person's efficacy beliefs about social and chance factors increases.

The focus of H1, H3, and H5 on the internality versus externality dimension makes our research compatible with literature that does not anticipate Levenson's three-dimensional conceptualization. However, H2, H4, and H6 divide the external factors into powerful others and chance, and thus provide insight into more complex settings where people might assume proxy control by making others help them achieve their objectives.

A mathematical foundation

To statistically test our hypotheses and link them to more formal theories, we develop a formal mathematical model that mirrors our verbal hypotheses. The foundation of our theory is that dispositional optimism (DO) is a weighted average of efficacy beliefs, i.e., self-efficacy (SE), other-efficacy (OE), and chance-efficacy (CE). The weights represent the

relative influence these factors have, i.e., the control beliefs regarding these factors—internal control (IC), other control (OC), and chance control (CC). Note that we assume that all control beliefs sum to 1, In other words, we assume that life is always fully controlled by one or more of these factors. This is consistent with Rotter's (1966) conceptualization that life is either controlled by external or by internal factors; however, we extend this idea by splitting the external factors into "powerful others" and "chance". An increase in the perceived control by one factor is therefore inevitably linked to a decrease in perceived control by other factors.

$$DO = SC \cdot SE + OC \cdot OE + CC \cdot CE \qquad \text{with} \quad SC + OC + CC = 1 \tag{1}$$

H1 to H6 are based on differences between efficacy beliefs. Interestingly, Equation (1) can be transformed into a form that almost perfectly reflects our hypotheses (see Equation (2)). For a complete proof, see the Appendix 1. Since the restriction that all weights sum to 1 is incorporated, we end up with five independent variables.

$$DO = GE + IEC \cdot IEE + OCC \cdot OCE \qquad \text{with} \qquad \begin{aligned} GE &= \frac{IE + \frac{OE + CE}{2}}{2} \\ IEE &= \frac{IE - \frac{OE + CE}{2}}{2} \\ OCE &= \frac{OE - CE}{2} \\ IEC &= IC - (OC + CC) \\ OCC &= OC - CC \end{aligned} \tag{2}$$

Dispositional optimism, DO, is based on the average of efficacy beliefs about internal factors (self-efficacy) and external factors, where this external efficacy is in turn the average of other-efficacy and chance-efficacy. This averaged efficacy belief is termed "generic efficacy" (GE). Furthermore, we see that the effect of a larger internal locus of control, i.e., a larger difference between weights attached to internal than to external factors (IEC), is moderated by the difference between internal and external efficacy beliefs (IEE). This reflects H5. A similar structure, using the variables OCE and OEE, is given for the effects of control and efficacy about others and chance control, reflecting H6.

Equation (2) is a rather narrow representation of our interaction theory. There very well may be other links between control beliefs and dispositional optimism and between efficacy beliefs and dispositional optimism. Given the large amount of support for the hypothesis that internal control leads to optimism, there might be a general tendency to be more optimistic if one perceives more control, independent of the efficacy beliefs regarding the factors under consideration. We therefore include main effects of control beliefs, IEC and OCC. These terms basically reflect H1 and H2. Furthermore, a person's control beliefs might not be the only drivers of how efficacy beliefs are weighted such that our interactions do not explain all differences in weighing these expectancies. We therefore include main effects of differences between these efficacy beliefs. Our final model is represented in Equation (3).

$$DO = GE + IEE + OCE + IEC + OCC + IEC \cdot IEE + OCC \cdot OCE \quad (3)$$

After estimating this model, coefficients for a generic average of efficacy beliefs and differences of these efficacy beliefs need to be interpreted. Finding that IEE is a significant driver, for example, indicates that self-efficacy and efficacy beliefs regarding external factors do not equally affect dispositional optimism. In some cases, it might be desirable to estimate the coefficients of all three types of efficacy beliefs directly, which can easily be done by transforming Equation (3) into Equation (4).

$$DO = IE + OE + CE + IEC + OCC + IEC \cdot IEE + OCC \cdot OCE \quad (4)$$

Equations (3) and (4) are equivalent from a mathematical perspective as well as from a regression perspective. Resulting regression coefficients can be transformed into each other, i.e., $\beta_{IE} = \beta_{GE}/2 + \beta_{IEE}/2$, $\beta_{OE} = \beta_{GE}/4 - \beta_{IEE}/4 + \beta_{OCE}/2$, and $\beta_{CE} = \beta_{GE}/4 - \beta_{IEE}/4 - \beta_{OCE}/2$. The advantage of Equation (3) is that it provides an effective way of integrating models with two and three dimensions of control. If one removes the terms OCE, OCC, and their interaction, the model is perfectly specified for a two-dimensional conceptualization of

control beliefs. If, however, one wants to have directly estimated coefficients for main effects of efficacy beliefs, then Equation (4) is appropriate.

EMPIRICAL TEST

We now proceed to empirically test our hypotheses by estimating the model represented by Equations (3) and (4) using data generated from a survey of students.

Participants and procedure

In April 2008, we distributed a questionnaire in three undergraduate lectures at a German university; one lecture was on biological psychology, one on economic and social history, and the third was on inheritance law.[4] The survey was completed during the first 15 to 20 minutes of the lectures and we randomly distributed three gifts, valued between 5 and 30 Euro, in each of the lectures. This procedure resulted in a total of 446 responses. Twenty-nine participants did not fill out the questionnaire completely and were removed from the sample because in this study most measures are based on very few items, i.e., short scales, and we did not want to expose ourselves to missing response bias. We excluded three more participants who had rather extreme scores on GE and IEE. Our final dataset consists of 414 students, 266 women and 148 men.

[4] The students attending these lectures were studying a variety of subjects, including law, teaching and education, economics, management, psychology, politics, philosophy, communication sciences, sociology, languages, German, geography, business mathematics, medicine, sports, chemistry, computer science, arts, and history.

Measurements

Dependent variable. We measured *dispositional optimism* (DO) with the revised life-orientation test (LOT-R) introduced by Scheier et al. (1994). We utilized a seven-point Likert scale ranging from "completely disagree" to "completely agree." In our data, Cronbach's alpha for LOT-R is sufficiently high ($\alpha = 0.79$) and the factor analysis shows a single factor. The largest eigenvalue is 2.27 and the second largest is 0.19.[5] For summary statistics, see Table 1.

Independent variables. *Control beliefs* were measured by Levenson's (1974) IPC scale using the German translation by Mielke (1979). We utilized a seven-point Likert scale ranging from "completely disagree" to "completely agree." The IPC scale provides absolute values for the perceived impact of internal factors, powerful others, and chance, but does not ensure that the sum of all subscales is constant. Therefore, it is possible that when comparing the control beliefs of two people, one of them might believe more in both internal and external control. However, as an increase in perceived internal control should lead to a decrease in perceived control by external factors (as conceptualized by Rotter (1966) and as we assume in our theory, too), we need to transform the responses to Levenson's IPC scale. To generate the response format needed for our theory, i.e., the relative importance of internal versus external and social versus chance, we make use of the fact that every item in Levenson's subscales has a counterpart in the other subscales, e.g., "I can pretty much determine what will happen in

[5] Other researchers find a two-dimensional structure of the life-orientation test. However, these can be artificial factors (Spector et al., 1997) or based on measurement errors affecting positively and negatively worded items differently (Rauch et al., 2007).

my life," "My life is chiefly controlled by powerful others," and "To a great extent my life is controlled by accidental happenings." For every triple item, we divide the response to one of the items by the sum of all three responses, resulting in relative values and providing measurements for IC_i, OC_i, and CC_i for each triple item, indexed by i. Based on these values we can determine the values for perceived internal versus external control (IEC; see Equation (2)) and powerful others versus chance control (OCC; see Equation (2)) for each triple item. A person's average values across all item sets then represent his or her score on internal control (IC), other control (OC), chance control (CC), internal versus external locus of control (IEC), and other versus chance locus of control (OCC). Note that if Levenson's IPC scale is used to measure the internal versus external locus of control, the responses are aggregated such that responses to the OC and CC items are reverse coded and all responses are added or averaged (see, e.g., et al., 1998). Except for the normalization, which ensures that the sum is 1, IEC is calculated equivalently.

Although we collected responses to all items on Levenson's IPC scale, after re-considering the results reported by Levenson (1974), and by Mielke (1979) for the German translation, we excluded four item sets (in every set there are three items related to each of the control dimensions), the ones having to do with car accidents, having many friends, and becoming a leader, as well as the set including the item "I have often found that what is going to happen will happen." Items from these sets appear weak in Levenson (1974); in fact, Levenson (1974), whose primary motivation is not a rigorous scale development, intentionally separates several items at the end of her table, indicating them to be week. Most of these items are included in the item sets we eliminated. Furthermore, when developing the German translation of the scale, Mielke (1979) removed or rearranged four items, i.e. associated some to another subscale than they were originally assigned to by Levenson. Every one the four sets we excluded includes one of the items considered to be very weak in

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Mielke's study. These items also appear weak in our data, making their elimination even more reasonable. Also, Chen et al. (1998) use only a subset of the items reported in Levenson (1974) and their item set is very similar to ours.

Efficacy beliefs are measured using a scale created by Diemo Urbig that measures three dimensions of efficacy; a revised version can be found in Urbig (2008). We utilized a seven-point Likert scale ranging from "completely disagree" to "completely agree." Urbig's scale builds on items selected from the New General Self-Efficacy (NGSE) scale developed by Chen et al. (2001), plus one new item. In developing the scale, Urbig (2008) took care to remove from the NGSE those items related to the achievement of goals instead of to expectancies related to abilities to perform actions. Achievement of goals might already encompass outcomes and outcome expectancies and therefore could be confounded with control beliefs and outcome expectancies. He also added one item that explicitly focuses on performance expectation.[6] For other- and chance-efficacy, Urbig (2008) develops two new sets of items. For other-efficacy, we considered using Suurmeijer's (1982) Social Support Questionnaire (reported in Doeglas et al., 1996); however, it is multidimensional and does not use a Likert scale, and we wanted to avoid changes in response mode. Chance-efficacy could be measured by Drake and Freedman's (1997) "belief in good luck scale," but, as mentioned previously, their scale mixes control beliefs and outcome expectancies regarding chance events. Since we want to clearly distinguish between optimism and control beliefs, we

[6] Urbig (2008) reports that replacing the new item with one of those items that only weakly relate to outcomes is almost equivalent regarding psychometric properties as the one he reports; our results are robust to this exchange.

therefore decided against using this instrument. When presenting the items measuring self-efficacy, other-efficacy, and chance-efficacy, in the questionnaire, they have been intermixed. For further explorative research we included additional items related to efficacy and optimism.

Appendix 2 contains a complete list of all items retained for further analysis. Table 1 provides an exploratory common factor analysis with oblique rotation of these items. It also includes the reliability coefficient, Cronbach's alpha. With one exception, all items load as expected, with factor loadings of more than 0.4. Only the control item set referring to protecting one's own interests (OCC3) is weak regarding the loading on the other versus chance control dimension, meaning that the reliability coefficient for this scale is very weak. The factor structures for all other factors are sufficiently good. Internal versus external control, self-efficacy, and other-efficacy have reliability coefficients above 0.7, while chance-efficacy just reaches 0.6, making these factors appropriate for explorative research. We also retain the other versus chance control factor, but note that this factor will need to be refined in subsequent studies. If we exclude the item with a weak loading, the coefficient increases to $\alpha = 0.57$. Since the results of this study remain robust, there is no need to adjust the measurements based on our data. Note that the three original eight-item factors taken from Levenson (1974) yield reliability coefficients of 0.57 for internality, 0.54 for chance, and 0.68 for powerful others. Similarly weak reliability coefficients are reported in the literature (e.g., Mielke, 1979).

Table 2 reports the summary statistics for all variables. Note that although people believe more in internal locus of control than in control by others or by chance, they on average believe that these others and chance have roughly the same impact on life. People are

most optimistic regarding their own abilities, followed by others' support, and least optimistic regarding chance and luck, where the average almost hits the center of the scale.

Control variables. As control variables we include a population dummy for the three lectures in which we distributed the survey (pop = 1 for biological psychology, pop = 2 for economic and social history, and pop = 3 for inheritance law). It has been found that age and gender affect risk aversion (see Dohmen et al., 2005), leading to the reasonable expectation that they might also affect the perception of risk and, thus, dispositional optimism. Urbig (2008) reports a positive correlation between self-reported risk taking and dispositional optimism. We therefore included these variables as control variables.

Control for gender effects. Scheier et al. (1994) and Felton et al. (2003) report that there is no difference between genders as to absolute level of dispositional optimism; however, Felton et al. report that there is a gender effect on the correlation between dispositional optimism and risk taking. For men, this correlation is significant; it is insignificant and has an inverse sign for women. Felton et al. (2003) discuss their finding extensively but come to no final conclusion as to whether it is a meaningful result. To test if such an effect is present in our study, we include a question for self-reported risk taking: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?"[7] This question was experimentally validated by Dohmen et al. (2005) and it has been shown to correlate with occupational choice and other risk-related measures (e.g., Bonin et

[7] How do you see yourself: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means: 'unwilling to take risks' and the value 10 means: 'fully prepared to take risk'."

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al., 2007, in press). In our data, we do indeed find that the correlation of self-reported risk taking with dispositional optimism is highly significant for men ($r = .35$, $p < 0.0001$), but insignificant for women ($r = .12$, $p > 0.05$). Furthermore, in a six-country study, Reitz and Jewell (1979) find differences between women and men with respect to the correlation of control beliefs and job involvement, such that for women the correlation was insignificant in five out of six countries. Similarly, Riipinen (1994) finds gender differences regarding the correlation of control beliefs. Therefore, we need to control not only for unlikely main effects of gender on dispositional optimism but also, and more importantly, we need to test for gender effects on slope and potential interactions with other independent variables.

Results

Table 2 reports the correlations between dependent and independent variables[8] and contains nothing very surprising—all correlations are reasonable. For the correlation between internal versus external locus of control (IEC) and dispositional optimism (DO) we find $r_{IECxDO} = 0.30$, which is typical; Carver and Scheier (1991) report values in the upper 20s. This correlation is based on a positive correlation of internal control ($r_{ICxDO} = 0.30$) and negative correlation of external sources of control ($r_{OCxDO} = -0.12$, $r_{CCxDO} = -0.26$). Chance-efficacy is more correlated with dispositional optimism than is self-efficacy, which is again more strongly correlated than other-efficacy. Locus of control along the internal versus external dimension is also strongly significantly correlated with self-efficacy ($r_{IECxSE} = .40$), but not with chance- and other-efficacy. Chance- and other-efficacy are significantly

[8] Note that IC, OC, and CC represent control beliefs based on the selected four item sets and are already normalized such that the sum of these variables is always 1.

negatively correlated with internal control beliefs; chance-efficacy is also negatively correlated with control by powerful others. Efficacy beliefs (SE, OE, and CE) are significantly positively correlated with each other, with correlation coefficients of 0.15 to 0.23.

To test our hypotheses, we run regression analyses based on the standardized variables IEC, OCC, SE, OE, and CE (see Tables 3 and 4). Note that standardization was done prior to calculating GE, SEE, and OCE, allowing easy comparison of the regression coefficients according to Equation (3) (Table 3) and Equation (4) (Table 4). There is virtually no problem with multicollinearity, i.e., variance inflation factors for all models and all variables are below 1.5. Model I with control variables only, Model IIa with control beliefs, Model IIb with factor-specific efficacy beliefs, and Model III combining main effects of control beliefs and efficacy beliefs are the benchmarks. Model III provides significant support for H1 and H2, i.e., an increase in internal control increases dispositional optimism as does an increase in other control compared to chance control (but to a smaller extent than internal versus external control). We find also significant support for H3 and H4, i.e., self-, other-, and chance-efficacy positively contribute to dispositional optimism. Table 3 also shows that self-efficacy contributes less than external efficacy (average or other- and chance-efficacy) and that other-efficacy contributes less than chance-efficacy. We observe that control beliefs explain far less than efficacy beliefs, but that the combined model explains more than any single model. Furthermore, we observe that while the model with efficacy beliefs explains a huge amount of variance in dispositional optimism, there is also a highly significant amount of heteroscedasticity involved. This might indicate a mis-specification; according to Downs and Rocke (1979), such a finding can indicate interaction effects. We will see that, indeed, including terms representing our hypotheses on interactions reduces heteroscedasticity such that for the full model the assumption of homoscedasticity can no longer be rejected.

Model IV is the full model with no controls for gender effects. H5 and H6 state that the influence of a change in perceived control of one factor compared to another factor is moderated by the difference between the corresponding efficacy beliefs. We find that H6, which is related to powerful others versus chance, is fully supported because the interaction between others versus chance control (OCC) and others versus chance efficacy (OCE) is significant. The interaction between internal versus external control (IEC) and internal versus external efficacy (IEE) is not significant; as such, H3 is not supported. When comparing Model IV with Model III, we observe that adding the interactions significantly increases the amount of variance explained and the significance level of the test for heteroscedasticity decreases sharply, but heteroscedasticity does not completely disappear.

Since we previously wondered whether gender might moderate the correlation of dispositional optimism with other variables we now test for such effects. Model V allows for gender effects on the main effects of all variables, while Model VI includes gender effects at the level of interactions. We observe that the effect of the interaction between IEC and IEE depends on gender, whereas no other effect does. Inspection of the interaction diagrams (see Figure 1) and separate regressions for women and men (results reported in Table 4) reveals that H5 is supported for males but not for females. In the interaction plots (see Figure 1), we see that the effect of less control by a factor and more control by another factor, e.g., less internal and more external control or less social and more chance control, decreases dispositional optimism less if the difference between the factor-specific expectancies is less positive or more negative. Including the interaction with gender creates a model that no longer suffers from heteroscedasticity; thus, the heteroscedasticity of Models IIb and III, which included no interaction, does indeed seem to indicate a mis-specification related to interaction effects, as suggested by Downs and Rocke (1979). While the gender differences are not significant except for the interaction, it is nevertheless interesting that for men self-efficacy is

less relevant for disposition optimism than it is for women. From gender-specific regressions we can see that for men self-efficacy has no independent effect on dispositional optimism.

We run two robustness checks: a regression with robust errors (Table 3) because there might be problems with heteroscedasticity despite tests for same finding it to be insignificant, and a robust regression (Table 3) if some distributional assumptions are not satisfied, e.g., there is still a small tendency for slightly skewed residuals (Berk, 1990). However, regression results from Model VI remain quite stable.

DISCUSSION

We started our study by extending Bandura's (1997) insight into the possibility of an interaction effect between internal locus of control and self-efficacy on outcome expectations by considering multiple dimensions of control. We furthermore argued that the effect of more internal than external control on outcome expectations and especially on dispositional optimism depends not only of the level of self-efficacy (as motivated by Bandura, 1997), but on the difference between levels of efficacy beliefs about internal and external efficacy As a consequence the effect is positive if efficacy beliefs about internal factors are substantially larger than about external factors and negative if they are substantially smaller. Following Levenson (1974), we suggested that differentiating external factors between those having to do with powerful others, i.e., the relevant social environment, and those involving chance is important in explaining dispositional optimism. In particular, we hypothesized that the effect of more control by social factors than by chance on dispositional optimism is moderated by the difference between efficacy about powerful others, the social environment, and efficacy beliefs about chance optimism.

The empirical part of the study produced substantial evidence in support of our theory of mixed control. We used Levenson's (1974) IPC scale as our measurement instrument, after removing several items confirmed to be weak in the literature (Mielke, 1979; Chen et al., 1998). The factor-specific efficacy beliefs were measured by way of short scales that have not been widely tested; however, their reliability coefficients were promising enough to give us confidence that using them would be appropriate for this exploratory study. Nonetheless, we do encourage the further development of instruments for measuring control beliefs and factor-specific efficacy beliefs. Below, we discuss our results and the limitations of our study in more detail.

Hierarchy of controlled factors

The literature suggests that more internal control leads to more optimism. Our results are in concurrence. Bandura (1997) argues that people might assume proxy control by trying to influence the behavior of powerful others (external factor). We might thus expect that a stronger belief that life is more controlled by others than by chance will lead to more optimism or, at least, less pessimism, and this idea found support in our empirical analysis, in both the regression results and the correlations. We can thus establish a hierarchy of factors: internal control has a large positive impact on dispositional optimism, control by others has an intermediate impact, and control by chance has a negative impact. Our analysis thus provides substantial support for conceptualizing locus of control three-dimensionally (Levenson, 1974). Despite these findings, however, we are also in agreement with Carver and Scheier's (1991) opinion that, in general, control beliefs explain only a small part of the variation in dispositional optimism. The correlation of internal versus external locus of control (IEC) with dispositional optimism of .30 is close to values in the upper 20s that these authors report. The small explanatory power of the locus of control variables in the regression analysis controlling

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for age, gender, and specific populations adds further weight to this opinion (Model IIa with $R^2 = 0.1015$).

Efficacy beliefs

Pooling across gender, we cannot reject the hypothesis that efficacy beliefs are positively correlated with dispositional optimism. In fact, chance-efficacy, which can be considered as belief in good luck, correlates most with dispositional optimism. This finding contradicts the results of Darke and Freedman (1997), Day and Maltby (2003, 2005), and Maltby et al. (2008), who find weak or no correlation of belief in good luck with dispositional optimism. We have already mentioned that this discrepancy could be the result of a measurement instrument confounded by control beliefs. Regarding the positive correlation of self-efficacy and other-efficacy with optimism, our results are consistent with those reported by Karademas (2006). In sum, our results indicate that dispositional optimism measured by Scheier et al.'s (1994) life-orientation test is more related to external efficacy beliefs than to self-efficacy.

If we define collective-efficacy as the confidence one holds in a work group to which one belongs (as does Schaubroeck et al., 2000), it might be possible to derive a person's collective-efficacy based on a weighted average of self-efficacy and other-efficacy. The larger the internal control is compared to control by powerful others, the larger the weight for self-efficacy should be. Whether collective-efficacy can indeed be explained by such models remains to be answered by future research.

Interaction between locus of control and factor-specific expectancies

Investigating interaction effects between control and efficacy beliefs requires that there is actually a difference between the two, something that is not without controversy. For example, Judge et al. (1997) suggest that self-efficacy and an internal locus of control are just

different facets of the same core construct. However, the factor analysis reported in Table 1 indicates that locus of control and efficacy beliefs can be distinguished, a finding that has even more impact when one considers that we did not intentionally select items with this purpose in mind.

Our main hypotheses state that regarding the effect on dispositional optimism, the loci of control along the two dimensions considered in this paper interact with differences in efficacy beliefs. These hypotheses are largely supported and, in fact, there is unambiguous support for the hypothesis involving social versus chance control. The internal versus external dimension is complicated by a gender effect: for men, our hypotheses hold true, for women, there is no significant effect. The interaction effects that our theory predicts significantly contribute to explaining the variance of dispositional optimism among our sample; the explained variance between models with and without these interaction effects is significantly different.

Interaction effects similar to those investigated here have been reported for stress (Schaubroeck and Merritt, 1997; Schaubroeck et al., 2000) and for actually realized performance outcomes (Litt, 1988). This study goes beyond previous work and makes three contributions to this literature. First, the interaction effect is replicated even when the difference between self-efficacy and efficacy regarding external factors is considered instead of self-efficacy alone. Second, the interaction effect has been shown for generalized outcome expectations; neither outcome expectancies nor generalized expectancies are considered in the extant literature. Third, the interaction effect has been shown for the three-dimensional locus of control—internal, powerful others, and chance—also novel to the field. Our results provide additional support for the importance of considering interaction and moderation effects between control and efficacy beliefs.

Gender effect

The gender effect revealed by our empirical study deserves some special attention. This gender effect was not a complete surprise to us as, based on empirical findings reported in the literature, we suspected such might be the case, especially when measuring dispositional optimism by means of the life-orientation test (see the longer discussion in Felton et al., 2003). Felton et al. (2003) study the correlation between optimism and risk-taking behavior, whereas we investigate drivers of optimism. Nevertheless, we wanted to test more directly whether a gender effect might be at work in our data. To this end, we included a question on self-reported risk-taking in our survey. We do, indeed, find a gender effect in the correlation between optimism and self-reported risk taking, a result that adds empirical strength the findings of Felton et al. (2003). However, the causes of this gender effect are not clear. Felton et al. suggest "that what it means to be optimistic may be different for men and women," a phenomenon that, if true, could be caused by gender differences at the construct level. We thus strongly encourage that dispositional optimism and, especially, the life-orientation test be studied at this level as has already been done successfully for other variables (see Anderson et al., 2006). Second, quasi-replication of Felton et al.'s result is a sufficient reason to test and control for gender difference in correlations between optimism and other variables. Indeed, we find a gender effect on one of our main hypotheses. We cannot yet explain that effect, but this consistent gender-effect pattern across different studies suggests taking a closer look at the life-orientation test and measurements of related variables to discover whether the items used to measure the construct are subject to gender-specific interpretations and understandings. We therefore suggest a construct-driven perspective in analyzing dispositional optimism, following the lead of Anderson et al. (2006), who used this approach in studying leadership styles.

To summarize the gender effect we found, men are more optimistic about internal factors than are women ($p < 0.005$, Welch's t-test with unequal variances, two-sided) but that women are more optimistic about social factors ($p < 0.05$, two-sided). There are no other gender differences in the absolute level of measurements. If we group-wise standardize our variables, all results regarding the significance of variables and their interactions remain stable.

General versus specific beliefs

In this study, we applied the theory of mixed control in an effort to understand the drivers of dispositional optimism, defined as generalized outcome expectancy. However, we want to emphasize that the theory of mixed control could just as well be employed to understand the drivers of more specific expectancies. For instance, the expectation that a specific business opportunity will result in profit might depend on the person's abilities, on the help expected from others, or on pure chance. Expectations as to these factors, and the perceived control these factors have on the final outcome, are very likely to influence, and influence strongly, the ultimate expectation of success.

CONCLUSION

This study was inspired by the lack of integrated theories on control and efficacy beliefs. Previous studies do not consider the role of beliefs of efficacy regarding external factors. We extend previous studies on the interaction effects between self-efficacy and internal locus of control by arguing that control beliefs moderate the effect of the difference of self-efficacy and control beliefs. Furthermore, we extend the hypothesis on the interaction effect from two dimensions, internal and external, into three dimensions, internal, powerful others, and chance and provide empirical support for the link between general control beliefs,

general efficacy beliefs (including general self-efficacy), and dispositional optimism as a general outcome expectancy. This study is the first to show that the efficacy-control interaction holds for general beliefs, not just context-specific beliefs, as has been demonstrated by previous research. This is an important discovery with consequences for future work. Studies undertaken on the link between control beliefs and self-efficacy, on one hand, and outcome expectancies and decisions influenced by outcome expectancies, on the other, need to include the interaction term in the analysis.

Our study is a step toward understanding the sources of dispositional optimism. We employed a simple mathematical form where the efficacy beliefs regarding drivers of optimism are weighted with the perceived importance of these drivers. Based on this mathematical form, it can be shown that the effect of a larger internal locus of control depends on the difference between beliefs about the efficacy of internal and beliefs about the efficacy of external factors. For example, if a person believes in that others will be supportive and in luck, but has no faith in her own competence, then strongly believing that self-efficacy (internal locus of control) is crucial to success will have the effect of making this particular person *less* optimistic. This effect is graphically illustrated in Figure 1, where one can see that if men have a stronger belief in the efficacy of external factors, then a weakening of their internal control beliefs will lead to greater dispositional optimism. Therefore, unambiguous statements to the effect that a strong internal locus of control leads to optimism should be viewed with some (dare we say it?) pessimism. In closing, consider the following passage from Jules Verne's (1911) story, "A Floating City."

> *"My dear sir," said the captain, "it is not the duel in itself which I fear for Fabian. … but it is the result of this engagement which is to be dreaded."*
>
> …
>
> *"Certainly," replied the captain, "but one cannot help feeling distressed to think that even at the risk of my own life I could not have spared Fabian this."* …

> *"Do you know any means of preventing the duel?"*
>
> *"None at present; at the same time, if the meeting must take place, it seems to me that it can only do so in America, and before we get there, chance, which has brought about this state of things, will, perhaps, turn the scales in our favor."*
>
> *Captain Corsican shook his head like a man who had no faith in the efficacy of chance in human affairs.*

This is the entire theory of mixed control in a nutshell. Captain Corsican, by putting himself in Fabian's shoes, believes in the self-efficacy of Fabian to survive the duel. However, the outcome which does not seem to be restricted to survival, does not depend on Fabian's ability alone, to survive the duel, but on certain external factors, which are beyond the captain's (and by extension, Fabian's) control. Other people cannot help (no one else can fight Fabian's duel and can take his life with the duel's consequences, whatever they are), nor does the captain believe that Lady Luck will smile. Combining his beliefs about what controls the outcome of Fabian's duel with his beliefs about the efficacy of those factors makes the captain pessimistic for Fabian, even though he has confidence in Fabian's fighting skill. In light of this example, perhaps the paper would have been more appropriately titled "Pessimistic, But in Control."

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TABLE 1

Rotated solution for factor analysis for control and efficacy variables

		Factor 1 SE	Factor 2 IEC	Factor 3 OE	Factor 4 CE	Factor 5 OCC
Internal versus external control beliefs						
Protecting own interests	(IEC3)	0.1039	**0.6021**	0.0571	0.1052	0.0308
Who influences own life?	(IEC5)	-0.0306	**0.6967**	0.006	-0.0133	-0.0017
Planning	(IEC6)	0.1785	**0.4385**	-0.0066	-0.0558	0.0512
Get what one wants	(IEC7)	0.0771	**0.5126**	-0.0177	-0.1607	-0.161
Social versus chance control beliefs						
Protecting own interests	(OCC3)	-0.1601	-0.0051	0.0158	0.1952	0.185
Who influences own life?	(OCC5)	-0.122	0.0176	0.0797	0.0432	**0.4947**
Planning	(OCC6)	0.0411	-0.0756	0.0188	-0.0311	**0.6291**
Get what one wants	(OCC7)	0.2128	0.1176	-0.0462	-0.0927	**0.4093**
Self-efficacy						
	SE1	**0.4152**	0.1818	-0.0536	0.2253	0.1351
	SE4	**0.5603**	0.0422	0.0018	-0.0046	0.0705
	SE2	**0.7339**	-0.0321	0.0421	-0.0257	-0.025
	SE3	**0.7003**	0.071	-0.0204	0.0051	-0.0063
Other-efficacy						
	OE1	0.0253	0.0683	**0.648**	0.0951	-0.0294
	OE2	-0.036	-0.0773	**0.6689**	-0.119	0.0608
	OE3	0.0485	0.014	**0.6033**	0.0156	0.0029
	OE4	-0.0219	0.036	**0.6539**	0.0186	0.0009
Chance-efficacy						
	CE2	-0.1164	0.0263	-0.0865	**0.5583**	0.0419
	CE4	0.1417	-0.2436	0.0471	**0.469**	-0.0799
	CE3	-0.0371	0.2011	0.1464	**0.4665**	-0.0521
	CE1	0.2001	-0.1098	0.14	**0.4668**	-0.1165
eigenvalues		2.3679	2.0281	1.9525	1.4791	0.9796
Cronbach's α for sum scores		0.7457	0.7029	0.7512	0.6115	0.4690

Common factor analysis with oblique oblimin rotation, N = 417.

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TABLE 2

Correlations and summary statistics

	DO	SE	CE	OE	IC	CC	OC	IEC	OCC
Mean	4.49	5.02	4.02	4.64	.442	.279	.279	-.115	-.000
Std.	1.01	.76	1.00	1.02	.076	.060	.060	.153	.092
Min	1	2.25	1.00	1.50	.227	.093	.089	-.547	-.304
Max	6.83	7.00	7.00	7.00	.732	.468	.448	.464	.243
SE	.41***								
CE	.57***	.23***							
OE	.38***	.15***	.23***						
IC	.30***	.40***	.01	.08					
CC	-.26***	-.31***	.05	-.11*	-.64***				
OC	-.12*	-.19***	-.06	.00	-.64***	-.18***			
IEC	.30***	.40***	.01	.08	1)	1)	1)		
OCC	.09	.08	-.07	.07	1)	1)	1)	.00	

N = 414, significance levels: * p < 0.05, ** p < .01, *** p < 0.005.
1) Entry omitted because the two corresponding constructs are mathematically derived from each other.

TABLE 3

Regression of efficacy and control on life-orientation

Dispositional optimism	**I**	**II a**	**II b**	**III**	**IV**	**V**	**VI**	**VII** robust errors	**VIII** robust regr.
Constant	-.014 (.082)	.013 (.078)	-.030 (.060)	-.001 (.058)	-.014 (.059)	.000 (.059)	-.005 (.059)	-.005 (.058)	.016 (.060)
Control variables									
Gender difference (Gen)	.013 (.056)	.022 (.053)	.002 (.042)	.026 (.040)	.021 (.040)	.027 (.040)	.001 (.042)	.001 (.041)	-.003 (.043)
Age	-.025 (.050)	-.038 (.048)	-.046 (.037)	-.046 (.036)	-.047 (.036)	-.045 (.036)	-.038 (.036)	-.038 (.031)	-.041 (.037)
Population dummy (2)	.030 (.123)	.001 (.117)	-.011 (.091)	-.040 (.088)	-.061 (.087)	-.064 (.087)	-.068 (.087)	-.068 (.088)	-.080 (.089)
Population dummy (3)	.035 (.130)	-.030 (.124)	.135 (.096)	.075 (.093)	.054 (.092)	.040 (.092)	.035 (.092)	.035 (.093)	.028 (.094)
Model variables									
Internal vs. external control (IEC)		.306 (.047)***		.209 (.039)***	.199 (.039)***	.204 (.039)***	.182 (.040)***	.182 (.040)***	.193 (.041)***
Social vs. chance control (OCC)		.085 (.047)$^{+}$		.093 (.036)*	.093 (.035)**	.107 (.038)**	.110 (.038)***	.110 (.039)***	.123 (.039)***
Generic efficacy (GE)			.966 (.053)***	.883 (.053)***	.888 (.053)***	.879 (.055)***	.880 (.055)***	.880 (.055)***	.903 (.056)***
Internal vs. external efficacy (SEE)			-.410 (.069)***	-.526 (.069)***	-.521 (.069)***	-.534 (.070)***	-.549 (.070)***	-.549 (.076)***	-.535 (.071)***
Social vs. chance efficacy (OCE)			-.218 (.059)***	-.264 (.058)***	-.209 (.060)***	-.193 (.062)***	-.193 (.062)***	-.193 (.067)***	-.221 (.063)***
IEC x SEE					.092 (.063)	.111 (.066)$^{+}$	.110 (.066)$^{+}$	.110 (.075)	.054 (.067)
OCC x OCE					.119 (.045)**	.137 (.046)***	.144 (.046)***	.144 (.052)**	.150 (.047)***
Gender effects									
Gen x IEC						.006 (.040)	-.005 (.040)	-.005 (.041)	.013 (.041)
Gen x OCC						.055 (.038)	.054 (.038)	.054 (.040)	.052 (.039)
Gen x GE						-.043 (.055)	-.030 (.055)	-.030 (.055)	-.013 (.056)
Gen x SEE						-.091 (.070)	-.104 (.070)	-.104 (.076)	-.076 (.071)
Gen x OCE						.046 (.059)	-.059 (.062)	-.059 (.067)	.016 (.063)
Gen x IEC x SEE							.149 (.066)*	.149 (.075)*	.149 (.067)*
Gen x OCC x OCE							-.011 (.046)	-.011 (.052)	-.026 (.047)
N	414	414	414	414	414	414	414	414	414
R^2	.0012	.1015	.4628	.5051	.5171	.5242	.5303	.5303	-
ΔR^2	-	.1003***	.4616***	.0424***	.0120**	.0070	0.0061^{+}	-	-
IM - test: χ^2/df	18.61 / 15	36.98 / 30	76.20 / 39***	97.16 / 60***	118.43 / 83 **	163.67 / 126 *	152.48 / 137	152.48 / 137	-
- Heteroskedasticity	6.35 / 10	22.10 / 23	56.41 / 31***	81.56 / 50 ***	99.13 / 71*	134.46 / 109 *	127.61 / 118	127.61 / 118	-
- Skewness	11.85 / 4	14.67 / 6*	15.29 / 7*	13.60 / 8	17.78 / 11 $^{+}$	28.80 / 16 *	24.47 / 18	24.47 / 18	-
- Kurtosis	.40 / 1	.21 / 1	1.44 / 1	2.00 / 1	1.53 / 1	.58 / 1	.40 / 1	.40 / 1	-
F	.12	7.66	49.96	45.82	39.14	27.33	24.78	28.52	24.95
LogLik	-586.69	-564.79	-458.32	-441.32	-436.24	-433.20	-430. 52	-430.52	-
AIC	1183.39	1143.57	932.65	902.63	896.49	900.40	899.03	899.03	-

Significance levels: + p < 0.10, * p < 0.05, ** p < .01, *** p < 0.005, values in parentheses are standard errors.
Variables IEC, SCC, SE, OE, and CE are standardized. GE, IEO, OCE are calculated based on these standardized values.

TABLE 4

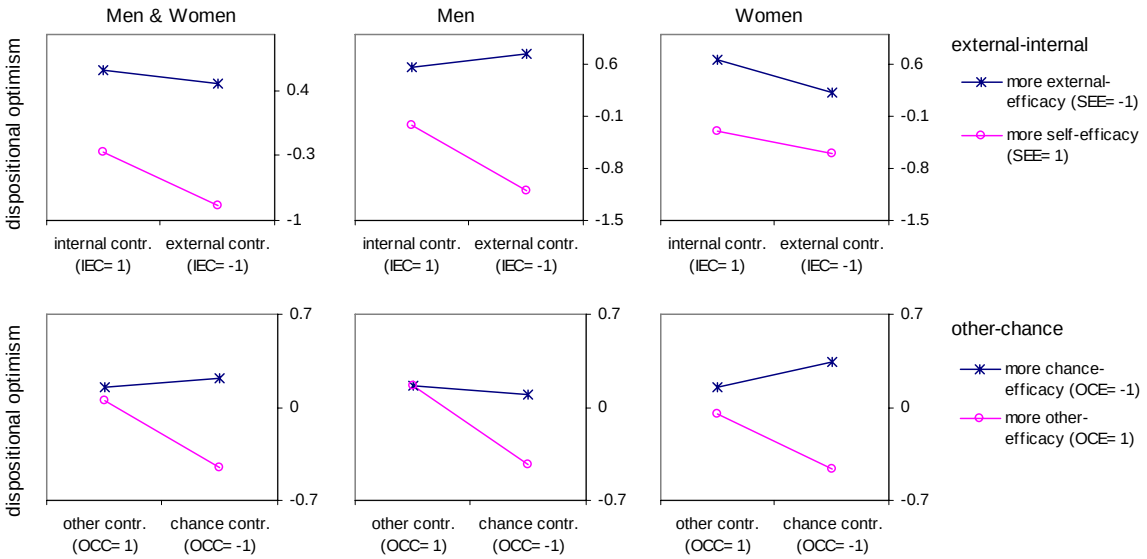
Regression of efficacy and control on life-orientation

Dispositional optimism	I	II a	II b	III	IV	V	VI	Women	Men
Constant	-.014 (.082)	.013 (.078)	-.030 (.060)	-.001 (.058)	-.014 (.059)	.000 (.059)	-.005 (.059)	-.016 (.059)	-.009 (.123)
Control variables									
Gender difference (Gen)	.013 (.056)	.022 (.053)	.002 (.042)	.026 (.040)	.021 (.040)	.027 (.040)	.001 (.042)		
Age	-.025 (.050)	-.038 (.048)	-.046 (.037)	-.046 (.036)	-.047 (.036)	-.045 (.036)	-.038 (.036)	-.105 (.047)*	.062 (.055)
Population dummy (2)	.030 (.123)	.001 (.117)	-.011 (.091)	-.040 (.088)	-.061 (.087)	-.064 (.087)	-.068 (.087)	-.010 (.110)	-.119 (.150)
Population dummy (3)	.035 (.130)	-.030 (.124)	.135 (.096)	.075 (.093)	.054 (.092)	.040 (.092)	.035 (.092)	-.013 (.119)	.064 (.154)
Model variables									
Internal vs. external control (IEC)		.306 (.047)***		.209 (.039)***	.199 (.039)***	.204 (.039)***	.182 (.040)***	.196 (.054)***	.172 (.058)***
Social vs. chance control (OCC)		.085 (.047)$^{+}$		.093 (.036)*	.093 (.035)**	.107 (.038)**	.110 (.038)***	.047 (.045)	.171 (.060)**
Self-efficacy (SE)			.278 (.038)***	.179 (.041)***	.183 (.041)***	.172 (.041)***	.165 (.041)***	.233 (.054)***	.087 (.061)
Other-efficacy (OE)			.235 (.040)***	.220 (.037)***	.248 (.037)***	.256 (.039)***	.261 (.039)***	.212 (.048)***	.315 (.059)***
Chance-efficacy (CE)			.453 (.038)***	.484 (.037)***	.457 (.038)***	.450 (.039)***	.454 (.039)***	.462 (.052)***	.447 (.057)***
IEC x SEE					.092 (.063)	.111 (.066)$^{+}$	.110 (.066)$^{+}$	-.034 (.095)	.283 (.088)***
OCC x OCE					.119 (.045)**	.137 (.046)***	.144 (.046)***	.150 (.064)*	.117 (.065)$^{+}$
Gender effects									
Gen x IEC						.006 (.040)	-.005 (.040)		
Gen x OCC						.055 (.038)	.054 (.038)		
Gen x SE						-.067 (.041)	-.067 (.041)		
Gen x OE						.035 (.038)	.048 (.039)		
Gen x CE						-.011 (.038)	-.011 (.039)		
Gen x IEC x SEE							.149 (.066)*		
Gen x OCC x OCE							-.011 (.046)		
N	414	414	414	414	414	414	414	266	148
R^2	.0012	.1015	.4628	.5051	.5171	.5242	.5303	.5058	.5947
ΔR^2	-	.1003***	.4616***	.0424***	.0120**	.0070	0.0061^{+}		
IM - test: χ^2/df	18.61 / 15	36.98 / 30	76.20 / 39***	97.16 / 60***	118.43 / 83 **	163.67 / 126 *	152.48 / 137	68.69 / 71	103.97 / 71**
- Heteroskedasticity	6.35 / 10	22.10 / 23	56.46 / 31***	81.56 / 50 ***	99.13 / 71*	134.46 / 109 *	127.61 / 118	58.22 / 60	78.11 / 60 $^{+}$
- Skewness	11.85 / 4	14.67 / 6*	15.29 / 7*	13.60 / 8	17.78 / 11 $^{+}$	28.80 / 16 *	24.47 / 18	10.46 / 10	25.81 / 10 ***
- Kurtosis	.40 / 1	.21 / 1	1.44 / 1	2.00 / 1	1.53 / 1	.58 / 1	.40 / 1	.01 / 1	.05 / 1
F	.12	7.66	49.96	45.82	39.14	27.33	24.78	26.10	20.10
LogLik	-586.69	-564.79	-458.32	-441.32	-436.24	-433.20	-430. 52	-	-
AIC	1183.39	1143.57	932.65	902.63	896.49	900.40	899.03	-	-

Significance levels: + p < 0.10, * p < 0.05, ** p < .01, *** p < 0.005, values in parentheses are standard errors.
Variables IEC, SCC, SE, OE, and CE are standardized. GE, SEE SCE are calculated based on these standardized values.

Figure 1

Interaction plots



APPENDIX 1:

PROOF OF THE EQUALITY OF THE TWO FORMULATIONS

$$
\begin{aligned}
DO &= GE + IEC \cdot SEE + OCC \cdot OCE \\
&= \frac{SE + \frac{OE+CE}{2}}{2} + (IC - (OC + CC)) \cdot \left(\frac{SE - \frac{OE+CE}{2}}{2} \right) + (OC - CC) \cdot \left(\frac{OE - CE}{2} \right) \\
&= \left(\frac{1}{2}SE + \frac{1}{4}OE + \frac{1}{4}CE \right) + (1 - 2OC - 2CC) \cdot \left(\frac{1}{2}SE - \frac{1}{4}OE - \frac{1}{4}CE \right) + (OC - CC) \cdot \left(\frac{1}{2}OE - \frac{1}{2}CE \right) \\
&= \left(\frac{1}{2}SE + \frac{1}{4}OE + \frac{1}{4}CE \right) + \\
&\quad \left(\frac{1}{2}SE - \frac{1}{4}OE - \frac{1}{4}CE \right) - 2OC \cdot \left(\frac{1}{2}SE - \frac{1}{4}OE - \frac{1}{4}CE \right) - 2CC \cdot \left(\frac{1}{2}SE - \frac{1}{4}OE - \frac{1}{4}CE \right) + \\
&\quad OC \cdot \left(\frac{1}{2}OE - \frac{1}{2}CE \right) - CC \cdot \left(\frac{1}{2}OE - \frac{1}{2}CE \right) \\
&= \frac{1}{2}SE + \frac{1}{4}OE + \frac{1}{4}CE + \\
&\quad \frac{1}{2}SE - \frac{1}{4}OE - \frac{1}{4}CE - OC \cdot SE + \frac{1}{2}OC \cdot OE + \frac{1}{2}OC \cdot CE - CC \cdot SE + \frac{1}{2}CC \cdot OE + \frac{1}{2}CC \cdot CE + \\
&\quad \frac{1}{2}OC \cdot OE - \frac{1}{2}OC \cdot CE - \frac{1}{2}CC \cdot OE + \frac{1}{2}CC \cdot CE \\
&= \left(\frac{1}{2} + \frac{1}{2} - OC - CC \right) \cdot SE + \\
&\quad \left(\frac{1}{4} - \frac{1}{4} + \frac{1}{2}OC + \frac{1}{2}CC + \frac{1}{2}OC - \frac{1}{2}CC \right) \cdot OE + \\
&\quad \left(\frac{1}{4} - \frac{1}{4} + \frac{1}{2}OC + \frac{1}{2}CC - \frac{1}{2}OC + \frac{1}{2}CC \right) \cdot CE \\
&= (1 - OC - CC) \cdot SE + OC \cdot OE + CC \cdot CE \\
&= IC \cdot SE + OC \cdot OE + CC \cdot CE
\end{aligned}
$$

APPENDIX 2:

ITEM TEXTS

	Topic	Internal	Social	Chance
Control beliefs	Protecting own interests (IEC3,OCC3)	I am usually able to protect my personal interests.	People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups.	Often there is no chance of protecting my personal interest from bad luck happenings.
	Who influences own life? (IEC5,OCC5)	When I make plans, I am almost certain to make them work.	In order to have my plans work, I make sure that they fit in with the desire of people who have power over me.	It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.
	Planning (IEC6,OCC6)	When I get what I want, it's usually because I worked hard for it.	Getting what I want requires pleasing those people above me.	When I get what I want, it's usually because I'm lucky.
	Get what one wants (IEC7,OCC7)	My life is determined by my own actions.	My life is chiefly controlled by powerful others.	To a great extent my life is controlled by accidental happenings.
Factor-specific expectancies		When facing difficult tasks, I am certain that I will accomplish them. (SE1)	I am always optimistic regarding support from others. (OE1)	Even if something only depends on chance, I am optimistic. (CE1)
		I am confident that I can perform effectively on many different tasks. (SE2)	In general, I expect that more people will help me than hinder me. (OE2)	I would never rely on luck. (CE2)
		Even when things are tough, I can perform quite well. (SE3)	Other people generally have my best interests at heart. (OE3)	Chance often does not favor me. (CE3)
		If it depends only on my abilities, then I will be successful. (SE4)	When confronted with difficult tasks I can count on the help of others. (OE4)	When my success depends on luck, then I often do better than others would expect. (CE4)