

The IE-4: Construction and Validation of a Short Scale for the Assessment of Locus of Control

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The IE-4

Construction and Validation of a Short Scale
for the Assessment of Locus of Control

Anastassiya Kovaleva

The IE-4: Construction and Validation of a Short Scale for the Assessment of Locus of Control

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Anastasiya Kovaleva

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Summary

Locus of control defines a personal belief about whether outcomes of behavior are determined by one's actions or by forces outside one's control.

This personality trait has been shown to have an impact on human behavior across a wide spectrum of social situations. Due to its link to education, general health, overall life satisfaction and other important variables of social research issues, it is interesting not only for psychological but also for sociological research questions.

Locus of control is often used in survey research to predict such complex phenomena as social commitment, political participation, unemployment, vocational behavior, well-being or health issues, etc. However, the established German scales for locus of control comprise between twenty and thirty items or more. Given the strict time constraints to which social surveys are subject, such lengthy assessment tools are generally unsuitable for survey research. Hence, surveys such as the German Socio-Economic Panel (GSOEP) use self-developed scales to assess locus of control. However, such self-developed scales are not always thoroughly validated. Therefore, a new standardized and validated short scale measure is called for that caters for research settings with strict time constraints.

This thesis addresses this need. Taking into consideration the theoretical background of the established scales assessing locus of control and the empirical results of the scales used in German surveys, a standardized measure – the four-item scale for the assessment of locus of control (IE-4) – was constructed. The thesis describes the construction of the IE-4 with the help of a pilot study (N=201) and cognitive interviews, and its validation in an extended sample (N=539). The work concludes with a discussion of the efficiency of the IE-4, i.e. its brevity and satisfactory psychometric properties.

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List of Acronyms and Abbreviations

AID:A	Aufwachsen in Deutschland 2009 [English: Growing up in Germany]
ANOVA	Analysis of Variance
CAIC	Consistent Akaike Information Criterion
CAPI	Computer-Assessed Personal Interviews
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DIW	Deutsches Institut für Wirtschaftsforschung [English: German Institute for Economic Research]
DJI	Deutsches Jugendinstitut [English: German Institute for Youth Research]
EFA	Exploratory Factor Analysis
ELOC	External Locus of Control of Reinforcement
ESDS	Edwards Social Desirability Scale
FKK	Fragebogen zu Kompetenz- und Kontrollüberzeugungen [English: Questionnaire on Competence- and Control Expectancies]
FRD	Scale for Fate Orientation with Respect to Driving
FRG	Federal Republic of Germany
GDR	German Democratic Republic
GGSS	German General Social Survey
GSOEP	German Socio-Economic Panel
IE-4	Die Skala Internale-Externale-Kontrollüberzeugung-4 [English: Internal External Locus of Control-4]
IEC	Rotter's Internal-External Locus of Control Scale
ILOC	Internal Locus of Control of Reinforcement
IPC	Internal, Powerful Others, and Chance Scale
IZA	Institute for the Study of Labour
KLC	Körperbezogener Locus of Control [English: Body-Oriented Locus of Control]
KMKB	Kurzskalen zur Messung von Kontrollüberzeugungen in Bevölkerungsumfragen [English: the Short Scales for the Assessment of Locus of Control Orientations in Population Surveys]
LOC	Locus of Control of Reinforcement

LOC-IRQ	Locus of Control – Interpersonal Relationships Questionnaire
MANOVA	Multivariate Analysis of Variance
MCSDS	Marlowe-Crowne Social Desirability Scale
MGCFA	Multigroup Confirmatory Factor Analysis
MHLC	Mental Health Locus of Control Scale
MI	Measurement Invariance
MIMIC	Multiple Indicator Multiple Cause
MLR	Maximum Likelihood Robust
MMCS	Multidimensional Multiattributitional Causality Scale
MMLC	Miller Marital Locus of Control Scale
NLS	National Longitudinal Survey
PAPI	Paper-And-Pencil-Interview
PCA	Principle Component Analysis
PLOC	Parental Locus of Control
RMSEA	Standardized Root Mean Square Residual
ROT-IE	Rotter’s Internal-External Locus of Control Scale
SMM	Structured Means Model
SOWIBUS	Sozialwissenschaftliche Bevölkerungsumfrage [English: Social Sciences Omnibus Survey]
SRMR	Standardized Root Mean Square Residual
TLI	Tucker Lewis Index’
ZPID	Leibniz-Zentrum für Psychologische Information und Dokumentation [English: Leibniz Associations’ Institute for Psychological Information and Documentation]

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1 Introduction

Decades of research in sociology and psychology have demonstrated that a sense of control is a robust predictor of physical and mental well-being and perhaps even longevity.
E. A. Skinner, 1996, p.549

1.1 Basic concepts and research issues of the thesis

Control beliefs are among the most important variables employed in research on human nature and behavior conducted by different sciences. As far back as 1899, the economist Thorstein Veblen, when developing his „theory of the leisure class“, underlined the importance of human belief in fate, chance, or luck. He arrived at a remarkable conclusion about the possible influences of individual beliefs on the gross national product, postulating that belief in chance or luck is frequently used as an excuse for low productivity (Veblen, 1899, p. 170).

Sociologists, too, drew attention to the fact that belief in luck functions as a defense behavior that preserves self-esteem in the case of mistakes and failure (Merton, 1946). Furthermore, it was even suggested that belief in chance or luck leads to political and social passivity (e.g., Merton, 1949; Seeman, 1959).

By now, personality psychology has furnished sufficient empirical evidence that subjective beliefs about personal characteristics are predictive of human behavior. Elaborate conceptualizations have shifted the research focus from species instincts to human motives and beliefs (e.g., Strickland, 1977; White, 1959). Even those who stress the importance of situational determinants still acknowledge that people's expectations about themselves in relation to their environment strongly influence their behavior. One such expectancy variable is internal versus external locus of control of reinforcement (LOC) (Rotter, 1966). Internal LOC orientation (hereinafter referred to as ILOC) describes an individual belief that life events can be controlled by active behavior. An external LOC orientation (hereafter: ELOC), on the other hand, embodies the personal belief that life is controlled by external forces, i.e. social or political powers (powerful others), or forces beyond human control and understanding (fate, luck, or chance) (cf. Levenson, 1972, 1974; Krampen 1979, 1981a; Mielke, 1979, 1982a). In other words, LOC defines the personal belief about the connection or contingency between personal means, which are generally understood as personal behavior or activity, and ends, which are seen as all conceivable results of the various situations, events, occasions, incidents, and accidents experienced in the course of life (Skinner, 1996, p. 553).

Due to its direct link to human behavior, LOC quickly became one of the most researched variables of applied psychology. As early as 1976, Levenson and Miller noted that “(...) over 1,000 studies have been published dealing with the construct” (p. 199). In addition, as Skinner (1996, p. 549) pointed out, “decades of research in sociology and psychology have demonstrated that a sense of control is a robust predictor of physical and mental well-being (...) and perhaps even longevity.” Summarizing findings regarding LOC published in the previous decades, Amelang and Bartussek (1981) suggested that it is hard to find a research topic that had not been correlated with LOC. Indeed, LOC has become not only one of the most popular psychological constructs, but it has also been used successfully in studies conducted outside the field of psychology, for example in (1) medical, (2) pedagogical, (3) economic, and (4) socio-political research:

(1) Clinical studies report correlations between an internal locus of control (ILOC) and the active use of coping strategies against chronic pain and despair (e.g., Andrasik & Holroyd, 1980; Carlson, 1982; Crisson & Keefe, 1988; Gehlert, 1994; Spector, Cull, & Goldstein, 2000, 2001; Velissaris, Wilson, Saling, Newton, & Berkovic, 2007). An internal locus of control has also been associated with low risk of burnout on the part of employees – particularly medical staff. On the other hand, a high external locus of control (ELOC) is associated with depression, subjectively reported high psychological burden, and underdeveloped coping strategies in new problem situations (e.g., Abramson, Seligman, & Teasdale, 1978; Benassi, Sweeney, & Dufour, 1988; Glass & Levy, 1982; Kirkcaldy, Cooper, Furnham, & Brown, 1993; Rotter, 1954, 1970, 1978).

(2) Pedagogical studies have revealed that pupils and students with a high ILOC accommodate better and faster to new scholarly demands, learn more effectively for exams, find friends more easily, and are more intrinsically motivated when it comes to learning (e.g., Bar-Tal & Bar-Zohar, 1977; Hank, Pohl, & Krampen 2009; Lefcourt, 1966, 1972, 1976, 1981, 1982; Rotter, Chance, & Phares, 1972; Skinner, Wellborn, & Connell, 1990). The sense of control is evidenced to be correlated with persistence in solving complex problems (e.g., Ahle, 2002; Anderson, 1977; Goodnow & Pettigrew, 1955, Goodnow & Postman, 1955; DeCharms, 1968; DeCharms & Shea, 1976; Lefcourt, 1976, 1981; Rotter et al., 1972; Rotter, Seeman, & Liverant, 1962). A number of studies report correlation of general school, academic, and career success with LOC (e.g., Burger, 1985; Dweck & Licht, 1980; Gordon, 1977).

(3) Research in vocational behavior reveals that a high ILOC on the part of hotel managers has been associated with job satisfaction on the part of employees and positive guest ratings (Canary, Cunningham, & Cody, 1988). A number of studies have reported that successful career planning, job satisfaction, robustness against burnout, and the ability to cope with interpersonal conflicts can be associated with LOC (e.g., Burger, 1985; Cooper, Sloan, & Williams, 1988; De Hoogh & Den Hartog, 2009; DeNeve & Cooper, 1998; Gable, Thompson, & Glanstein, 1976; Kirkcaldy, Furnham, & Cooper, 1998; Nolte, Weische, Wilkesmann, Maetzel, & Tegethoff, 1997; Wang, Bowling, & Eschleman, 2010). Moreover, a sense of control has been found to have a significant impact not only on job satisfaction but also on occupational

attainment, annual earnings, and perceived financial progress (e.g., Andrisani & Nestel, 1976; Canary et al., 1988). A high ILOC has been shown to be correlated with lower levels of subjectively experienced job stress (e.g., Kirkcaldy & Cooper, 1992; Kirkcaldy et al., 1993; Cooper et al., 1988). Internal control orientation is also found to be correlated with innovativeness and entrepreneurial potential across different cultures (Mueller & Thomas, 2001)

(4) And finally, studies report that conservative and liberal political persuasions, social and environmental engagement are strongly correlated with LOC (e.g., Gootnick, 1974; Levenson & Miller, 1976; McCarty & Shrum, 2001; Scaturro & Smalley, 1980).

Usually, generalized belief in external control is associated with undesirable outcomes, for example, lower satisfaction with life (cf. DeNeve & Cooper, 1998), mental-health problems (cf. Benassi et al., 1988), a worse course of physical diseases (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000), or less academic success (Prociuk & Breen, 1975). However, external locus of control may be beneficial at certain times. Confronted with uncontrollable life events such as a chronic disease or death of a spouse, individuals with a high ELOC have more realistic expectations than individuals with a low external locus of control (e.g., Specht, Egloff, & Schmuckle, 2011; Wortman, Sheedy, Gluhoski, & Kessler, 1992). In addition, patients with a high ELOC are more cooperative with medical personnel and more compliant with treatment plans, which proves to be life-prolonging (cf. Burish et al., 1984).

Social surveys are increasingly interested in tracking social change and determining the impact of social data at the micro-level. In doing so, they draw on psychological constructs – all the more so because these constructs have been found to be of crucial importance for many of the substantive issues addressed in social research (e.g., Klandermans & Roggeband, 2007; Mayer, 2002; Staudinger & Lindenberger, 2002; Van Stekelenburg & Klandermans, 2007). Here, too, LOC is frequently the psychological construct of choice. For example, Mayer (2002) accentuates the importance of life course research and points out that “control strategies relate to the active shaping of own personality development and to efforts to bring one’s environment in line with personal needs and goals” (p. 13). To take some examples of such life course research issues: Utilizing data from the German Socio-Economic Panel Survey (GSOEP), Nolte et al. (1997) use LOC to explain the social commitment, political engagement and different ways of looking for a job. Later, Heady (2008) provides evidence for linkage between LOC, personal life goals and subjective well-being of the GSOEP respondents. Another good example is a research project at IZA (Institute for the Study of Labour [German: Forschungsinstitut zur Zukunft der Arbeit]): Caliendo, Cobb-Clark, and Uhlendorff (2010) had analyzed the IZA Evaluation Data Set that targeted German individuals who entered unemployment in 2007-2008 and provided the evidence that interindividual differences in LOC had an effect on the job search behavior and reservation wage. Findings of the other team of German survey researchers (Infurna, Gerstorf, Ram, Shupp, & Wagner, 2011) indicated that higher concurrent levels of social participation, life satisfaction, and self-rated health as well as more positive changes in social participation over the preceding

11 years were each predictive of between-person differences in LOC. Researchers in other countries have also published findings pointing out the meaning of LOC for contemporary survey research: Investigating the health behavior of 2,500 Finnish citizens Ek and Heinström (2011) reported the connection between ELOC and the low motivation to act on health issues.

Once survey researchers developed an interest in assessing LOC, they faced the difficulty of applying the established psychological scales within the strict time constraints to which they were subject. For example, when assessing LOC for the first time in the National Longitudinal Survey (NLS), Andrisani and Nestel (1976) were obliged to shorten Rotter's Internal-External Locus of Control Scale (ROT-IE) from 29 to 11 items. The length of the psychological scales is still perhaps the most severe handicap for their use in interdisciplinary studies and surveys. Hence, researchers usually have no alternative but to develop their own scales. The following assessment tools were found in German surveys: Hof and Hohner (1992) published guidelines for the assessment of LOC in a personal interview; the German Socio-Economic Panel (GSOEP) developed its own short scale for LOC (Nolte, 1996); and the Short Scales for the Assessment of Locus of Control Orientations in Population Surveys [German: Kurzskalen zur Messung von Kontrollüberzeugungen in Bevölkerungsumfragen - KMKB] were developed by Jakoby and Jacob (1999) especially for social surveys.

In sum, survey researchers face a dilemma where their interests contradict their research constraints: On the one hand, there is growing interest in measuring LOC in survey research. This is due to the fact that both experimental and correlational studies support the assumption that from earliest infancy to old age individual differences in LOC are related to different outcomes, including issues of general health, optimism (e.g., Baltes & Baltes, 1990; Bandura, 1989; Rodin, 1986); achievement, persistence, motivation, coping (e.g., Lachman & Burack, 1993; Lefcourt, 1981, 1983); self-esteem, personal adjustment (e.g., Levenson, 1981; Strickland, 1965); success, and failure in a variety of life domains (e.g., Brim, 1974; Fiske & Taylor, 1991; Gurin & Brim, 1984, Langer & Rodin, 1976). LOC is found to be predictive for such important content variables of survey research as life- and job satisfaction (e.g., Burger, 1985; Cooper et al., 1988; De Hoogh & Den Hartog, 2009; DeNeve & Cooper, 1998; Gable et al., 1976; Nolte et al., 1997; Wang et al., 2010), annual earnings (e.g., Andrisani & Nestel, 1976; Canary et al., 1988), innovativeness and entrepreneurial potential across different cultures (Mueller & Thomas, 2001), conservative or liberal political persuasions (Levenson & Miller, 1976).

On the other hand, the established psychological questionnaires are constructed for diagnosis at the level of individual persons, patients, or clients. Such questionnaires usually have aimed to differentiate between individuals. In order to provide the strong discrimination power of an assessment tool and the reliable interindividual differentiation, such scales are usually comprise of several subscales and a sufficient number of items (e.g., the Questionnaire on Competence- and Control Expectancies [German: Fragebogen zu Kompetenz- und Kontrollüberzeugungen - FKK] developed by Krampen (1991), which consists of four subscales and 32 items).

Scales developed for the single diagnostic are targeting to collect the most comprehensive information about the psychological criteria of a person. This automatically leads to lengthy questionnaires or extensive questionnaire batteries. Such detailed assessment takes time and resources. Although indisputably required in the case of a single person, such a comprehensive diagnosis is not feasible in situations where psychological constructs are used as additional correlates or explanatory dimensions, as is the case in surveys.

Psychological short scales offer a solution to this dilemma. The results of short scales are excellent for filtering the most important empirical findings based on very coarse microdata. Such data cannot claim to assess the complete broadness of the target psychological construct. The purpose of such a psychological diagnostic is to gather basic information about psychological constructs in the most efficient way in order to reduce the comprehensive information flow to a manageable size. Results of a short scale do not tell us much about the characteristics of an individual person, but they allow differentiation between groups of people, providing an empirically supported direction for further research.

The strict demands on assessment time, and the length of established psychological scales, prevent survey researchers from using them and force them to develop their own scales for the assessment of psychological constructs: For example, the shortest psychological scale suggested for the measurement of LOC comprises 12 items (Krampen, 1981a), and that is double as long as the shortest scale constructed by survey researchers (cf. Jakoby & Jacob, 1999). The short scale suggested by Krampen (1981a) assesses three dimensions of LOC with four items per subscale. Jakoby & Jacob (1999) constructed the short scale for two dimensional assessment of LOC using three items per subscale.

Although a six-item scale takes about a minute to be assessed, contemporary psychodiagnostic methods allow construction of even more efficient short scales for the assessment of even more complex constructs such as the Big Five (e.g., Gosling, Rentfrow, & Swann, 2003; Rammstedt & John, 2007), depression (e.g., Löwe, Kroenke, & Gräfe, 2005), or substance abuse (e.g., Sullivan, 2003). The works of these authors evidence two-item scales providing valid assessment of extremely broad psychological constructs. Methodological studies report that a two-item scale with good psychometric properties can already achieve an adequate test power by using the occasional samples of 300 participants (e.g., Scott et al., 2009). In other words, the test power of such very brief measures is achieved not through the number of items for the assessment of one dimension, as is the case with the single person diagnostic, but through the number of respondents (e.g., Thomas & Bremer, 2011). The fact that surveys usually have several thousand respondents in samples representative of national populations encourages implementation of the most efficient methods of the contemporary psychodiagnostics. Surveys operate under extremely strict time constraints in which every item counts. In view of the considerable interest in the locus of control construct on the part of survey researchers, there is a great value in providing a reliable and valid instrument that ensures that researchers can avoid

wasting precious time. Hence, there is an urgent need for such an efficient short scale assessing LOC only with two items per dimension.

1.2 Research aims and structure of the thesis

Enduring interest in locus of control in different research fields, and the growing demand for an efficient screening tool applicable within strict time constraints prevailing in surveys led me to choose this thesis topic. The present thesis resulted from my attempt to solve the dilemma of the incompatibility of established psychological questionnaires with time constraints of survey research. The first research aim of the present work is to provide survey researchers with an efficient psychometric scale. ‘Efficiency’ is understood here not only in terms of the minimum number of items necessary but also in the sense of the adequateness of the instrument’s psychometric properties. Normal distribution of the scale scores, reliability, and content validity must inevitably be considered during the construction process. With regard to current empirical evidence concerning the efficiency and validity of the psychological short scales (cf. Scott et al., 2009; Thomas & Bremer, 2011) it is assumed that two items per dimension are the least necessary amount to provide the qualitative assessment of LOC.

The factorial and construct validity of the new scale should also be investigated in an extended sample stratified according to the actual distribution of core socio-demographic variables of gender, age, and levels of education in the German population. It is necessary to carry out a comparison of factorial and construct validity of the new scale to those of a scale that is already established in the German survey research in order to investigate the assumption of the efficiency of the new scale. The second research aim of the present thesis is to provide this empirical evidence of how efficient the new questionnaire is.

To facilitate an overview of the organization of the thesis, its structure is illustrated in Figure 1. The work consists of two parts. The first part depicts the milestones of the theoretical and empirical work relating to the personality construct LOC. In view of the fact that there are some concerns about the control variables (cf. Skinner, 1996), Chapter 2 summarizes the main aspects of the theoretical background with regard to the definition of LOC in order to arrive at the working definition employed in the present study (see section 2.3). Chapter 3 provides a summary of the key results of the review of the literature on the wide range of LOC questionnaires. Four scales were selected for presentation here, namely the benchmark scales for the assessment of LOC: (1) the ROT-IE (Rotter, 1966) and (2) the IPC (Levenson, 1972) and two scales which were constructed by survey researchers and currently assessed in German surveys (3) the GSOEP short scale for the assessment of LOC and (4) the KMKB (Jakoby & Jacob, 1999). In Chapter 4, the theoretical background is integrated with the information on the assessment tools, and the research objective of the thesis is outlined.

In the second part of the thesis, the four steps of the empirical research phase are described. These empirical steps are linked to the theoretical part and objectives of the thesis.

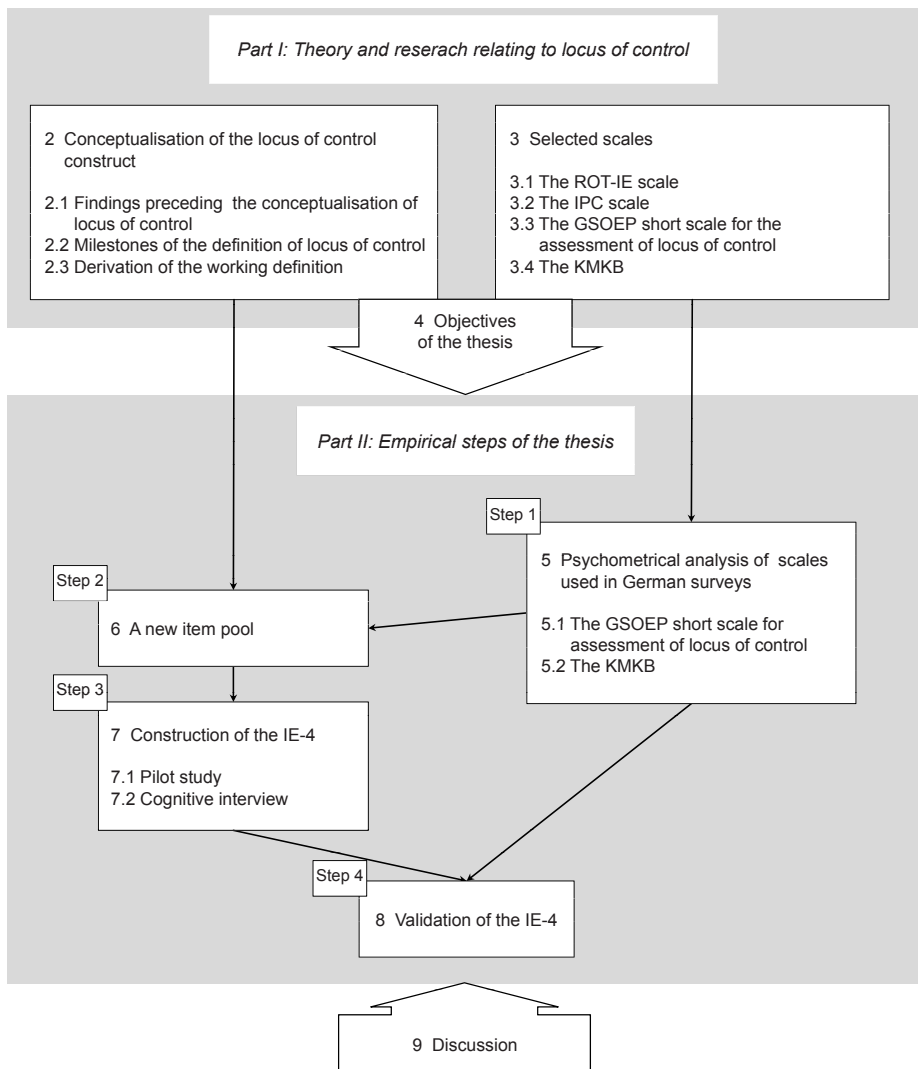


Figure 1 Structure of the thesis.

Although the SOEP short scale for the assessment of LOC and the KMKB has often been used by surveys within the last ten years, the psychometric quality of the SOEP short scale has not yet been published, and only one publication reporting the psychometric quality of the KMKB has been found. Due to such a deficit of information

on the psychometric properties of these scales the first empirical step comprises the psychometric analysis of the GSOEP short scale for the assessment of LOC and the KMKB (Step 1; Chapter 5). The next empirical step is devoted to the construction process of a new item pool for the development of the IE-4 (Step 2; Chapter 6). The new item pool is developed in regard to the working definition that has been put in section 2.3. The set of the four items with the best psychometric properties is selected in an empirical pilot study using a student sample, and is modified in accordance to the results of cognitive interviews (Step 3; Chapter 7). Step 4 (Chapter 8) addresses the issues of the psychometric quality of the newly developed IE-4. The factorial and construct validity of the scale is investigated based on the data of an extended sample stratified according to the distribution of gender, age and levels of education in the German population. Finally, the results of the present literature review and four empirical studies are summarized and discussed in Chapter 9.

Part I: Theory and research relating to locus of control

2 Conceptualization of the locus of control construct

The observations of the economists and sociologists (e.g., Veblen, 1899; Merton, 1946, 1949; Seeman, 1959, 1963) as well as early personality theories (e.g., Adler, 1927; Freud, 1933; Lewin, 1935, 1936) were based on the assumption that all people innately desire to engage in effective interactions with their environment. Human behavior was explained as the result of different natural needs (e.g., Adler, 1927; Freud, 1933). These assumptions led to extensive experimental research resulting in an ample number of different control variables (e.g., control beliefs, control judgments, sense of control, efficacy expectations, capacity beliefs, collective efficacy, self-efficacy, etc.; a complete list of the relevant constructs can be found in Skinner, 1996, pp. 566-570).

It is necessary to devote this chapter to the most important milestones of theoretical research into LOC that are relevant to the definition of the construct. First, the roots of the social learning theory, the experimental studies conducted by Phares (1955, 1957), will be reviewed. This is followed by a summary of the key postulates and corollaries of social learning theory (Rotter, 1954), from which the LOC construct emerged (Rotter, 1966). The further development of the concept in the works of Lefcourt (1966, 1976) and Levenson (1972, 1981) is then outlined before turning to the contributions of German researchers who implemented the LOC concept in the German-speaking area (Krampen, 1979, 1981a, 1991; Mielke, 1979). The description of the major theoretical milestones concludes with the formulation of a working definition that will serve as the core for the development of a new LOC assessment scale. The results of a review of existing measurement tools for the assessment of LOC are then presented. This short summary of the most researched tools is necessary in order to provide an overview of the main issues relating to the measurement scales. The focus here will be on the two most popular and well-researched scales and on the theoretical and empirical development of the LOC construct. Two scales developed by survey researchers will be also reviewed. The conclusions reached in this section will result in the formulation of the research objective of the present thesis.

2.1 Empirical findings preceding the conceptualization of locus of control

As far back as 1955, Phares investigated human behavior in skill-versus-chance situations. In an experimental setting, he managed to investigate the assumption that people innately desire to engage in effective interactions with their environment – interactions in which they experience themselves as producing desired effects and preventing undesired results. Four experimental groups were given ambiguous tasks that involved matching paint patches of slightly different shades of gray or lines of slightly different length. Half the subjects were told that success was a matter of skill; the other half were instructed that the tasks were so difficult that success was a matter of luck. Phares observed that the subjects were more productive under skill conditions than under chance conditions. Although success in both situations depended on luck, the skill instructions elicited greater motivation and better performance from the subjects under the skill instructions. This effect was found even when the different instructions were given to the same subjects (Phares, 1955, 1957).

Phares's findings suggest that subjectively perceived learning with behavior-reward sequences experienced under skill or controlled conditions is different from that under chance or uncontrolled conditions (Phares, 1964). When people feel they control the situation, they are more likely to exhibit perceptual behavior that will enable them to cope with potentially threatening situations than are subjects who feel that chance or other uncontrollable forces determine whether their behavior will be successful. In his further research, Phares notes that not only the situation itself but also the subjective perception of a person's own behavior is important for the kind of behavior that is shown in an experimental situation (Phares, 1965). When describing his results, Phares (1962, 1965) introduced into personality research such terms as expectancy, and internal versus external orientation without, however, embedding them in a personality theory. He focused more on the results of his experiments, showing that these variables tend to be crucial in skill-versus-chance situations. Reporting a direct relationship between the extent of coping behavior and the expectancy that one's skills or abilities are the crucial variable in achieving desired effects or, to use social learning theory terminology, in obtaining a reinforcement, Phares (1965) proposed a meaningful concept for further research, namely the expectancy that a reinforcement can be controlled.

In a later study, Phares (1976) refers to Rotter's social learning theory (1954). Phares (1976) concretizes his initial observations and underlines that not every kind of human behavior can be "inevitably strengthened through reinforcement" (p. 27). Phares recognizes that the capacity of humans to analyze the sequence of and connection between their own actions and the resulting outcomes - i.e. to perceive the contingency between behavior and results – strengthens behavior considerably. He assumes that the crucial variable for the repetition of a behavior is a belief that reinforcement is contingent upon behavior (Phares, 1976).

2.2 Milestones of the definition of locus of control

Consolidating the previous empirical findings (cf. Phares, 1964), learning theories (cf. Hull, 1943), and personality concepts (e.g., Adler, 1927; Freud, 1933; Lewin, 1936), Rotter built his social learning theory around the concept of human behavior. He defines behavior as changes that take place in a person or in his or her relationship to the environment as a function of personal response or reaction to the significance of environment (Rotter, 1954, p. 136). Implicit behavior that is not readily observed directly is also included in his concept (e.g., a behavior of looking for alternative solutions by bringing different geometric figures into definite sequences elicited in experiments conducted by Schroder and Rotter (1952)).

The following section focuses on the major concepts of social learning theory that are related to the conceptualization and final definition of LOC. Describing the basic theoretical concepts, Rotter (1954, p. 86) states that:

The study of personality is the study of learned behavior. Learned behavior is behavior that is modifiable, that changes with experience. Learned behavior may be distinguished from what may be called ‘physiological adaptation’ in that, in learning, the acquired change may be described in terms of a new relationship, association, or connection.

Rotter notes that “the human organism may interact with itself using learned meanings (...)” (1954, p. 93). In his view, human beliefs are formed by means of such self-interactions. The basis of these interactions is perception and the reaction of others to the behavior. Having learned the reaction of others to its own behavior, the organism starts to interact with itself using these newly learned terms (cf. Rotter, 1954, 1966). Rotter also postulates that person’s experiences influence each other and are integrated in one unit of personality. He considers new experiences to be a partial function of new and old acquired meanings. Rotter (1954, p. 94) interprets learning process as changes in the system of acquired meanings. Further he states that one cannot truly speak of causes of behavior as described by personality constructs but only of the conditions that are necessary for the occurrence of the behavior (Rotter, 1954, p. 96). Social learning theory describes the etymology of human goal-directed behavior. According to its postulates the directional aspect of behavior is inferred from the effect of reinforcing conditions (Rotter, 1954, p. 97).

Although the social learning theory is behavioristic in nature, it also includes elements of personality theories such as Freud’s psychic determinism (1933), Adler’s security and superiority (1927), and Lewin’s vector psychology (1936). In addition, learning theories, such as that proposed by Hull (1943), take up the concept of goal-directed behavior to explain the structure of organismic needs. In other words, social learning theory attempts to integrate two diverse trends in psychology – the stimulus-response theories on the one hand and the cognitive and field theories on the other. It attempts to deal with the complexity of human behavior without yielding the goal of empirically testable hypotheses.

Rotter's social learning theory uses three basic concepts in the explanation, measurement and prediction of behavior: behavior potential, expectancy, and reinforcement value. Behavior potential (BP) may be defined as the potentiality of any kind of behavior occurring in any situation or situations as calculated in relation to any single reinforcement or set of reinforcements (Rotter, 1954, p. 105). The potentiality for the occurrence of any behavior may be ultimately determined from its occurrence in any situation where other alternatives are present. In this respect, expectancy (E) is defined as the probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation or situations. Expectancy is independent of the value or importance of the reinforcement (Rotter, 1954, p. 107). Rotter defines reinforcement as "(...) something that changes behavior in some observable way by either increasing or decreasing the potentiality of its occurrence" (Rotter, 1954, p. 112). Hence, the reinforcement value (RV) of any external reinforcement is defined as the degree of preference for this reinforcement (Rotter, 1954, p. 107). Consequently, behavior is predicted with the following equation comprising these three components:

$$BP_{x,s1,Ra} = f(E_{x,Ra,s1} \& RV_a)$$

The formula reads as follows: the BP for behavior x to occur in a specific situation (s1) in relation to a definite reinforcement (Ra) is a function of the expectancy of the occurrence of reinforcement a following behavior x in situation 1 and the value of reinforcement a. Hence, E and RV are postulated to be independent. Rotter (1954) underlines that the "sign & is used as the only indication of the nature of the mathematical relationship" (p. 108) between both components, i.e. E and RV interact with each other in various mathematical ways. Having underlined the motivational importance of expectancies and reinforcements for behavior, Rotter (1954, p. 114) noted that both expectancy and reinforcement control the occurrence and frequency of behavior. This general formula for occurrence of behavior says that the BP occurs in any specific situation as a function of the expectancy that the behavior will lead to a particular reinforcement in the situation and a value of the reinforcement. Rotter postulates that expectancies in each situation are determined not only by experiences in the situation but also by experiences in other more or less similar situations (1954, p. 166). The experience in each situation is meant to change expectancy (E) (Rotter, 1954, p. 167; Rotter, 1975, p.57):

$$E_{s1} = f \left(E'_{s1} \& \frac{GE}{N_{s1}} \right)$$

In this formula, N represents the amount of previous experiences the person has had in a definite situation (s1) or similar situations. E' represents a specific expectancy and GE stands for a generalised expectancy.

According to these postulates, LOC is a generalized expectancy that forms other kinds of specific expectancies. Defining LOC, Rotter (1966) uses three key concepts of the social learning theory. He states that E results from interactions of an organism with itself after perception of contingencies between BP and reinforcement. RV acts to strengthen E in a way that a particular behavior or event will be followed by the same kind of reinforcement in the future. As Rotter points out, the determination of the functionality of the reinforcement differs from individual to individual and is strongly linked to personality:

A perception of causal relationship need not be all or none but can vary in degree. When a reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then, in our culture, it is typically, perceived as a result of luck, chance, fate as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labeled this a belief in external control. If the person perceives that the event is contingent upon his own behavior or his own relatively permanent characteristics, we have termed this a belief in internal control (Rotter, 1966, p. 1).

In sum, in the social learning theory, locus of control is a variable that embodies generalized expectancies and helps to refine the prediction of how reinforcements change behavior. Rotter postulates that a person's LOC can be either internal or external but not both at the same time. In other words, he perceives LOC as a single dimension, with high internals at one end and high externals on the other. According to this assumption, Rotter (1966) developed the first measurement tool for the assessment of locus of control – Rotter's Internal-External Locus of Control Scale (ROT-IE). The ROT-IE scale consists of 29 pairs of statements. It will be described in section 2.3.

Lefcourt (1966; 1976) modified the initial concept of LOC. Exploring research findings; he interprets the concept of behavior potential according to the attribution of success and failure. Outlining his approach in later works, Lefcourt (1976) explicitly underlined the role of attribution of results of behavior in forming the expectancy belief. He exemplifies his approach stressing that freedom of movement is nothing other than generalized expectancy of success resulting from man's ability to remember and reflect upon a lifetime of behavior-outcome sequences. Lefcourt defines perceived control as a generalized expectancy for internal as opposed to external control of reinforcements. This expectancy is an abstraction deriving from a series of specific expectancy behavior-outcome cycles (Lefcourt, 1976, p. 27).

Although Lefcourt supports the crucial role of expectancies, he claims that they are rooted in a casual attribution of success and failure. His research is synthesized with the work of Heider (1958) and Wiener, Heckhausen, Meyer, and Cook (1972) and links Rotter's theoretical approach to the attribution theory. Theoretical framework developed by Wiener and his colleagues (1972) is concerned with how individuals interpret events and how this relates to their thinking and behavior. Attribution

theory assumes that people try to interpret causes to an event or behavior, i.e. try to determine why people do what they do. It is suggested that human nature seeks for causality of the life events. In other words, understanding why another person did something may attribute one or more causes to that behavior. According to Heider (1958) there are two kinds of attributions: (1) internal attribution, the inference that a person is behaving in a certain way because of something about the person, such as attitude, character or personality; and (2) external attribution, the inference that a person is behaving a certain way because of something about the situation he or she is in. Wiener et al. (1972) proclaims stability to be the second dimension of attribution, distinguishing between fixed and variable causes. Integrating the attributional classification of causes in the frameworks of the social learning theory, Lefcourt (1976) subdivided internal and external LOC according to their stability as is shown in Figure 2.

Lefcourt (1976, p. 78) claims that, due to this link, the more differentiated concept of LOC can be developed that differentiates the causes of life events into 'fairly' constant, such as ability and those that can vary for different reasons, such as effort. He considers task difficulty to be the fixed external cause, and luck to be the variable cause outside the organism.

Although Lefcourt regards stability as the second necessary dimension for differentiation between internals and externals, he still adheres largely to Rotter's definition and determines LOC as the generalized expectancy of internal control, in regard to the perception of events, whether positive or negative, as being a consequence of one's own actions and are thus seen to be potentially under personal control. The generalized expectancy of external control refers to the perception of events as being unrelated to one's own behavior and thus beyond personal control (Lefcourt, 1972, p.29).

		Locus of control	
		<i>Internal</i>	<i>External</i>
Stability	<i>Fixed</i>	Ability	Task Difficulty
	<i>Variable</i>	Effort	Luck

Figure 2 The perceived determinants of success and failure. (Figure was modified according to Lefcourt, 1976, p. 78.)

Lefcourt substitutes the idea of contingency used by Rotter (1966) with the notion of consequence, strengthening the impact of reinforcement on changes in expectancies. He also sees the crucial role of expectancies on behavior occurrence. Moreover, in view of the fact that his approach is focused primarily on attribution of behavioral

characteristics, he omits the concept of relatively permanent characteristics, which is included in Rotter's conceptualization of the construct (1966).

The Multidimensional Multiattributorial Causality Scale (MMCS) was developed by Lefcourt, Baeyer, von Bare, and Cox (1979). Because of the strong link to Lefcourt's approach to the attributional theory, the MMCS measurement confounds locus of control with causal attribution of a person (Krampen, 1981b; Palenzuela, 1988).

Levenson (1972) undertook a further reconceptualization of Rotter's approach. While Rotter (1966) and Lefcourt (1976) assume that externally-oriented personalities still expect some contingency between behavior and reinforcement – albeit to a much lesser extent than internally-oriented persons do – Levenson (1972) distinguishes clearly between the two kinds of expectancies. She proposes the following definition of internal and external LOC:

Those who believe that they exercise control over their lives are considered to be internally controlled. Those who believe that their destinies are beyond their own control and are determined by fate, chance, or powerful others are classified as externally controlled (Levenson, 1972, p. 261).

Levenson (1972) argues in favor of a multi-dimensional structure. She takes a predominantly empirical approach, tending not to focus too much on theoretical assumptions, instead concentrating on the development of a measurement tool for the assessment of LOC that would have better psychometric qualities than the ROT-IE scale. Levenson's primary intention was to measure LOC more accurately. Her research is based on contradictory empirical findings reported in connection with LOC. For example, Gore and Rotter (1963) and Strickland (1965) found that Afro-American youths who engaged in social protest action had greater internal expectancies than their less active peers, whereas results from other studies (Gurin, Gurin, Lao, & Beattie, 1969; Ransford, 1968) suggested that young Afro-Americans had the lowest internal expectancies. All these studies employed the ROT-IE scale. Levenson (1972) concentrated her efforts on the revision of Rotter's scale as she assumes it did not "(...) meaningfully differentiate (...) because of the broad definition of externals as those with expectancies that fate, chance, or powerful others will control events" (p. 261).

The rationale behind her approach was that people who believe that the world is unordered or determined by chance or luck would behave and think differently from people who believe the world is ordered but powerful others are in control (Levenson, 1972, p. 261). In the latter case, a potential for human control exists. Furthermore, she expects that people who believe that chance is in control of life events are "(...) cognitively and behaviorally different from one who feels that he himself is not in control" (Levenson, 1972, p. 261).

Levenson proposes a three-dimensional LOC model: (1) the belief that events in one's life are self-determined (Internality (I)), (2) the belief that events are controlled by powerful others (P) and (3) the belief that events are chance-based (C). The latter two dimensions define externality. Based on this rationale, Levenson constructed

the Internal, Powerful Others, and Chance Scales (IPC). She criticized the forced-choice answering mode of the ROT-IE scale (Rotter, 1966), underlining that rejecting the internal items had artificially inflated the values of the external dimension and deflated those of the internal dimension. In contrast to the ROT-IE scale with its 29 forced-choice items, the IPC scale consists of 24 items and has a six-point Likert response scale. The translation and adaptation of Levenson's IPC scales to German was carried out by two researchers simultaneously working independently: (1) Mielke (1979) and (2) Krampen (1981a). They both adhere to the definition of internal and external LOC proposed by Levenson (1972). Krampen's translation has become the accepted one in the German psychometrical community. The IPC scales will be discussed further in the section 3.2.

2.3 Derivation of the working definition

In sum, LOC is conceived of as a personal expectancy with regard to different kinds of contingencies between one's own behavior and a reinforcement. However, as Furnham and Steele (1993, p. 444) point out, LOC is not an expectancy concerning a particular type of reinforcement, but a generalised expectancy that a behavior is instrumental to goal attainment, regardless of the specific nature of the goal in any given specific situation. LOC influences goal expectancy depending upon situational novelty and ambiguity as well as the degree of reinforcement that the individual has experienced in similar situations.

LOC was initially conceptualized as a bipolar continuum (cf. Rotter, 1966). However, numerous empirical findings subsequently revealed that it is, in fact, a multi-dimensional construct (cf. Albani et al., 2007; Bagherian, Ahmadzadeh, & Ahmadzaden, 2009; Collins, 1974; Connell, 1985; Gregory, 1981; Jacoby & Jakob, 1999; Levenson, 1973a, 1973b; Mirels, 1970; Palenzuela, 1988; Paulhus & Van Selst, 1990). While there is still no consensus about the exact number of dimensions in LOC, the clear distinction between ILOC and ELOC as two separate dimensions is undisputed (Furnham & Steele, 1993; Mielke, 1982b; Skinner, 1996). The distinction between ILOC and ELOC has also been shown to be crucial for the explanation of the interpersonal differences in behavior (e.g., Krampen, 1981b, 1982, 1991; Lefcourt, 1972, 1976; Levenson, 1974; 1975b; Mielke, 1979, 1982b, 1996). Mielke (1996) stressed that the precise distinction in Powerful Others and Chance within external LOC undertaken by Levenson (1972; 1975a) and Krampen (1981a, 1991) was of importance only when the object of research was concrete, specific behavior. She argues that, particularly in the case of generalized beliefs, it is immaterial whether behavior is due to the belief that the world is controlled by chance or by powerful others.

The working definition of locus of control to be used in this thesis is derived from the approaches described above, which conceive of LOC as a generalized expectancy of a certain contingency between active behavior and situational outcomes or reinforcement. In line with the numerous studies conducted in order to

explore the inner structure of LOC, the present author adapts Levenson's division of generalized LOC into an internal and an external dimension (ILOC and ELOC): *ILOC refers to an expectancy that personal permanent characteristics and goal-directed behavior are instrumental in obtaining a reinforcement, and ELOC is the expectancy that outcomes of life events, whether positive or negative, are controlled by powerful others, chance, or luck.*

Considering that the three-factorial structure postulated by Levenson (1972) still could not be successfully supported by empirical findings (cf. Levenson, 1973a; Krampen, 1979, 1981a; Mielke, 1979), the dimensions of powerful others and chance are treated in the present thesis as one broad dimension. The preferred definition of 'reinforcement' is that proposed by Rotter (1954, p. 112), namely as something that changes behavior in an observable way by either increasing or decreasing the potentiality of its occurrence.

In the following chapter, the results of the present review of psychodiagnostic instruments for the assessment of LOC will be presented. While the main focus will be on the description of the ROT-IE and IPC scales, two scales constructed by survey researchers will also be considered.

3 Selected scales

Having arrived at a working definition of LOC, it is now time to prepare the groundwork for the empirical part of the thesis by reviewing the best research among the established scales for the assessment of LOC and comparing them with the scales constructed by survey researchers. A considerable number of psychometric tools have been constructed for the measurement of LOC. In 2011, the PSYNDEX (ZPID) database lists 64 LOC scales in the German-speaking regions alone (Eberwein, 2011). Lists and descriptions of the most popular questionnaires can be found in the works of Furnham and Steele (1993), Mielke, (1982a), Krampen (1982), and Lefcourt (1981). My review of assessment tools revealed four groups of scales:

- (1) the ROT-IE scale (Rotter, 1966) and its numerous variations (e.g., Andrisani & Nestel, 1976; Collins, 1974; Gurin, Gurin, & Morrison, 1978; MacDonald & Tseng, 1971)
- (2) scales assessing the multidimensional structure of the construct (e.g., Krampen, 1991; Lefcourt et al., 1979; Levenson, 1972; Paulhus & Christie, 1981)
- (3) measurement instruments for the assessment of control variables constructed by researchers outside the field of psychology (e.g., Nolte, 1996; Jakoby & Jacob, 1999) and
- (4) a wide range of tools assessing specific types of LOC such as the Multidimensional Health Locus of Control Scale (MHLC, Wallston, Wallston, & DeVellis, 1978); the Miller Marital Locus of Control Scale (MMLC, Miller, Lefcourt, & Ware, 1983); the Locus of Control Interpersonal Relationships Questionnaire (LOC-IRQ, Lewis, Cheney, & Dawes, 1977); the Scale for Fate Orientation with Respect to Driving (FRD, Tesser & Grossman, 1969); Parental Locus of Control (PLOC, Campis, Lyman, & Prentice-Dunn, 1986).

Because of their specialized focus, the latter instruments will not be dealt with here. I have aimed this chapter to depict and compare the ways of operationalization of LOC in psychological and survey research. For this purpose, the first group of scales is presented with (1) the ROT-IE. The importance of (2) the IPC in the LOC research makes it a good example of the second group of the measurement tools. The third group is presented with two scales constructed by survey researchers: (3a) the GSOEP short scale and (3b) the KMKB.

Table 1 Scales described in Chapter 3

Gr.	Title (author(s))	Number of items	Assessed dimensions	Used in survey
1	ROT-IE (Rotter, 1966)	29	one bipolar dimension	
2	IPC (Levenson, 1972)	24	internal locus of control, powerful others, chance control	
3a	GSOEP short scale for the assessment of locus of control (Nolte et al., 1997)	8	external, internal locus of control	GSOEP (1999, 2005)
3b	KMKB (Jakoby & Jacob, 1999)	6	external, internal locus of control	DJI (2000, 2009)

Note. Gr. = Group number, explanations are in text.

3.1 The ROT-IE Scale

Rotter's Internal-External Locus of Control Scale (ROT-IE, also referred to as IEC, Rotter 1966; German translation: Rost-Schaude, Kumpf, & Frey, 1975) was based on empirical findings (Phares, 1955, 1957) and on Rotter's elaborate social learning theory (1954, 1966). The ROT-IE scale comprises a single bipolar dimension or continuum; high internals are located at one end and high externals are located at the other. The scale consists of 29 forced-choice items, six of which are buffer items. Each item is made up of a pair of statements, one for the ILOC dimension, the other for the ELOC dimension. The respondents are asked to choose one statement from each pair. Take Item 13, for example: (a) When I make plans, I am almost certain that I can make them work. [German: Wenn ich Pläne mache, bin ich meist sicher, dass ich sie auch verwirklichen kann.] (b) It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow. [German: Es lohnt sich nicht immer zu weit voranzuplanen, weil viele Dinge schließlich doch vom Zufall bestimmt werden.]

The ROT-IE scale is perhaps the most popular questionnaire for the assessment of LOC and because of the strong interest in the topic, the ROT-IE is also one of the most researched scales (cf. Furnham & Steele, 1993). Moreover, a number of variations and modifications were made in late 60s and 70s. The variations, adaptations and extensions that were found during the course of the present review are summarized in Table 2.

Andrisani, and Nestel (1976), for example, reduced the original version and used the resulting short scale for the prediction of vocational development and career success; Collins (1974) extended the original scale and used his version to explain social and political responsibility. Some researchers not only changed the number of

items but even modified them while maintaining the original title of the scale (e.g., adaptation of the wording of the ROT-IE items for the research of socio-political issues (Gurin et al., 1969; Gurin et al., 1978; Mirels, 1970)).

Table 2 Variations of the ROT-IE

Author(s)	Items	Research field
Andrisani & Nestel, 1976	11	career success; vocational behavior
Collins, 1974	84	social control; social and political responsibility
Gurin et al., 1969	39	political behavior
Gurin et al., 1978	26	social control
MacDonald & Tseng, 1971	12	unspecified
Mirels, 1970	23	social and political behavior
Rotter, 1966	29	psychical and mental health, learning, social, political and vocational behavior, career success
Schneider & Parsons, 1970	20	political behavior; vocational behavior; career success
Schmidt, Hoffmann-Lange, & Wegner (1979)	8	unspecified
Valecha & Ostrom, 1974	11	vocational behavior

Note. The original ROT-IE (Rotter, 1966) is given for the purpose of comparison.

Both the English and the German versions of the ROT-IE scale are reported to have adequate psychometric properties (e.g., Harrow & Ferrante, 1969; Hersch & Schiebe, 1967; Mikula, 1975, Rost-Schaude et al., 1975; Rotter, 1966; Schneewind, 1976). More than 600 studies were published reporting the psychometric properties of ROT-IE (cf. Rotter, 1975). Table 3 gives the overview of the ROT-IE reliabilities reported for the samples with over 100 participants. The second column of Table 3 features the type of reliability calculation employed; the reliability coefficients are listed in the third column; the fourth and fifth columns are presented in order to give a short description of the samples used. The reported scale homogeneity for the mixed-gender groups ranged from .70 (Rost-Schaude, 1982; Rotter, 1966) to .98 (Harris & Salomone, 1981). The range for the gender-differentiated samples is .62 (Valecha & Ostrom, 1974) to .78 (Piontkowski, 1989) for males, and .70 (Piontkowski, 1989) to .79 (Rotter, 1966) for females.

Table 3 Reliability of the ROT-IE

Author(s)	Reliability	<i>r</i>	<i>N</i>	Sample
Mixed-Gender Samples				
Cherlin & Bourque, 1974	Cronbach's Alpha	.80	161	students (sociology)
Piontkowski, 1989	Cronbach's Alpha	.75	258	res. ¹ of Münster district
Rost-Schaude, 1982	Hoyt & Stunkard	.70	286	pupils and students
Rotter, 1966	Kuder-Richardson	.70	400	students (psychology)
Harris & Salomone, 1981	Kuder-Richardson	.98	223	res. of New York
Piontkowski, 1989	Split-Half	.79	258	res. of Münster district
Males				
Piontkowski, 1989	Cronbach's Alpha	.78	122	res. of Münster district
Valecha & Ostrom, 1974	Cronbach's Alpha	.62	3694	young adults
Rotter, 1966	Kuder-Richardson	.70	200	students (psychology)
Females				
Piontkowski, 1989	Cronbach's Alpha	.70	136	res. of Münster district
Rotter, 1966	Kuder-Richardson	.70	200	students (psychology)
Rotter, 1966	Kuder-Richardson	.79	500	unspecified
Collins, 1974	Test-Retest (1 week)	.54	300	Students
Rotter, 1966	Test-Retest (2 months)	.55	117	students (psychology)
Phares, 1976	Test-Retest (3 months)	.75	110	clinical sample
Phares, 1976	Test-Retest (9 months)	.26	110	clinical sample

Note. Reliability = type of algorithm used for the calculation of the reliability coefficient, *r* = reliability coefficient, *N* = sample size, Sample = description of the sample composition; ¹res. = residents.

An overall mean internal consistency of the ROT-IE is .75 (Table 7, section 3.5). The test-retest reliability reported for the mixed-gender samples is to be found in the last four lines of Table 3. The lowest test-retest reliability reported by Phares (1976) for a retest after nine months was .26. The highest stability was found in the same sample after 3 months (.75). The overall mean stability on the part of the ROT-IE is .53.

The ROT-IE has also been shown to identify interpersonal differences in selected samples, for example, among patients suffering from alcohol abuse or psychological disorders, and prison inmates (e.g., Cone, 1971; Hersch & Schiebe, 1967; Rotter, 1966).

However, the present review of the literature revealed that the psychometric properties of the ROT-IE scale are often claimed to be inadequate. The ROT-IE scale

has been frequently criticized because of its correlation with social desirability assessed with the Marlowe-Crowne Social Desirability Scale (MCSDS, Crowne & Marlowe, 1960) and with the Edwards Social Desirability Scale (ESDS, Edwards, 1957) (e.g., Altrocchi, Palmer, Hellman, & Davis, 1968; Feather, 1967; Gold, 1968). However, Schreiber (1980) relativises this criticism, noting that the assumptions of the signal-detection theory of Green and Sweets (1966) allow for the control of the correlation between social desirability and the ROT-IE.

Further criticism has been voiced in relation to the factorial structure of the ROT-IE scale. A substantial number of studies have revealed that the questionnaire does not assess a bipolar continuum as suggested by Rotter (1966) but rather a number of confounding dimensions (e.g., Coan, Fairchild, & Dobyns, 1973; Collins, 1974; Connell, 1985; Gregory, 1981; Gurin et al., 1969; Klockars & Varnum, 1975; Levenson, 1972, 1974, 1975a; Mirels, 1970). Moreover, a multi-dimensional structure of the ROT-IE was found in data from 43 countries (Smith, Trompenaars, & Dugan, 1995).

The problematic assessment of the ROT-IE scale in the context of extended surveys was discussed by Schmidt et al. (1979). The authors claimed adaptation of the item-number, item-wording, and answering scale of the ROT-IE scale before it was able to be used in survey research. The applied method of forced-choice items of the ROT-IE scale has been also questioned by other researchers (cf. Lefcourt, 1991; Levenson, 1972, 1981; Krampen, 1982; Palenzuela, 1988; Paulhus & Christie, 1981).

In sum, the ROT-IE scale is an established psychometric tool with a well-grounded theoretical basis as well as good reliability and content validity (Mielke, 1982b). However, a number of empirical studies maintain that its factorial and construct validity are inadequate and that its response scale lacks efficiency.

3.2 The IPC

The Internality, Powerful Others, and Chance Scale (IPC; Levenson, 1972) is constructed according to Levenson's three-dimensional approach. The IPC was translated into German by two independently working researchers: Mielke (1979) and Krampen (1981). Levenson developed this scale on the basis of Rotter's social learning theory. She was prompted to reconceptualize Rotter's scale by contradictory empirical findings of studies employing the ROT-IE scale (Levenson, 1975a, 1981). Levenson not only divides LOC into two subscales, ILOC and ELOC, but she also differentiates ELOC into two further subscales, namely Powerful Others (P) and Chance (C). The IPC comprises 24 items, i.e. eight items per subscale, and has a six-point, fully-labeled Likert response scale: strongly disagree, disagree, slightly disagree, slightly agree, agree, strongly agree. It was translated into German with two different variants of a six-point, end-labeled Likert scale: Mielke (1979) reversed the scale and used the end labels agree, disagree [German: trifft zu, trifft nicht zu], while Krampen (1981) suggested the end labels 'very incorrect', 'very correct'. [German: sehr falsch, sehr richtig].

Here are examples of one item for each subscale. The translated items were taken from Krampen (1981):

I-scale, item number 1: Whether or not I get to be a leader depends mostly on my ability. [German: Es hängt hauptsächlich von mir und meinen Fähigkeiten ab, ob ich in einer Gruppe eine Führungsposition innehabende oder nicht.]

P-scale, item number 11: My life is chiefly controlled by powerful others. [German: Mein Leben wird hauptsächlich von mächtigeren Leuten kontrolliert.]

C-scale, item number 2: To a great extent my life is controlled by accidental happenings. [German: Zufällige Geschehnisse bestimmen zum großen Teil mein Leben.]

The theoretical background proposed by Levenson (1972) was adopted by the translators of the scale (Krampen, 1981; Mielke, 1979). When translating the IPC, Mielke (1979) employed a homogeneous pupil sample. Krampen (1981) had used an extended occasional adult sample; his translation became more accepted in the German research community.

As early as the first publication of the IPC results, Levenson (1972, p. 261) reported a discrepancy in the descriptive statistics of the subscales. This effect has been also found in the German translation and validation studies (e.g., Krampen, 1979, p. 581, 1991, p. 47). Though all scales have the same number of items, the Internality subscale consistently yields higher total sum scores or means.

Both the English and German versions of the scale possess sufficient reliability (e.g., Krampen, 1981; Levenson, 1972; 1981). About 100 published articles deal with the psychometric properties of the IPC and its adaptations in different languages. Only the studies with the samples over 100 participants were selected for the present overview. An overview of the reported reliability coefficients is given in Table 4. Studies show reliability of the subscales ranging from .55 (Krampen, 1979) to .94 (Krampen & Ohm, 1979) for the I-scale; from .56 (Rossier, Rigozzi, & Berthoud, 2002) to .95 (Krampen, 1979) for the P-scale; and from .59 (Rossier et al, 2002) to .94 (Krampen & Ohm, 1979) for the C-scale. The overall mean reliability of the IPC subscales reach or exceed .70, the threshold for good reliability, namely .70 for the I-scale, .71 and .72 for the P-scale and C-scale, respectively.

In the first publication of IPC results, Levenson reported positive correlation between the P- and C-dimension and a negative correlation between the P- and I-, and the C- and I-dimensions, respectively (Levenson, 1972, p. 261). Analysis of the translated versions supported these findings (e.g., Bornmann & Daniel, 2000; Krampen, 1979, 1991; Mielke, 1979). Table 5 summarizes the intercorrelation coefficients reported in the literature. The summary reveals an overall mean correlation between the P- and C-scale of .55. The overall mean correlation coefficients between the I- and P-, and between I- and C-dimension are considerably lower, namely .21 and .25, respectively.

Table 4 Reliability of the IPC

Author(s)	Reliability	<i>r</i>			<i>N</i>	Sample
		I	P	C		
Rossier et al., 2002	Cronbach's Alpha	.56	.65	.59	361	students unspecified
Krampen, 1979	Kuder-Richardson	.91	.95	.96	151	patients with alcohol abuse; prison inmates
Krampen & Ohm, 1979	Kuder-Richardson	.94	.93	.94	712	unspecified
Merz, 1981	Split-Half	.67	.65	.62	238	students (unspecified)
Krampen, 1979	Split-Half	.55	.66	.70	151	patients with alcohol abuse; prison inmates
Krampen & Ohm, 1979	Split-Half	.69	.57	.61	712	unspecified
Krampen, 1979	Split-Half	.55	.66	.70	151	patients with alcohol abuse; prison inmates
Krampen & Ohm, 1979	Split-Half	.70	.57	.61	712	unspecified

Note. Reliability = type of algorithm used for the calculation of the reliability coefficient, *r* = reliability coefficient, *N* = sample size, Sample = description of the sample composition, I = Internality, P = Powerful Others, C = Chance.

Table 5 Intercorrelation of the IPC subscales

Author(s)	<i>r</i>			<i>N</i>	Sample
	PC	IP	IC		
Bornmann & Daniel, 2000	.46	-.45	-.34	267	Students
Levenson, 1972	.59	-.14	-.17	96	Students
Krampen, 1979	.63	-.15	-.26	151	Unspecified
Krampen, 1979	.70	-.08	-.38	45	prison inmates
Krampen, 1979	.57	-.22	.09	34	male patients with alcohol abuse
Krampen, 1979	.44	-.17	-.29	16	female patients with alcohol abuse
Krampen, 1979	.68	-.11	-.42	40	male adults
Krampen, 1991	.57	-.30	-.26	2,028	German adults
Krampen, 1991	.39	-.20	-.35	258	high school pupils, students
Mielke, 1979	.32	-.28	-.18	151	high school pupils

Note. *r* = correlation coefficient, *N* = sample size, Sample = description of the sample composition, PC = correlation between subscales Powerful Others and Chance, IP = correlation between subscales Internality and Powerful Others, IC = correlation between subscales Internality and Chance.

Levenson (1974, p. 382) reported that the three-dimensional structure is difficult to support with factor analysis. Instead, she found seven principle components with an eigenvalue over 1. Both German translations also reported an unclear three-dimensional structure of the IPC. Krampen (1981, p. 15) extracted four principle components, while Mielke (1979, p. 8) claimed to have extracted nine components with an eigenvalue over 1. Regardless its weak factorial validity, the IPC is reported to be a valid predictor of inter-individual differences in various fields (e.g. Krampen, 1981b, Mielke, 1982a). The validity of the IPC has been supported in concern of psychological, clinical, pedagogical and political research issues. A number of validation criteria and constructs used to test the validity of the IPC subscales are summarized in Table 6. Although the IPC manual suggests the calculation of an overall LOC index, empirical findings show how important a differentiated interpretation of the results is. In a study using a sample of French students, Internality (I) was shown to be related to Neuroticism and Conscientiousness (Rossier et al., 2002); a study of patients with Parkinson's disease revealed a correlation between internality, sociability, and gravity of symptoms (Haltenhof, Krakow, Zöfel, Ulm, & Bühler, 2000).

Furthermore, the P- and C-subscale have been shown to be correlated with hopelessness, Machiavellianism, and gender-role orientation in a sample comprised of German adults (Krampen, 1981b), and to be associated with a need for security in a German student-sample (Merz, 1981).

Although difficulties in replicating the three-dimensional structure have been reported in connection with the IPC, its implementation in a variety of studies of interdisciplinary research issues has shown that it is a sufficiently validated and internationally assessed measurement tool.

In sum, the IPC is reported to be a reliable and valid questionnaire. Though the factorial structure conflicts with its theoretical assumptions, the IPC scales has been reported to explain personality differences in the case of various research issues. The criteria and construct validity of these two instruments have also been supported in a number of studies. Although the IPC is well-researched and validated, it has not been used in surveys. The following sections are devoted to scales that are currently employed in German surveys.

Table 6 Some examples of IPC validation studies

Author(s)	Criteria	I	P	C	N	Sample
Krampen, 1981b	age	.04	-.06	.03	151	German adults
Krampen, 1981b	hopelessness	.24	-.37	-.44	151	German adults
Krampen, 1981b	Machiavellianism	-.07	.51	.45	151	German adults
Krampen, 1981b	conservative attitudes	.01	.14	.23	151	German adults
Krampen, 1981b	gender-role orientation	.05	.25	.37	151	German adults
Krampen, 1981b	fascism	.13	.24	.30	151	German adults
Krampen, 1981b	rigidity	.16	.17	.22	151	German adults
Rossier et al, 2002	age	-	.20	-	161	French students
Rossier et al, 2002	gender	.23	.17	-	161	French students
Rossier et al, 2002	level of education	.17	.18	-	161	French students
Rossier et al, 2002	occupation	-	-.10	-	161	French students
Rossier et al, 2002	Neuroticism	-.35	.16	.24	161	French students
Rossier et al, 2002	Extraversion	.24	-	-	161	French students
Rossier et al, 2002	Openness	-	-.16	-	161	French students
Rossier et al, 2002	Agreeableness	-	-.16	-	161	French students
Rossier et al, 2002	Conscientiousness	.33	-	-	161	French students
Haltenhof et al, 2000	stage of illness	-.47	-	-	26	Parkinson's patients
Haltenhof et al, 2000	gravity of symptoms	-.47	-	-	26	Parkinson's patients
Haltenhof et al, 2000	sociability	.51	-	-	26	Parkinson's patients
Haltenhof et al, 2000	depressive attitudes	-	-	.46	26	Parkinson's patients
Merz, 1981	security	.20	-.43	-.32	171	German students
Merz, 1981	depression	-.07	.20	.18	238	German students
Merz, 1981	autonomy	-.15	-.30	-.05	171	German students

Note. I = Internality, P = Powerful Others, C = Chance, N = sample size, Sample = description of the sample composition, '-' = values are not reported.

3.3 The GSOEP short scale for assessment of locus of control

The GSOEP (German Socio Economic Panel) of the German Institute for Economic Research [German: Deutsches Institut für Wirtschaftsforschung - DIW] is a nationally representative, longitudinal annual panel study of private households and individuals. In total, the SOEP data currently spans 28 years, 1984–2011, and collects data of about 22,000 persons which includes residents of former West and East Germany, immigrants, and resident foreigners (Wagner, Frick, & Schupp, 2007). The GSOEP contains data on seven different subsamples – recruited, in either 1984, 1990, 1995, 1998, 2000, or 2002 – most of which have been drawn in a two-step design, register sampling of communities followed by a random route procedure (cf. Haisken-DeNew & Frick, 2005; Wagner, Schupp, & Rendtel, 1994). Assessment is usually conducted in mixed-modes, with about 50% as a personal interview (half of these interviews or near 24% of the entire sample based on computer-assessed personal interviews - CAPI), and about 50% as self-administered questionnaires (14% postal, the rest while the interviewer is in attendance). Full details of the survey structure are given in the Desktop Companion to the German Socio-Economic Panel (Frick, Haisken-DeNew, Spiess, & Wagner, 2005).

The GSOEP focuses primarily on socio-economic indicators such as income, job features, educational history, family structure, which are surveyed in the Household Questionnaire. Additionally, each member of the households aged 16 or older fills in the Persons Questionnaire, which also includes psychological questionnaires. The GSOEP short scale for the assessment of LOC (Nolte, 1996) was used in the 1999 and 2005 waves. Since 2006 the scale had become a part of the annual GSOEP Youth Questionnaire (Goebel, 2009).

Nolte (1996) distinguishes between ILOC and ELOC as two separate dimensions. The ILOC dimension is assessed with three items and the ELOC with five items. The items are presented in a random order. The first item is an example of the ILOC subscale: (1) The way my life goes depends on me. [German: *Wie mein Leben verläuft, hängt von mir selbst ab.*] Item number three assesses ELOC: (3) What a person achieves in life is above all a question of fate or luck. [German: *Was man im Leben erreicht, ist in erster Linie eine Frage von Schicksal oder Glück.*] (see also Table 9 of the section 5.1.1.2 for the complete item list). So far, no study investigating the psychometric property of the scale has been conducted yet. Therefore, such analysis needs to be carried out. The psychometric property of the GSOEP short scale for the assessment of LOC is to be conducted as a part of the present thesis (section, 5.1). The analysis will be based on the most recent data of the 2005 wave.

3.4 The KMKB

Facing the strict time constraints prevailing in survey research Jakoby and Jacob (1999) constructed the Short Scales for the Assessment of Locus of Control Orientations in Population Surveys (KMKB) [German: Kurzskalen zur Messung von Kontrollüberzeugungen in Bevölkerungsumfragen]. The theoretical background of the KMKB is Rotter's social learning theory (Rotter, 1954, 1966; cf. section 2.2). However, the authors were aware of the criticism voiced in connection with the ROT-IE scale and contradictory empirical results reported. Therefore, when developing the KMKB, they also considered the theoretical structure of the German translation of the IPC (Krampen, 1981, Mielke, 1979) and other LOC scales (e.g., Nowicki & Duke, 1974).

The KMKB consist of two subscales: (1) ILOC and (2) ELOC; each comprised of three items. The first three items of the KMKB measure internality; the next three assess externality. For example, an item number one for ILOC is: (1) I like taking responsibility. [German: Ich übernehme gerne Verantwortung.]. Item number four (ELOC) states: (4) Success often depends more on luck than on effort [German: Erfolg ist oft weniger von Leistung, sondern vielmehr von Glück abhängig.] (see also Table 13 of the section 5.2.1.2 for the complete item list).

Jakoby and Jacob (1999) had developed the scale on the basis of the data of an extended heterogeneous sample from the 1995 SOWIBUS omnibus survey, and validated on the data of the 1996 SOWIBUS omnibus survey: The internal consistencies reported by the authors are .62 to .71 for ILOC and .58 to .64 for ELOC. Moreover, the authors were able to clearly replicate the hypothesized structure of two factors. The correlation coefficients with the level of the secondary education ranging from -.25 to -.26 for ILOC and from .22 to .27 for ELOC were claimed to be low (Jakoby & Jacob, 1999, p. 69). The KMKB have been used in studies conducted by the German Institute for Youth Research [German: Deutsches Jugendinstitut - DJI], for example in the Family Survey 2000 or in Growing up in Germany 2009 [German: Aufwachsen in Deutschland – AID:A]. Apart from the authors' own validation studies (Jakoby & Jacob, 1999), no further publications about psychometric properties of the scale were conducted. The cross-validation of the KMKB on the data of the Family Survey 2000 is to be done as a part of the present thesis (section 5.2).

3.5 Comments on the ROT-IE, IPC, GSEOP short scale for the assessment of locus of control and the KMKB

A considerable number of scales have been constructed for the measurement of LOC (cf. Eberwein, 2011). The ROT-IE and IPC scale were selected for this chapter to depict the major dilemma that face survey researchers working with the established LOC scales, namely, to show that two best researched and validated established LOC scales are too long and too complicated for frameworks of survey research (cf. Schmidt et al., 1979). Moreover the detailed review of the psychometric quality of

these questionnaires revealed some difficulties in the validation of the hypothesized structure of LOC (cf. Coan et al., 1973; Collins, 1974; Connell, 1985; Gregory, 1981; Gurin et al., 1969; Klockars & Varnum, 1975; Krampen, 1981, 1991; Levenson, 1972; Mielke, 1979). The GSEOP short scale for the assessment of locus of control and the KMKB scale were described to exemplify the questionnaires constructed by survey researchers and contemporary used in surveys. The most important finding of the present literature review is the urgent demand for the studies, which analyze or validate the psychometric quality of the scales constructed by survey researchers.

In order to link the reader to the objectives of the present thesis, this section is aimed to summarize and comment the reported findings about the four depicted scales with regard to their (1) applied methods, (2) psychometric goodness (3) psychometric problems and (4) efficiency:

(1) LOC is a personality construct reflecting a belief in how functional the goal-directed behavior is subjectively evaluated, i.e. all four questionnaires utilize the self-report method operationalizing it. The differences are observed in the form of items and their semantic structure: The forced-choice form of the ROT-IE items (Rotter, 1966) were often criticized to be too long and complicated (cf. Lefcourt, 1991; Levenson, 1981; Schmidt et al., 1979). Rotter aimed to assess the width of the construct (cf. Rotter, 1966, 1975), i.e. he developed the statement pairs applying not only to subjective expectancies but also evaluation of general efficiency of goal-directed behavior of other people (e.g., Item 4 (a) In the long run people get the respect they deserve in this world. [German: Auf die Dauer bekommen die Menschen die Anerkennung, die sie in dieser Welt verdienen.] (b) Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries. [German: Unglücklicherweise bleiben die Werte eines Menschen oft unerkant, wie sehr er sich auch bemüht.]). Moreover the Items of ROT-IE comprised from different specific contexts (e.g., Item 5 [German: Die Vorstellung, Lehrer seien ungerecht gegenüber ihren Schülern, ist unsinnig.] [German: Die meisten Schüler merken nicht, wie sehr ihre Noten vom Zufall abhängen.]).

Levenson's (1972) Items of the IPC are completely focused on the goal-directed behavior of a subject. The Items comprised from single statements. Levenson used a six-point Likert response scale, which is more common in self-report method (cf. Bühner, 2006). Nevertheless Levenson (1972) operationalized LOC in different contexts of specific life situations. For example, two items of the P-scale, Item 20 (Whether or not I get into a car accident depends mostly on the other driver. [German: Ob ich einen Autounfall habe oder nicht, hängt vor allem von den anderen Autofahrern ab.]) and Item 22 (In order to have my plans work, I make sure that they fit in with the desires of people who have power over me. [German: Damit meine Pläne eine Chance haben, richte ich mich beim Planen auch nach den Wünschen wichtiger Leute.]) have different context of life situations in which powerful others are more in control as a respondent. As early as 1991, Krampen noted that the situational contexts of the item-wording were at some point obsolete in regard to the contemporary life change. He also revised the IPC items for the Internality, Powerful

Others, and Chance subscales of the FKK (Krampen, 1991). Since that time no further changes on the German translation of the IPC have been undertaken.

The GSOEP short scale for the assessment of LOC and the KMKB scales comprise statements with no specific context (sections 5.1.1 and 5.2.1). Therefore the wording of the items remains the same in different research contexts (e.g., the KMKB have been used in the 1995-1996 SOWIBUS omnibus survey and in various contexts of the DJI studies).

(2) Reliability, validity and factorial structure of the scales were given in this chapter. The present literature review revealed that both the ROT-IE and IPC have been rated to be reliable and valid measures, which were adapted in different languages and used in different research fields (cf. Krampen, 1981b; Lefcourt, 1991; Mielke, 1982a). Table 7 gives an overview of the overall mean of the reported reliability of the scales described in this chapter. The overall mean reliability of the ROT-IE scale and IPC subscales reach or exceed .70, i.e. the threshold for good reliability. The mean consistency of both KMKB subscales are lower than this threshold, namely, .67 for the ILOC and .61 for the ELOC subscale. Considering that Cronbach's Alpha is very sensitive to the total number of items in a scale, the authors still remain satisfied with this level of internal consistency (Jakoby & Jacob, 1999). Moreover, the hypothesized two dimensional structure of the KMKB is reported to be clearly supported by empirical data (Jakoby & Jacob, 1999).

Table 7 Overall mean internal consistency of the ROT-IE, IPC, and KMKB

Scale	Number of items	Internal consistency
ROT-IE (Rotter, 1966)	23	.75
I-scale (IPC; Levenson, 1972)	8	.70
P-scale (IPC; Levenson, 1972)	8	.71
C-scale (IPC; Levenson, 1972)	8	.72
ILOC-scale (KMKB; Jakoby & Jacob, 1999)	3	.67
ELOC-scale (KMKB; Jakoby & Jacob, 1999)	3	.61

Note. Psychometric properties of the GSOEP short scale for the assessment of LOC have not been published yet.

(3) Nevertheless the present literature overview shows some weak points of the psychometric properties of the described scales, namely that Rotter's (1966) scale has been often criticised for its factorial structure. The hypothesized factorial structure of the IPC also turned out to be difficult to prove by empirical data. The scales constructed by survey researchers have another kind of weak points in their psychometric data: (1) The psychometric property of the GSOEP scale for the assessment of LOC has not been published yet. (2) The reported psychometric quality of the KMKB has not been validated outside the developers' group.

(4) The efficiency was determined in the present theses not only as the least necessary set of items for the assessment of LOC but also as sufficient psychometric properties. In other words, the efficient scale is understood as the scale with the least number of items that is able to provide data of sufficient psychometric quality, i.e. the assessment tool is reliable, valid, and has a clear factorial structure. The GSOEP short scale and the KMKB with eight and six items, respectively, are considerably shorter than the ROT-IE (29 items) and IPC (24 items). Along with their length both later scales are claimed to have unclear factorial structure (e.g., Krampen, 1981a; Levenson, 1972; Mielke, 1979). Among the four scales described in this chapter, the KMKB have the least number and are reported to have an unambiguous structure of two factors. However, there is no information about the psychometric properties of the GSOEP short scale.

In sum, both the ROT-IE and the IPC are sufficiently researched and validated. Nevertheless the factorial validity of both measurement tools tends to be difficult to support with empirical findings, none of them has been used in the context of a survey. Moreover, the present review of the literature leads me to conclude that there is a great need for studies that confirm or, in the case of the GSOEP short scale, calculate the psychometric properties of the scales constructed for use in survey research.

The described theory and research relating to locus of control are summarized in the next chapter, and the research aim of the thesis is outlined.

4 Objectives of the thesis

Rotter's publication of 1966 has often been compared to a catalyst that caused an explosion of research into LOC (e.g., Furnham & Steele, 1993; Mielke, 1982a; Skinner, 1996). Although Lefcourt (1966) and Levenson (1972) made important amendments to Rotter's approach by uncovering the inner structure of the construct, this did not lead to major changes in Rotter's definition of LOC. When formulating a working definition of LOC for this thesis, I retained much of Rotter's definition, regarding internal locus of control (ILOC) as the human belief about the instrumentality of personal behavior for goal attainment, and considering external locus of control (ELOC) to be the belief that external powers have a much greater influence on goal attainment. Numerous empirical findings relating to the factorial structure of LOC gave rise to a reconceptualization of the original operationalization of the construct. The initially postulated one-dimensional structure (Rotter, 1966; Lefcourt, 1966) was clearly shown to be multidimensional (cf. Collins, 1974; Connell, 1985; Gurin et al., 1969; Levenson, 1973a, 1975a; Mirels, 1970; Skinner, 1996). Although there are still some contradictions in empirical findings about the exact number of dimensions (e.g., Krampen, 1991; Levenson, 1972; Mielke, 1979), the most important result of the present literature review is the clear separation of LOC into two dimensions, namely ILOC and ELOC. This is supported more by numerous empirical findings (e.g., Collins, 1974; Connell, 1985; Hersch & Schiebe, 1967; Gregory, 1981; Gurin et al., 1969; Lefcourt, 1981; Levenson, 1973b, 1974, 1975b; Mirels, 1970; Mielke, 1979; Krampen, 1982, 1991; Phares, 1976; Skinner, Chapman, & Baltes, 1988) than by theoretical assumptions (e.g., Krampen, 1981b; 1991; Levenson, 1972). Mielke (1996) concludes that the precise multidimensional structure of the construct is of importance only in the case of research into concrete, specific behavior, or of individual diagnoses for intervention purposes. In other words, the two dimensional structure of LOC seems to be more stable as the suggested one- or multidimensional structures (cf. Skinner, 1996).

Four crucial aspects are pointed out in my working definition of locus of control, namely (1) the expectancy or personal belief to have control over life events and (2) the expectancy of a contingency between one's efforts and the results achieved are regarded to be core constructs of the ILOC dimension; (3) the expectancy that the external force of powerful others and (4) the force of chance or fate controls attainment of a reinforcement are important components for the operationalization of the ELOC dimension (cf. section 2.3).

Recently, the new research field of the methodological issues of short scales has been developed. According to the methodological studies in concern to the efficiency and validity of the psychological short scales used in extended samples (cf. Scott et al., 2009; Thomas & Bremer, 2011), it is possible to use only two items per dimension. Thomas & Bremer (2011) showed that in large samples, the test power of a questionnaire comes with the number of participants and not with the number of items as is usually the case in the established psychological questionnaires. These

findings are important to be considered, because efficiency is understood in this thesis not only in terms of the minimum number of items necessary but also in the sense of the adequateness of the instrument's psychometric properties.

Based on this literature review, the objectives of the present thesis were established. There are two primary objectives: (1) The first is to meet the demand of the survey research for a short scale with sufficient psychometric properties and to construct an efficient questionnaire for the assessment of LOC - a two-dimensional, four -item scale (IE-4 [German: 4-Item Skala zur Erfassung von internalen und externalen Kontrollüberzeugungen – IE-4]).

(2) My second objective is to prove the efficiency of the new scale comparing its psychometric quality to that of a scale currently used in German surveys. The aim is to investigate the efficiency of the new scale in the typical survey setting, because of the differences between the survey situation and the typical situation of a psychological testing session. The present literature review reveals that there is an urgent demand for the studies that analyze and validate the scales used in surveys (sections 3.3 and 3.4). Hence, the fulfillment of the second objective should be preceded by an analysis of the psychometric properties of the GSOEP short scale for the assessment of LOC and the KMKB. The major purpose of this analysis is to determine the scale with the best psychometric properties in order to provide an adequate measure for the comparison to the IE-4.

Part II: Empirical steps of the thesis

5 Step 1: Psychometrical analysis of scales used by German surveys

The primary objective of the present thesis is the development and validation of a short scale for the assessment of LOC that can be applied under the strict time constraints of surveys. The objective is to develop a highly efficient scale, i.e. consisting of the least necessary set of items and providing reliable and valid measurement of LOC. The empirical evidence of the efficiency of the IE-4 can be provided through comparison of its psychometric properties to those of a scale currently used in German surveys. Two scales currently used by German surveys have been described in sections 3.3 and 3.4. The present literature review revealed that the psychometric properties of the GSOEP scale have not been published yet. The only findings of the KMKB are the initially reported psychometric values published by the authors Jakoby and Jacob (1999), which are based on data from 1995 and 1996. Since then, the initial psychometric quality of the KMKB has not been investigated.

Hence, the first step in the empirical part of this thesis investigates the psychometric quality of the scales constructed by survey researchers. This analysis is of particular interest in the present context, because both scales are currently utilized by German surveys: The GSOEP short scale (Nolte, 1996) is used annually in the GSOEP Youth Questionnaire, while the KMKB (Jakoby & Jacob, 1999) are employed in various surveys, for example the Family Survey 2000 and the Growing up in Germany Survey (AID:A) conducted by the DJI. The findings about the psychometric quality of the short scales constructed by survey researchers are necessary to ensure the quality of the currently collected data.

5.1 GSEOP short scale for the assessment of locus of control

5.1.1 Method

5.1.1.1 Sample

The population to be represented by the GSOEP is defined as the residential population of the Federal Republic of Germany (FRG) in 1984 including West Berlin, and as the German residential population in the former German Democratic Republic (GDR), including East Berlin, in June 1990 (Frick et al., 2005, p. 19). Seven supplementary samples have been drawn since the first wave in 1984. The GSOEP uses

multi-stage random sampling, in which the respondents are recruited using random-walk selection procedure.

The socio-demographic distribution of the total sample in 2005 ($N = 21,105$) as well as for males ($N = 10,093$) and females ($N = 11,012$) separately is presented in Table 8. In order to facilitate the overview, four age groups were formed representing the major life stages of the German population: 'up to 25 years' is the period of vocational education (in the case of the present data, the period from 16 to 25 years); '26 to 45 years' is the time for occupational consolidation and forming a family; the period 'from 46 to 65 years' is for most Germans the phase when occupational activity plays an important role; and the time 'after the age of 65' is the retirement phase. The frequency distribution of these age groups is given in the first four rows of Table 8. The age of participants ranges from 16 to 96 years, with a mean (M) of 47.4 and a standard deviation (SD) of 17.6 years. The mean age of males and females is 47.2 (SD 17.3) and 47.7 (SD 17.9), respectively.

The educational level of the participants was differentiated according to the years of their secondary education. Three groups were defined: a 'low level of education' means that the person either did not obtain a secondary school qualification or obtained a qualification after 9 years at school; an intermediate level of education means the person obtained a secondary school qualification after 10 years; and a 'high level of education' means that the person obtained a qualification to study at a university or a university of applied sciences, which takes up to 13 years. On average respondents report to have 11.0 (SD 1.1) years of schooling that is 11.1 (SD 1.1) for males and 11.0 (SD 1.2) for females.

Table 8 Socio-demographic characteristics of the GSOEP 2005

	Total sample		Males (<i>N</i> = 10,093; 47.7 %)		Females (<i>N</i> = 11,012; 52.1 %)	
	Freq.	%	Freq.	%	Freq.	%
Age						
16-25 years	2,848	13.5	1,374	13.6	1,444	13.1
26-45 years	7,328	34.7	3,480	34.5	3,848	34.9
46-65 years	7,116	33.7	3,479	34.5	3,637	33.0
> 65 years	3,843	18.2	1,760	17.4	2,083	18.9
<i>M</i> _{age} (<i>SD</i>)	47.4	(17.6)	47.2	(17.3)	47.7	(17.9)
Level of education¹						
Low	3,475	16.4	1,261	12.5	2,214	20.1
Intermediate	12,052	57.0	5,879	58.2	6,173	56.1
High	4,380	20.7	2,382	23.6	1,998	18.1
n.a.	1,238	5.9	571	5.7	627	5.7
<i>M</i> _{years of schooling} (<i>SD</i>)	11.0	(1.1)	11.1	(1.1)	11.0	(1.2)
Total	21,105	100	10,093	100	11,012	100

Note. (*N* = 21,105); Freq. = absolute frequencies, % = relative frequencies, n.a. = not applicable, *M* = mean, *SD* = standard deviation; ¹low level of secondary education = no secondary school qualification or qualification after 9 years at school; intermediate level of education = secondary school qualification after 10 years schooling; high level of education = university/university of applied sciences entrance qualification after up to 13 years of schooling. Mean values are in italic.

5.1.1.2 The GSOEP short scale for the assessment of LOC

The currently used GSOEP short scale was developed by Nolte (1996). It comprises two dimensions of LOC: the ILOC dimension is assessed with three items and the ELOC dimension is assessed with five items (cf. section 3.3). There are no negative items in the questionnaire. The complete text of the items is given in Table 9. In 2005, the scale is assessed with a seven-point-end-labeled-Likert response scale: (1) disagree completely (7) agree completely [German: (1) stimme überhaupt nicht zu; (7) stimme voll zu] (GSOEP, 2005).

Table 9 GSOEP items in English and German

	English	German
	Internal Locus of Control	Internale Kontrollüberzeugung
Item 1	How my life goes depends on me.	Wie mein Leben verläuft, hängt von mir selbst ab.
Item 4	One has to work hard in order to succeed.	Erfolg muss man sich hart erarbeiten.
Item 7	Inborn abilities are more important than any efforts one can make.	Wichtiger als alle Anstrengungen sind die Fähigkeiten die man mitbringt.
	External Locus of Control	Externale Kontrollüberzeugung
Item 2	What a person achieves in life is above all a question of fate or luck.	Was man im Leben erreicht, ist in erster Linie eine Frage von Schicksal oder Glück.
Item 3	I frequently have the experience that other people have a controlling influence over my life.	Ich mache häufig die Erfahrung, dass andere über mein Leben bestimmen.
Item 5	If I run up against difficulties in life, I often doubt my own abilities.	Wenn ich im Leben auf Schwierigkeiten stoße, zweifle ich oft an meinen Fähigkeiten.
Item 6	The opportunities that I have in life are determined by social conditions.	Welche Möglichkeiten ich im Leben habe, wird von den sozialen Umständen bestimmt.
Item 8	I have little control over the things that happen in my life.	Ich habe wenig Kontrolle über die Dinge, die in meinem Leben passieren.

Note. Taken from the household questionnaire “Living in Germany”, TNS Infratest, 2005, p. 30.

5.1.1.3 Statistical analyses

First, descriptive statistics of items and scale reliabilities (Cronbach’s Alpha) were calculated. Confirmatory factor analysis (CFA) was chosen in order to analyze the factorial structure of the GSOEP short scale that was assumed by its construction (cf. Nolte, 1996). A two-independent-factors model and a two correlated-factors model were investigated, and their fit indices were compared. The maximum likelihood robust (MLR) estimator, which is robust against violations of normality assumptions (cf. Lang, John, Lüdtke, Schupp, & Wagner, 2011), was chosen. Five fit indices were used to estimate the level of model fit. Schweizer (2010) proposed the first four of them: (1) The normed χ^2 , (2) the root mean square error of approximation (RMSEA), (3) the Bentler comparative fit index (CFI), and (4) the standardized root mean square residual (SRMR). In addition, (5) the parsimony of the model fit was estimated on

the basis of the Bozdogan Consistent Akaike Information Criterion (CAIC) (Byrne, 2001). Simplifying the evaluation of the model fit, the following cut-off values for the selected fit indices were regarded (cf. Byrne, 2001; Schweizer, 2010):

- (1) The normed χ^2 or χ^2 -ratio (proposed by Wheaton, Muthén, Alwin, & Summers, 1977) below 2 usually suggests a good model fit, and below 3 an acceptable model fit (cf. also Bollen, 1989).
- (2) As RMSEA is not related to an established probability distribution, it has the advantage of being usually associated with a 90 % confidence interval. RMSEA values less than .05 are usually found to indicate a good model fit and values less than .08 are indicative of an acceptable model fit (cf. Brown, 2006; Brown & Cudeck, 1993).
- (3) Values between .95 and 1.00 of the CFI indicate a good model fit, whereas values in the range of .90 to .95 signify an acceptable fit (cf. Bentler, 1990; Hu & Bentler, 1999).
- (4) The lowest acceptable value of SRMR is expected to stay below .10. SRMR below .08 is considered to indicate a good fit (cf. Hu & Bentler, 1999; Beauducel & Wittmann, 2005; Kline, 2005; Marsh, Hau, & Wen, 2004).
- (5) The decrease of CAIC coefficient is usually interpreted in the sense of the parsimony of the model fit (Byrne, 2001).

Missing data were handled by listwise deletion as their number did not exceed the threshold of 5% of the sample (Graham, Cumsille, & Elek-Fisk, 2003; Lüdtke, Robitzsch, Trautwein, & Köller, 2007). This yielded a total sample of 20,572.

5.1.2 Results

5.1.2.1 Descriptive statistics and reliability

Data are analyzed using Version 19.0 of the Statistical Package for Social Sciences (SPSS). Means, standard deviations, skewness and kurtosis as well as item-total correlations of the GSOEP short scale for the assessment of LOC are presented in Table 10. The ILOC subscale yields the following results: item means range from 4.95 to 6.06 (*SD* 1.09 to 1.37). Item means of the ELOC subscale range from 2.74 to 4.54 (*SD* 1.57 - 1.72), which is lower than those of the ILOC subscale. The difference of the total means of the ILOC subscale (5.48; *SD* .87) and ELOC subscale (3.49; *SD* 1.06) is significant ($t(20,571) = 210.39$ ($p < .001$); Cohen's $d = 1.47$) (cf. Cohen, 1988).

Apart from Item 4 with a negative skewness of 1.37, a normal distribution can be assumed for the items of the GSOEP short scale (Muthén & Kaplan, 1985). Item total correlations of the ILOC subscale range from .24 to .28. This results in scale reliability (Cronbach's Alpha) of .43. The ELOC scale, with five items, has a reliability of .65. In view of the extreme brevity of both subscales, the reliability coefficients of the subscales are corrected to an equal length of 10 items each using the Spearman-Brown formula (Brown, 1910; Spearman, 1910). The corrected reliability for the ILOC

subscale still remains lower (.69) than for the ELOC subscale (.79). Both subscales are found to be independent, having a negative correlation to each other of .10.

Table 10 Descriptive Statistics of the GSOEP short scale for the assessment of locus of control

	<i>M</i>	<i>SD</i>	Skew.	Kurt.	r_{it}
Internal Locus of Control					
Item 1	5.45	1.37	-0.84	0.44	.25
Item 4	6.06	1.09	-1.37	2.24	.28
Item 7	4.95	1.33	-0.31	-0.22	.24
<i>ILOC subscale</i>	<i>5.48</i>	<i>0.87</i>	<i>-0.36</i>	<i>0.23</i>	-
External Locus of Control					
Item 2	3.65	1.70	0.17	-0.81	.35
Item 3	3.13	1.72	0.44	-0.80	.43
Item 5	3.34	1.69	0.27	-0.90	.39
Item 6	4.54	1.51	-0.31	-0.36	.33
Item 8	2.74	1.56	0.75	-0.21	.49
<i>ELOC subscale</i>	<i>3.49</i>	<i>1.06</i>	<i>0.21</i>	<i>-0.10</i>	-

Note. ($N = 20,572$); Items are labeled with their numbers; M = mean, SD = standard deviation, Skew. = skewness, Kurt. = kurtosis, r_{it} = item-total correlation. Coefficients of subscales are in italic.

5.1.2.2 Factorial structure

Since the GSOEP scale is supposed to assess two dimensions (Nolte, 1996), a two-independent-factor model is calculated first. The fit indices of the model with two independent factors reveal a poor model fit ($\chi^2/df = 217.95$; RMSEA = .10 (90% CI = .10 to .11); CFI = .76; SRMR = .09; CAIC = 4534.02). In view of the modification indices and the theoretical postulation, subscales relatedness is modified in the next model – one with two correlated factors. Table 11 gives an overview of the fit indices of both models.

Table 11 Fit indices of estimated models of the GSOEP short scale for the assessment of locus of control

Model	χ^2/df	$\Delta\chi^2/df$	RMSEA (90% CI)	CFI	SRMR	CAIC
2 independent factors	217.95		.10 (.10 - .11)	.76	.09	4534.02
2 correlated factors	144.86	73.09	.08 (.08 - .09)	.85	.06	2938.14

Note. ($N = 20,572$); χ^2/df = normed; $\Delta\chi^2/df$ = normed χ^2 difference, RMSEA = Root Mean Square Error of Approximation, 90% CI = Confidence Interval for RMSEA, CFI = Comparative Fit Index, SRMR = Standardized Root Mean Square Residual, CAIC = Consistent Akaike Information Criteria.

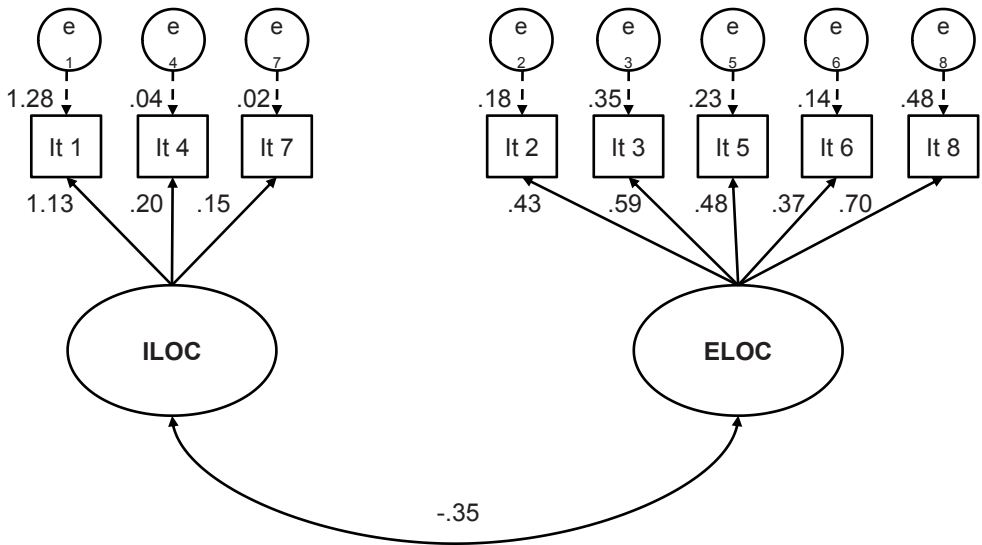


Figure 3 Confirmatory factor analysis, a model with two correlated factors of the GSOEP short scale for the assessment of locus of control. Completely standardized robust maximum likelihood parameter estimates. ILOC = Internal Locus of Control, ELOC = External Locus of Control, It = item. Large ovals represent latent factors (subscales), rectangles stay for the manifest variables (items), and the residual terms are indicated in round elements.

With regard to these fit indices, none of the models could be accepted. However the model with two correlated latent factors reveals significant change ($\Delta\chi^2/df = 73.09$) in fit indices ($\chi^2/df = 144.86$; RMSEA = .08 (90% CI = .08 to .09); CFI = .85; SRMR = .06; CAIC = 2938.14) comparing to the model with the two independent factors. The standardized regression weights and multiple squared correlation coefficients for the manifest variables of the model with two correlated factors are presented in Figure 3.

The factor analysis presented in Figure 3 signifies further psychometric problems with regard to the ILOC subscale: an ultra-Heywood case for Item 1 (1.13) and low coefficients of standardized regression weights of Items 4 (.20) and 7 (.15) on the latent factor (cf. Brown, 2006). Furthermore, the variance of three from the total of eight manifest variables in the model is explained to a small extent, namely Item 4 (.04), Item 7 (.02) of the ILOC subscale, and Item 6 (.14) of the ELOC subscale.

The psychometric analysis of the KMKB scales is presented in the next section.

5.2 The KMKB

5.2.1 Method

5.2.1.1 Sample

The questionnaire is validated based on a Family Survey 2000 conducted by DJI. The KMKB is used in an extended sample of German households with adoptive children (DJI, 2000). Households are selected using multi-stage random sampling and all members of each selected household have been asked to participate. The socio-demographic composition of the Family Survey 2000 for the total sample ($N = 10,318$) and for males ($N = 4,629$) and females ($N = 5,689$) separately is given in Table 12. Here, too, the total sample was grouped according to the four age groups representing the major life episodes of the German population and the three levels of the secondary education (cf. section 5.1.1.1). The age of the participants of the present sample ranges from 16 to 69 years with a mean age of 38.6 (SD 11.8) for the total sample, 38.7 (SD 12.2) for males, and 38.6 (SD 11.5) for females, respectively. In the present sample participants have 9.2 (SD 1.5) mean years of schooling for the total sample, 9.2 (SD 1.5) for males, and 9.24 (1.4) years for females.

Table 12 Socio-demographic characteristics of the Family Survey 2000

	Total sample		Males (<i>N</i> = 4,629; 44.9 %)		Females (<i>N</i> = 5,689; 55.1 %)	
	Freq.	%	Freq.	%	Freq.	%
Age						
16-25 years	1,737	16.8	846	18.3	891	15.7
26-45 years	5,385	52.2	2,276	49.2	3,109	54.6
46-65 years	3,005	29.1	1,415	30.6	1,590	27.9
> 65 years	70	0.7	26	0.6	44	0.8
n.a.	121	1.2	66	1.4	55	1.0
<i>M_{age}</i> (<i>SD</i>)	<i>38.6</i>	<i>(11.8)</i>	<i>38.7</i>	<i>(12.2)</i>	<i>38.6</i>	<i>(11.5)</i>
Level of education¹						
Low	7,837	76.9	3,459	75.8	4,378	77.7
Middle	357	3.5	172	3.8	185	3.3
High	1,818	17.8	839	18.5	979	17.4
n.a.	185	1.8	39	2.0	92	1.6
<i>M_{years of schooling}</i> (<i>SD</i>)	<i>9.2</i>	<i>(1.5)</i>	<i>9.2</i>	<i>(1.5)</i>	<i>9.2</i>	<i>(1.4)</i>
Total	10,318	100	4,629	100	5,689	100

Note. (*N* = 10,318); Freq. = absolute frequencies, % = relative frequencies, n.a. = not applicable, *M* = mean, *SD* = standard deviation; ¹low level of education = no secondary school qualification or qualification after 9 years at school; intermediate level of education = secondary school qualification after 10 years schooling; high level of education = university/university of applied sciences entrance qualification after up to 13 years of schooling. Mean values are in italic.

5.2.1.2 The KMKB

The KMKB scales have been developed according to the theoretical background of Rotter's social learning theory (cf. Jakoby & Jacob, 1999; see also section 3.4 of the present thesis). The KMKB also consist of two subscales: both ILOC and ELOC dimensions comprise tree items. The German items and the English translation of the KMKB are given in Table 13. All items of the scales are positive.

Table 13 KMKB items in English and German

	¹ English	German
	Internal Locus of Control	Internale Kontrollüberzeugung
Item 1	I like taking responsibility	Ich übernehme gerne Verantwortung
Item 2	I find it best to make decisions myself, rather than to rely on fate	Es hat sich für mich als gut erwiesen, selbst Entscheidungen zu treffen, anstatt mich auf das Schicksal zu verlassen
Item 3	When I encounter problems or opposition, I usually find ways and means to overcome them	Bei Problemen und Widerständen finde ich in der Regel Mittel und Wege um mich durchzusetzen
	External Locus of Control	Externale Kontrollüberzeugung
Item 4	Success often depends more on luck than on effort	Erfolg ist oft weniger von Leistung, sondern vielmehr von Glück abhängig
Item 5	I often have the feeling that I have little influence over what happens to me	Ich habe häufig das Gefühl, das ich wenig Einfluß darauf habe, was mit mir geschieht.
Item 6	When I make important decisions, I often look at what others have done	Bei wichtigen Entscheidungen orientiere ich mich oft an dem Verhalten von anderen.

Note. ¹B. Rammstedt, personal communication, September 9, 2009.

The KMKB have a five-point Likert response scale ranging from the positive to the negative pole. The answer categories are labeled: (1) applies to me to a very great extent (2) applies to me to a great extent, (3) applies to me to some extent, (4) hardly applies to me at all, and (5) does not apply to me at all [German: (1) stimme sehr zu; (2) stimme eher zu; (3) teils-teils; (4) stimme eher nicht zu; (5) stimme überhaupt nicht zu].

5.2.1.3 Statistical analyses

Descriptive statistics were calculated and compared with the initially reported coefficients. Some researchers have pointed out that judging the reliability according to the method of Cronbach's Alpha may be misleading when calculated on scales with a small number of items (Kline, 2000; Wood & Hampson, 2005). Hancock (2001) suggested an alternative method to calculate standardized measures of effect size for latent mean differences inferred both from Structured Means Model (SMM, Sörbom, 1974) and derivatives of Multiple Indicator Multiple Cause model (MIMIC, Jöreskog & Goldberger, 1975; Muthén, 1989) approaches. Using the CFA algorithm he suggests an approach that helps to facilitate the post-hoc analysis of the homogeneity of manifest variables (Hancock, 1997, 2001). In particular, in the case of extremely

short scales comprising three items or less, in which Cronbach's Alpha is not as reliable as in the case of longer scales and sometimes is even not possible to apply (e.g., on the very brief measures with only two items per dimension), Hancock's *H* is one of the ways to determine the reliability coefficient. Hence, two methods are used to distinguish the subscale reliabilities: Cronbach's Alpha and Hancock's *H*.

Jakoby and Jacob (1999) assume the independence of both subscales because the Principle Component Analysis (PCA) with VARIMAX rotation was chosen for construction and validation of the scale. The authors also report a sufficient correlation of both subscales ranging from .36 to .38. Here, too, CFA was chosen to confirm these assumptions and to test the factorial validity of the KMKB. Two models were estimated: a two-independent-factors model and a two correlated-factors model, and their fit indices were compared. The MLR estimator was also used, and the level of model fit was determined according to the five indices defined in section 5.1.1.3. The replication of the reported correlation with the educational level was carried out for the purpose of comparison (cf. Jakoby & Jacob, 1999).

Missing data were handled by listwise deletion since the number of them fell below 5% (Graham et al., 2003; Lüdtke et al., 2007). This yielded a sample of 10,030.

5.2.2 Results

5.2.2.1 Descriptive statistics and reliability

Means, standard deviations, skewness, kurtosis, and item-total correlations of the KMKB items are presented in Table 14.

Table 14 Descriptive Statistics of the KMKB items

	<i>M</i>	<i>SD</i>	Skew.	Kurt.	r_{it}
Internal Locus of Control					
Item 1	2.00	0.93	0.66	-0.10	.55
Item 2	1.76	0.84	0.98	0.64	.63
Item 3	2.01	0.86	0.50	-0.24	.57
<i>ILOC subscale</i>	<i>1.93</i>	<i>0.72</i>	<i>0.63</i>	<i>0.22</i>	-
External Locus of Control					
Item 4	3.26	1.07	-0.22	-0.45	.41
Item 5	3.65	1.09	-0.58	-0.27	.51
Item 6	3.73	1.01	-0.46	-0.34	.41
<i>ELOC subscale</i>	<i>3.54</i>	<i>0.79</i>	<i>-0.36</i>	<i>0.17</i>	-

Note. ($N = 10,030$); Items are labeled with their numbers, *M* = mean, *SD* = standard deviation, Skew. = skewness, Kurt. = kurtosis, r_{it} = item-total correlation. Coefficients of subscales are in italic.

The means of the ILOC subscale range from 1.76 to 2.01 (*SD* 0.84 to 0.93). The means of the ELOC subscale are higher, ranging from 3.26 to 3.73 (*SD* 1.01 to 1.09). Here the difference in the total mean scores of the subscales is also significant ($t(10,029) = 152.65$ ($p < .001$); Cohen's $d = 2.14$). The values of skewness and of kurtosis indicate that normal distribution can be assumed for all items of the KMKB (Muthén & Kaplan, 1985). The item-total correlations of both subscales range from .41 to .63.

Jakoby and Jacob (1999) report descriptive statistics only in the form of the relative frequencies of the response categories. For the purpose of the comparison of the present descriptive statistics with those reported in the literature (cf. Jakoby & Jacob, 1999), the relative frequencies of response categories were also calculated. The average reported frequencies of both initial studies by Jakoby and Jacob (1999) and the frequencies of the present data are given in Table 15. Reporting the validity of the KMKB items, Jakoby and Jacob (1999) note that the middle point of the response scale (3) is more frequently used in the case of the ELOC subscale. Looking at the value of the frequency coefficients, this finding is supported only in the case of Item 4. However, comparing the present coefficients with the average of those reported by Jakoby and Jacob, no significant deviance for the KMKB items could be found ($\chi^2 = 870$, $df = 841$, $N = 30$). Hence, it can be assumed that the descriptive statistics of the KMKB arrived at in the present study are to a large extent similar to those reported by Jakoby and Jacob (1999).

Cronbach's Alpha and Hancock's H (Hancock, 2001) are calculated in order to analyze the reliability of the KMKB subscales. The reliability coefficients of the present study and those reported by Jakoby and Jacob are given in Table 16.

Table 15 Relative frequencies of the response categories of the KMKB.

	Likert scale				
	1	2	3	4	5
Item 1	35.40 / 24.65	35.80 / 37.35	23.00 / 28.45	04.80 / 07.80	01.00 / 01.75
Item 2	46.00 / 38.20	35.90 / 42.00	15.00 / 16.50	02.50 / 02.90	00.60 / 00.45
Item 3	31.10 / 26.05	41.00 / 43.05	23.90 / 26.70	03.50 / 03.60	00.50 / 00.55
Item 4	06.40 / 08.75	15.20 / 25.55	36.90 / 37.55	28.40 / 21.25	13.10 / 06.90
Item 5	04.40 / 05.45	10.10 / 18.83	25.50 / 28.55	35.70 / 31.05	24.30 / 16.15
Item 6	02.30 / 05.05	08.50 / 19.65	29.30 / 34.75	34.00 / 28.40	25.90 / 12.10

Note. Relative frequencies calculated on the data of the Family Survey 2000 are presented before the slash ($N = 10,030$), the average mean of the frequencies reported in the initial studies (Jakoby & Jacob, 1999, p. 66) are after the slash.

Table 16 Reliability of the KMKB subscales

Reliability	Internal Locus of Control	External Locus of Control
¹ Sample of 1995 (Cronbach's Alpha; $N = 2,979$)	.70	.58
¹ Sample of 1996 (Cronbach's Alpha; $N = 3,132$)	.62	.64
² Sample of 2000 (Cronbach's Alpha; $N = 10,030$)	.76 (.91) ³	.60 (.85) ³
² Sample of 2000 (Hancocks's H ; $N = 10,030$)	.77	.64

Note. ¹Jakoby & Jacob, 1999, p.67; ²Kovaleva, Beierlein, Kemper, & Rammstedt, 2010; ³corrected Cronbach Alpha to 10 Items according to the Spearman-Brown formula.

Both subscales have Cronbach's Alpha coefficients comparable to those reported by Jakoby and Jacob (Jakoby & Jacob, 1999), namely .76 and .60 for ILOC and ELOC, respectively. Hancock's H (Hancock, 2001) yielded reliability coefficients of .77 for the ILOC- and .64 for the ELOC subscale. For means of comparison of the present results with the reliability of the GSOEP short scale, correction of the reliability coefficients for the extension of the subscales to 10 items per subscale are calculated using the Spearman-Brown formula (Brown, 1910; Spearman, 1910). This results in a reliability of .91 for the ILOC- and .85 for the ELOC subscale.

5.2.2.2 Factorial structure

CFA is performed to confirm the factorial structure of the KMKB. The goodness of the model's fit is assessed using the same indices as those employed in connection with the analysis of the findings of GSOEP short scale (cf. section 5.1.1.3). In view of the fact that the initial validation (Jakoby & Jacob, 1999) is based on a Principle Component Analysis (PCA) with the orthogonal rotation (VARIMAX), a two-independent-factors model is calculated first (Table 17). However, the fit indices indicate the poor fit of this model ($\chi^2/df = 457.69$; RMSEA = .13 (90% CI = .12 to .13); CFI = .88; SRMR = .14; CAIC = 1571.77).

Table 17 Fit indices of estimated models of the KMKB

Model	χ^2/df	$\Delta\chi^2/df$	RMSEA (90% CI)	CFI	SRMR	CAIC
2 independent factors	457.69		.13 (.12 - .13)	.88	.14	1571.77
2 correlated factors	30.87	426.82	.06 (.05 - .06)	.98	.03	379.79

Note. ($N = 10,030$); χ^2/df = normed; $\Delta\chi^2/df$ = normed χ^2 difference, RMSEA = Root Mean Square Error of Approximation, 90% CI = Confidence Interval for RMSEA, CFI = Comparative Fit Index, SRMR = Standardized Root Mean Square Residual, CAIC = Consistent Akaike Information Criteria.

An improvement in the fit indices ($\Delta\chi^2/df = 426.82$) was found after allowing the correlation of both latent variables. The model with two correlated factors yields a good fit ($\chi^2/df = 30.87$; RMSEA = .06 (90% CI = .05 to .06); CFI = .98; SRMR = .03; CAIC = 379.79). Both factors have negative covariance of .48 (Figure 4).

Figure 4 shows the details of the model with two correlated factors. The multiple squared correlation coefficients of the variables range from .24 to .64. The resulting standardized parameter estimates range from .65 to .80 and from .41 to .56 for the ILOC and ELOC subscales, respectively. However, the orthogonal structure of both dimensions assumed and reported by Jakoby and Jacob (1999) cannot be confirmed.

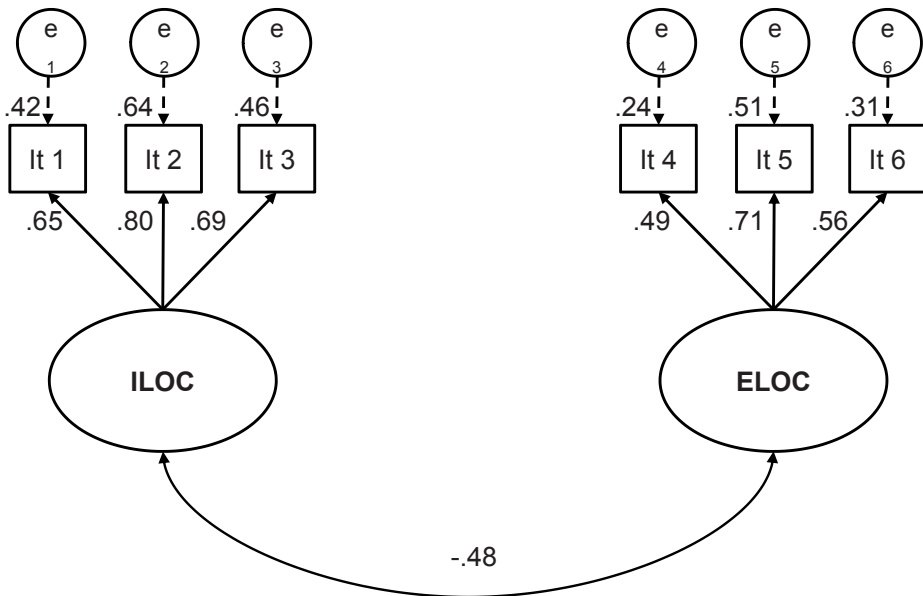


Figure 4 Confirmatory factor analysis, a model with two correlated factors of the KMKB. Completely standardized robust maximum likelihood parameter estimates. ILOC = Internal Locus of Control, ELOC = External Locus of Control, It = item. Large ovals represent latent factors (subscales), rectangles stay for the manifest variables (items), and the residual terms are indicated with dotted arrows.

5.2.2.3 Criteria validity

The authors of the KMKB have already drawn attention to the low coefficients of criteria validity (Jakoby & Jacob, 1999). The educational level of participants is one of the criteria reported by Jakoby and Jacob (1999). The Spearman correlation of both subscale scores with the educational level of participants in the Family Survey is calculated, and the attenuation correction of the coefficients is undertaken. The resulting coefficients are presented in Table 18 together with the coefficients reported by

Jakoby and Jacob (1999). Although some of my psychometric coefficients are higher than those reported by Jakoby and Jacob, the coefficients of the criteria validity are found to be even lower. Since the response scale (Jakoby & Jacob, 1999) has a reverse answering mode, the correlation coefficients are reversed when reporting criteria validity in Table 18 in order to maintain the plausibility of the findings.

Table 18 Criteria validity of the KMKB

Level of secondary education	Internal Locus of Control	External Locus of Control
¹ Sample of 1995 (<i>N</i> = 2,979)	.25	-.27
¹ Sample of 1996 (<i>N</i> = 3,132)	.27	-.22
² Sample of 2000 (<i>N</i> = 10,030)	.15	-.13

Note. ¹Coefficients are taken from Jakoby and Jacob (1999) p.67. ²Kovaleva et al., 2010

5.3 Comments on the analyses of the psychometric properties

The first step in the empirical part of this thesis investigated the psychometric quality of two scales constructed by survey researchers. This analysis was aimed to determine the psychometric properties of the scales and to provide an adequate measure for the validation of the scale that is to be developed in this thesis – the IE-4.

The analysis of the GSOEP short scale revealed three psychometric problems only in the case of the ILOC subscale: (1) high item means of the ILOC subscale suggest a ceiling effect in data-gathering, i.e. the psychological construct is poorly measured and estimated (2) the coefficients of the item-total correlation are low, and (3) even, after the Spearman-Brown correction the reliability remains under .70. Moreover, CFA analysis revealed an ultra-Haywood case for Item 1 of the ILOC subscale. The lack of the common variance in the subscale may be one of the possible explanations for this problematic result with regard to communality (Brown, 2006, p. 71; see also Chen, Bollen, Paxton, Curran, & Kirby, 2001). Two different models were calculated: a two-correlated-factors model and a two-independent-factors model. The fit indices revealed the poor fit of both models, none of which could be accepted. However, the model with two correlated factors yielded the better fit than the model with two independent factors.

The initial validation of the KMKB by Jakoby and Jacob (1999) is to a large extent supported by the present analysis. The analysis of descriptive statistics yielded results comparable to those of Jakoby and Jacob (1999), and both subscales display good reliabilities. However, the initially postulated structure of two independent factors could not be supported by the CFA. The model with the two correlated latent dimensions yielded a good fit, and was significantly better than the model with two independent factors proposed by Jakoby and Jacob (1999). However, the degree of

criteria validity in the case of different levels of education, which was reported by the authors in the initial validation study, could not be achieved. The specificity of a sample comprised of families with adoptive children might be an explanation for these findings in regard to the level of education.

In sum, the KMKB are found to provide data with normal distribution, good reliability and clear factorial structure. None of these psychometric criteria can be supported in the case of the GSOEP short scale. The model with two-correlated-factors of the KMKB scales is supported with good fit indices and is proved to be well replicated. These findings are important for the research aim of the present thesis and are in line with the contemporary psychometrical works evidencing that extremely short scales are able to provide reliable and valid data in big samples (cf. Scott et al., 2009; Thomas & Bremer, 2011). Moreover, the two-dimensional structure of LOC is clearly supported with the empirical data.

Surveys usually operate under strict time and monetary constraints which come through methodological peculiarities of the survey research situation: A usual survey collects data for a total scientific community and is comprised of numerous independent and dependent variables that are summarized under main topics of a survey. For example, the German General Social Survey (GGSS [German: Allgemeine Bevölkerungsumfrage der Sozialwissenschaften – ALLBUS]) is a biennial survey that has been conducted since 1980 on the attitudes, behavior, and social structure of persons resident in Germany. In its first wave the GGSS 1980 already had 10 main research topics. Moreover, the number of main research topics has increased in the life-time of the GGSS from 8-10 in 1980-1990 to 11-14 in 2000-2010. However, contrary to the increasing number of topics, an average assessment time remains of 70 minutes (cf. Diekmann et al., 2010; Wasmer, Scholz, & Blohm M., 2010). Operating with numerous research variables simultaneously, survey researchers often face the problem of high unit and item non-response by long questionnaires (cf. Janik & Kohaut, 2011; Lipps, 2007).

In regard to this extreme parsimony, the present analysis reveals that a scale with six items provides data of better psychometric quality and is more efficient than a scale with eight items. Nevertheless three items per dimension are still not the most efficient way of measuring (cf. Scott et al., 2009; Thomas & Bremer, 2011). The aimed construction of a two dimensional four-item scale is described in the following sections.

6 Step 2: A new item pool

The first version of a new item pool was developed based on the established LOC scales (e.g., the IPC scale, Krampen 1981a, Levenson, 1972, Mielke, 1979; the items of I, P, and C subscales of the FKK scale, Krampen 1991; the ROT-IE scale, Rost-Schaude et al., 1975, Rotter, 1966). The phrases embodying the working definition the most were selected from the items of the questionnaires for further revision. In regard to the theoretical background and working definition, four crucial aspects were crystallized for the present operationalization of LOC: (1) the expectancy or personal belief to have control over life events and (2) the expectancy of a contingency between one's efforts and the results achieved were regarded to be core constructs of the ILOC dimension (cf. Rotter, 1954; 1966); (3) the expectancy that the external force of powerful others and (4) the force of chance or fate controls attainment of a reinforcement were important components for the operationalization of the ELOC dimension (cf. Levenson, 1972, 1973a, 1973b; Krampen, 1979, 1981b; Mielke, 1979). The first version of a new item pool was prepared. It comprised 20 items – ten expressions for the measurement of ILOC and ten for the assessment of ELOC. Regarding the revision of the IPC items in the further work of Krampen (1991) all items of this pool were free from situational context. In view of the further revision and modification of the item pool the semantic redundancies were tolerated at this stage, as were stylistically awkward sentences.

The first semantic reduction on the basis of item content was then undertaken. The initial item pool of 20 items was discussed in a team of three psychologists in order to reduce the semantic redundancies and to improve fluency of the expressions. The three criteria for the first semantic item-selection were:

- (1) avoidance of words denoting quantity and quality because respondents find words such as 'always' [German: immer], 'never' [German: nie] or 'sometimes' [German: ab und zu] confusing (Faulbaum, Prüfer, & Rexroth, 2009)
- (2) fluency – colloquial expressions were given preference over grammatically and semantically well-structured ones in order to avoid cognitive overload in the respondents and response bias caused by fatigue or boredom (cf. Porst, 2008)
- (3) short sentences were favored over longer ones with the same content in order to avoid subjecting respondents to cognitive overload (cf. Porst, 2008).

Table 19 The initial item pool

N (Scale)	English	German
N1 (ELOC)	Chance determines what happens in my life.	Was in meinem Leben passiert, hängt vom Zufall ab.
N2 (ILOC)	Whether I am well or not mostly depends on me.	Ob es mir gut geht, hängt vor allem von mir selbst ab.
N3 (ELOC)	I never plan in advance because things can always turn out differently than expected.	Ich plane nichts im Voraus, weil doch alles anders kommen kann.
N4 (ILOC)	I am successful only because of my own efforts and involvement.	Erfolg habe ich nur, weil ich mich selbst anstrengte und einsetze.
N5 (ILOC)	How many friends I have depends on me.	Wie viele Freunde ich habe, hängt von mir selbst ab.
N6 (ELOC)	My life is largely determined by others.	Mein Leben wird zum großen Teil von anderen bestimmt.
N7 (ILOC)	Whether or not I can fulfill my plans depends on my own behavior.	Ob ich meine Pläne verwirklichen kann, hängt von meinem Verhalten ab.
N8 (ELOC)	I often feel that important decisions in my life are taken by others.	Ich habe oft das Gefühl, dass andere in meinem Leben entscheiden.
N9 (ILOC)	I'm my own boss.	Ich habe mein Leben selbst in der Hand.
N10 (ELOC)	Fate often gets in the way of my plans.	Meine Pläne werden oft vom Schicksal durchkreuzt.

Note. N = fixed item number of the initial item pool. English translation was done by two translators working independently of each other.

In this way, the pool was reduced from 20 to ten items. The ten selected items are presented in English and German in Table 19. The items for the ILOC and ELOC dimensions are mixed. Each item has a fixed item number (N), which is given in the first column of the table. The fixed item numbers will be used hereafter in the text and the tables as fixed item tags.

The semantic and grammatical reduction is followed by empirical reduction and modification. This entails two kinds of empirical work: (1) the selection of the best four items on the basis of descriptive statistics, item-total correlations, and item loadings to their target factor using the data of an occasional student sample; and (2) testing the items' content in cognitive interviews for the possible response bias known in connection with the different levels of education.

7 Step 3: Construction of the IE-4

Proponents of survey evaluation have long advocated the integration of qualitative and quantitative methodologies, i.e. a combination of cognitive interviews with empirical pilot studies (cf. Sudman, Bradburn, & Schwarz, 1996; Wills, 2005). Usually cognitive interviews are the first part and a pilot testing the second in when developing a questionnaire (cf. Faulbaum et al., 2009; Porst, 2008; Sudman et al., 1996). Usually cognitive interviews are expected to distinguish and correct most of the semantic, stylistic and content awkwardness of the new constructed questionnaires. Cognitive interviews are also focused on suggesting better syntactic structures for items, in order to avoid response bias known in connection with low level of education (cf. Faulbaum et al., 2009; Porst, 2008). Nevertheless, two peculiarities of the present study allow me to conduct cognitive interviews parallel to the pilot study: (1) Regarding the fact that the initial item pool is based on the items of the established and sufficient validated questionnaires assessing LOC and already reduced for semantic, stylistic and content awkwardness to ten items, the changes in semantic structure of items are not expected. (2) The student sample is recruited for the pilot study, i.e. response bias which is known in connection with low level of education is also not expected. Additionally, the fact that both the ROT-IE and the IPC cannot provide clear factorial structure prompts the priority of the empirical analysis by the construction of a new questionnaire. In this empirical step of the thesis, I use qualitative and quantitative techniques complemented to each another, i.e. findings of cognitive interview complement the results of psychometric and factor analyses.

Hence, the ten-item pool is to be reduced and the best set of four items is to be selected in a pilot study and cognitive interviews. On the one hand, the ten-item set is administered to a student sample ($N = 201$). The selection of the items with the best psychometric properties is carried out on the basis of descriptive statistics and item-total correlations that are calculated using the algorithm of homogeneity coefficients (Cronbach's Alpha). Exploratory Factor Analysis (EFA) is conducted in order to reduce the item pool to four items, taking into account the working definition of LOC and the resulted factor loadings.

On the other hand, parallel to the pilot study the same set of ten items is tested in cognitive interviews (sample stratified according the distribution of gender, age, and education in the German population, $N = 20$) in order to prove the comprehensibility of the item syntax, especially for respondents with a low level of education.

7.1 Pilot study: a psychometric evaluation

7.1.1 Method

7.1.1.1 Sample

A total of $N = 201$ (68.7% females) completed the questionnaire. The distribution of gender and age are given in Table 20.

Table 20 Socio-demographic characteristics of the student sample

	Total sample		Males ($N = 63$; 31.3 %)		Females ($N = 138$; 68.7 %)	
	Freq.	%	Freq.	%	Freq.	%
Age						
18-29 years	185	92	53	93	130	94.2
30-45 years	16	7	10	7	8	5.9
M_{age} (SD)	22.85	(3.76)	23.6	(3.75)	22.54	(3.94)
University semester						
1-6 (Bachelor students)	183	91.1	55	87.8	127	92.3
7-11 (Master students)	18	8.9	8	12.2	11	7.7
Total	201	100	63	100	138	100

Note. ($N = 201$); Freq. = absolute frequencies, % = relative frequencies, M = mean, SD = standard deviation. Mean values are in italic

As all participants had a general university entrance qualification, i.e. all participants belong to the group of a high level of secondary education differentiated in section 5.1.1.1, the distribution of the level of education was omitted in Table 20. Age of the participants ranges from 18 to 45, with a mean age of 22.85 years (SD 3.76). At the time of assessment, 91.1 % of participants were enrolled in Bachelor courses, 8.9% were in Master courses.

7.1.1.2 Procedure

The ten items were administered to an occasional student sample. The paper-and-pencil questionnaires were distributed at seminars and lectures at the Department of Biology Didactics of Bielefeld University and the Department of Pedagogical Psychology of Frankfurt University. Participation was voluntary in all cases. A written instruction was used to achieve test objectivity. No specific information about the content of the questionnaire was given. Participants were asked to rate with the help

of a one-dimensional, five-point fully-labeled Likert scale the extent to which ten statements apply to them. The response scale was developed according to the recommendations of Rohrmann (1978). According to Rohrmann (1978), the semantic labels taken for the response scale built the interval scale in the German language. The following verbal labels were used: (1) doesn't apply at all; (2) applies a bit; (3) applies somewhat; (4) applies mostly; (5) applies completely [German: trifft gar nicht zu; trifft wenig zu; trifft etwas zu; trifft ziemlich zu; trifft voll und ganz zu].

7.1.1.3 Statistical analyses

Descriptive statistics, skewness, kurtosis, and item-total correlations provided the first empirical information on the psychometric properties of the ten items. At first, the items were selected according to the normal distribution of the answers and sufficient item-total correlation. Further reduction was done according to Exploratory Factor Analysis (EFA). In line with previous findings reported in Chapter 5, a two-factorial structure was expected. This assumption was to be proved by means of EFA with an oblique rotation algorithm. The Maximum Likelihood Robust (MLR) estimator was chosen. It is not only robust against violations of normality assumptions (cf. Lang et al., 2011) but also allows conservative estimation of the factor loadings. Following Marsh et al. (2010, p. 475), an oblique geomin rotation with an epsilon value of .5 (cf. Asparouhov & Muthén, 2009) was employed. The oblique rotation was preferred because not only do my own findings show a correlation between the ILOC and ELOC dimensions (cf. Chapter 5), but also because the results associated with the IPC scale revealed a correlation of ILOC and ELOC dimensions (cf. Levenson, 1972; Krampen, 1979, 1991). The selection of the four-item set was done on the basis of the factor loading coefficients and the theoretical background. The four core components of the theoretical background are summarized in the working definition employed in the present thesis (section 2.3) and are pointed out in Chapter 6. Missing values were handled by listwise deletion, which yielded a total sample of 199 participants.

7.1.2 Results

7.1.2.1 Descriptive statistics and reliability

The descriptive statistics and item-total correlations of the ten items are given in Table 21. The means of the items assessing the ILOC dimension are found to be consistently higher (ranging from 3.93 to 3.86; total mean 3.89, *SD* 0.91) than those of the items of the ELOC dimension (ranging from 2.07 to 2.62, with total mean of 2.34, *SD* 1.06). Here a significant difference in means of ILOC and ELOC scales is also found ($t(198) = 15.65$ ($p < .001$); Cohen's $d = 1.53$). The skewness of the internality items ranges from $-.54$ to $-.82$ (mean $-.72$). Although the coefficients of skewness and kurtosis of ILOC and ELOC scales indicate no severe violation of normal distribution (cf. Muthén & Kaplan, 1985, 1992).

Item homogeneity is assessed with the help of Cronbach's Alpha. The item-total correlation enables me to delete the items that contributed the least to the common variance. The Cronbach's Alpha of the 5-item ILOC subscale was .61; Item N7 (Whether or not I can fulfill my plans, depends on my own behavior. [German: Ob ich meine Pläne verwirklichen kann, hängt von meinem Verhalten ab.]) has the lowest item-total correlation of .28. Item N7 is intended for covering the aspects of functionality of behavior in respect of results achieved. The same intention is behind Item N4 (I am successful only because of my own efforts and involvement. [Erfolg habe ich nur, weil ich mich selbst anstrenge und einsetze.]) The aspect of contingency between one's efforts and the results achieved is still covered by the scale even after deletion of Item N7. Deletion of Item N7 does not impact the level of the reliability coefficient, which remains at .61 in the present four-item subscale for internality. After the deletion of N7 the mean item-total correlation became .40.

Table 21 The descriptive statistics of the initial item pool

	<i>M</i>	<i>SD</i>	Skew.	Kurt.	r_{it}	$r_{it /after del}$
Internal Locus of Control						
N2	3.93	1.01	-0.76	0.02	.45	.39
N4	3.87	0.85	-0.73	0.69	.44	.42
N5	3.86	0.98	-0.77	0.23	.38	.38
N7	3.88	0.83	-0.54	0.20	.28	-
N9	3.93	0.90	-0.82	0.72	.39	.42
<i>Mean</i> ¹	<i>3.89</i>	<i>0.91</i>	<i>-0.72</i>	<i>0.37</i>	<i>.38</i>	<i>.40</i>
External Locus of Control						
N1	2.62	1.16	0.43	-0.53	.33	.29
N3	2.28	1.01	0.63	0.08	.22	-
N6	2.07	1.00	0.91	-0.59	.42	.42
N8	2.15	1.05	0.91	0.43	.29	.39
N10	2.57	1.08	0.21	-0.67	.36	.32
<i>Mean</i>	<i>2.34</i>	<i>1.06</i>	<i>0.62</i>	<i>0.46</i>	<i>.32</i>	<i>.36</i>

Note. ($N = 199$); Items are labeled with their fix number, M = mean, SD = standard deviation, Skew. = skewness, Kurt. = kurtosis, r_{it} = item-total correlation, $r_{it/after del}$ = item-total correlation after deletion of item N7 and N3; ¹ absolute skewness and kurtosis are in the row with mean values. Mean values are in italic.

The five-item ELOC subscale is more heterogeneous than the ILOC subscale as far as it intended to cover aspects of power of Powerful Others and Chance (cf. Chapter

6). Hence, the low level of Cronbach's Alpha of .57, with Item N3 (I never plan in advance because things can always turn out differently than expected. [German: Ich plane nichts im Voraus, weil doch alles anders kommen kann.]) sharing the least part of the common variance with the other items (.22). Here, too, Item N10 embodies the aspect of the power of unexpected forces (e.g., fate; cf. Levenson, 1972) over one's plans (Fate often thwarts my plans. [German: Meine Pläne werden oft vom Schicksal durchkreuzt.]). After the deletion of N3, Cronbach's Alpha remains .57. The deletion of N3 resulted in a higher mean item-total correlation of .36 for the ELOC subscale.

7.1.2.2 Factorial structure

The factorial structure is investigated using Exploratory Factor Analysis (EFA) with oblique rotation. EFA analysis is conducted using *Mplus* applications (Version 5.2; Muthén & Muthén, 2008). The EFA model encompasses two latent factors and eight manifest indicators in total. Two factors with an eigenvalue over 1 have been extracted. The first five eigenvalues are 2.2; 1.6; .96; .82; .76. Parallel analysis suggested by Horn (1965), and a MAP-test (cf. O'Connor, 2000) support the two-factor structure. Fit indices also reveal a good fit of the two factor model ($\chi^2/df = 1.58$; RMSEA = .05 (90% CI = .00 to .06); CFI = .96; SRMR = .04; CAIC = 388.57). Both latent factors have a negative covariance of .54.

Table 22 Exploratory factor analysis, completely standardized factor loadings of the 8 Items of initial item pool

	Item	Factors	
		ILOC	ELOC
N2	Whether I am well or not mostly depends on me.	.45	-.08
N4	I am successful only because of my own efforts and involvement.	.57	.05
N5	How many friends I have, depends on me.	.52	.03
N9	I'm my own boss.	.58	-.08
N1	Chance determines what happens in my life.	-.16	.30
N6	My life is largely determined by others.	.05	.72
N8	I often feel that important decisions in my life are taken by others.	-.05	.70
N10	Fate often gets in the way of my plans.	-.14	.36

Note. ($N = 199$); N = fixed item number of the initial item pool. MLR estimator, geomin rotation. Loadings over .30 in bold print.

The geomin rotated completely standardized item-loadings are presented in Table 22, with the loadings over .30 in bold print. The item loadings can be clearly interpreted in terms of the simple structure. Items of the ILOC dimension load over .30

into one factor, which can be interpreted as ILOC. Items of the ELOC dimension also load at .30 or over .30 into another factor, which is interpreted as ELOC. There is no secondary loading over .20. Hence, two factors are clearly interpretable in terms of the ILOC and ELOC dimensions.

Items N4 and N9 load highest on the ILOC factor (.57 and .58, respectively). They transmit the two core ideas of internality contained in the working definition employed in this thesis, namely that *individuals have control over their own life events* (N9) and that *there is a contingency between one's efforts and the results achieved* (N4) (cf. section 2.3 and Chapter 6). Items N4 and N9 were selected to represent the ILOC dimension in the IE-4.

Items N6 and N8 had the highest loadings in the ELOC dimension, namely .72 and .70, respectively. Nevertheless, they both accentuate the idea that *the external force of powerful others influences life events*. In line with the working definition of ELOC Item N10 loading on the ELOC factor with .36 captured the second important part of the dimension, namely that *power of chance controls attainment of a reinforcement* (cf. Levenson, 1972, 1973a; Krampen, 1979, 1981a; Mielke, 1979). With a view to covering as much of the broadness of the externality dimension as possible, items N6 and N10 were retained to represent the ELOC dimension in the IE-4.

7.1.3 Comments on the pilot study

The pilot study began with a pool of ten items. The study was aimed to reduce the set to four items. The first two items were eliminated on the basis of descriptive statistics and low item-total correlations. The further selection based on the eight-item set was done with the help of exploratory factor analysis. The items were unambiguously arranged in two factors that could be interpreted in terms of the two dimensions of LOC (cf. section 2.3). The fit indices of the EFA supported the two-factor structure of LOC assumed at the working definition (cf. section 2.3). Four basic aspects of the LOC definition were to be measured with the resulted item set. The selection of the items was done in regard to the theoretical background, working definition, descriptive statistics, and item loadings to target factor. Having selected Item N4 and Item N9 for the ILOC dimension and Items N6 and N10 for the ELOC dimension, the first version of the scale Internal External Locus of Control-4 (IE-4) [German: Die Skala Internale-Externale-Kontrollüberzeugung-4 – IE-4] was completed.

The parallel conducted semantic research provides further evidence of the usability, and content validity of the selected items. Item wording, semantic structure and the comprehensibility of the items were tested on respondents of different gender and age, recruited from the different educational-level groups. The five-point response scale was also tested in cognitive interview to ensure its unambiguousness and usability.

In sum, the first version of the IE-4 is developed. Two subscales are constructed in regard to the simple structure of two factors and theoretical background of the construct. Nevertheless, the cognitive interviews prove the comprehension of the

items and the response scale. The results of the present quantitative analysis are to be completed by the findings of the qualitative study.

7.2 Cognitive interviews: further modification of the IE-4

Language is the vehicle that delivers items to respondents. Studies investigating response behavior claim strong bias of the low level of education (cf. Rammsted, Goldberg, & Borg, 2010). Hence, it is necessary to prove that the items were understood in the sense of the working definition for LOC by respondents of different age groups and levels of education, i.e., to prove the face validity of the IE-4. Cognitive interviews enabled the responses of the interviewees to items to be investigated. Cognitive interviews were aimed to test the face validity of the scale. Moreover, a series of cognitive tasks allowed respondents to report their thoughts about the items and the problems they had understanding the items or giving their responses. Their answers were helpful for identification of the potential for response bias known in connection with low level of education (cf. Sudman et al., 1996; Willis, 2005). In addition, the usability of the five-point Likert scale that also was used in the pilot study was tested in cognitive interviews.

Although ten items were used in cognitive interviews, this section reports only on the relevant results of the items selected for the IE-4 according to the theoretical background and psychometric properties: N4, N9, N6, and N10.

7.2.1 Method

7.2.1.1 Sample

The participants for the Interview were recruited according to the standard recruiting procedure of the cognitive laboratory of GESIS – Leibniz Institute for the Social Sciences. The present sample ($N = 20$) is quoted according to the schemes of the German Microcensus 2008 distributions of gender, age, and level of education. As a usual recruiting procedure of the cognitive laboratory the quota schemes were regarded separately (Table 23).

Table 23 Socio-demographic characteristics of the cognitive interview sample

	Total Sample		GM ¹ (Females 50.9%)	Males (N = 10; 50%)		Females (N = 10; 50%)	
	Freq.	%	%	Freq.	%	Freq.	%
Age							
21-34	6	30.0	25.5	3	30.0	3	30.0
35-54	8	40.0	36.5	4	40.0	4	40.0
>54	6	30.0	38.5	3	30.0	3	30.0
<i>M_{age} (SD)</i>	46.2	(14.7)	48.8 (18.5)	48.2	(16.3)	44.1	(13.5)
Level of education²							
Low	10	50.0	42.4	5	50.0	5	50.0
Intermediate	5	25.0	29.7	2	20.0	3	30.0
High	5	25.0	26.8	3	30.0	2	20.0
n.a.	0	0.0	1.0	0	0.0	0	0.0
<i>M_{years of schooling} (SD)</i>	9.5	(1.7)	10.1 (2.0)	9.6	(1.8)	9.4	(1.7)
Total	20	100	100	10	100	10	100

Note. (N = 20); Freq. = absolute frequencies, % = relative frequencies, n.a. = not applicable, M = mean, SD = standard deviation; ¹GM = Distribution of gender, age and education in German population (N = 83,144,698) calculated according to the German Microcensus 2008 is presented for comparison; ²low level of education = no secondary school qualification or qualification after 9 years at school; intermediate level of education = secondary school qualification after 10 years schooling; high level of education = university/university of applied sciences entrance qualification after up to 13 years of schooling. Mean values are in italic.

Hence, the items are tested on ten male (50%) and ten female (50%) participants. The age of the respondents ranged from 21 to 74 years; the mean age is 46.15 years; (standard deviation of 14.7), which is very close to the mean age of the total German population calculated on the basis of the data of the German Microcensus 2008, which is 43.44 (SD 22.8). Ten interviewees (50%) were recruited in a group of low level of education, five participants (25%) were in a group of an intermediate education, and five (25%) had a high level of secondary education.

7.2.1.2 Procedure

Items for the assessment of LOC were a part of an extended cognitive interview test conducted within the framework of a GESIS project for the construction of standardized psychological short scales for survey research. The conceptualization of the

cognitive tasks of the present part of the cognitive interview was done by the present author. The cognitive interviews were conducted and interpreted by the GESIS cognitive study experts Rolf Porst and Peter Prüfer, well known for their contributions to questionnaire development for survey research (cf. Faulbaum et al., 2009; Porst, 2008). Participation in the interview was remunerated with €20. The interviews were performed in the cognitive laboratory of GESIS. Interviews were implemented using Verbal Probing techniques which were reported to be robust against bias of subjective information processing (cf. Willis, 2005). Moreover, Verbal Probing allows controlling cognitive processes without special training of the respondents (cf. Willis, 2005).

First, the participants were asked to indicate with the help of the five-point Likert scale (cf. section 7.1.1.2) the extent to which the statements apply to them. Next, they were asked to interpret their comprehension of the items, i.e., verbalize their thoughts about the items in general and to paraphrase in their own words what the items were intended to measure. They were also asked whether they had any difficulties understanding or responding to the statements. Then, they were asked whether they detected semantic redundancies in the items. In the end, the participants were asked how easy they found the five-point answering scale was to rate their answers.

7.2.2 Results

7.2.2.1 Descriptive statistics

Descriptive statistics of the cognitive interviews are calculated in order to compare the present values with those of the pilot study reported in section 7.1.2.1. The means, standard deviations, skewness and kurtosis of the four items are given before the slash in Table 24, and the values of the student sample are given after the slash. For comparison purposes, t-tests are calculated for every item mean (Table 24). None of the present means deviates significantly from the reported means of the student sample. The fluctuations in the skewness and kurtosis values are caused by the different sample size and still show no violations of the standard normal distribution (cf. Muthén & Kaplan, 1985, 1992). All values display the same rank order as the initial descriptive statistics reported in section 7.1.2.1.

As in previous analyses reported in sections 5.1.2.1, 5.2.2.1, and 7.1.2.1, the means of the internal LOC (3.60–4.05; *SD* 0.69–1.27) are higher than those of the external LOC (2.30–2.60; *SD* 0.89–1.19). Here the difference in means is also significant ($t(19) = 5.24$ ($p < .001$); Cohen's $d = 1.39$).

Table 24 Descriptive Statistics of the IE-4 (cognitive interview)

	<i>M</i> ¹	<i>SD</i>	Skew.	Kurt.
Internal Locus of Control				
N4	3.95/3.87	0.83/0.85	-0.53/0-73	0.16/0.69
<i>t</i> ² (217)	<i>.03 (n.s.)</i>			
N9	3.98/3.93	0.69/0.90	-0.06/-0.82	0.63/0.72
<i>t</i> (217)	<i>.02 (n.s.)</i>			
<i>M</i> _{ILOC}	<i>3.97/3.90</i>	<i>0.76/0.87</i>	<i>-0.30/-0.77</i>	<i>0.40/0.71</i>
External Locus of Control				
N6	2.30/2.07	0.92/1.00	0.21/0.91	-0.60/-0.59
<i>t</i> (217)	<i>.07 (n.s.)</i>			
N10	2.60/2.57	1.19/1.08	0.47/0.21	-0.01/-0.67
<i>t</i> (217)	<i>.00 (n.s.)</i>			
<i>M</i> _{ELOC}	<i>2.45/2.32</i>	<i>1.05/1.04</i>	<i>0.34/0.56</i>	<i>-0.31/-0.63</i>

Note. ($N = 20/N = 199$); N = fixed item number of the initial item pool. M = mean, SD = standard deviation, Skew. = skewness, Kurt. = kurtosis; ¹five-point Likert scale (cf. section 7.1.1); values of cognitive interview are before the slash, descriptive statistics of the students sample are after the slash. Scale means and results of the ²two-tailed t -test are in italic.

7.2.2.2 Results of the cognitive interviews

The questions asked during the cognitive interview appear as sub-headings in italics below. Each question is followed by a summary of respondents' answers and the modifications to the item that are subsequently undertaken.

What do you think about these items in general?

The majority of the participants (15) report that they find the items "interesting", "true-to-life", and "easy to understand". One participant notes that the items are too private but still interesting and worth asking, the other noted: "I am forced to think back over my life. It is good". Four participants find items to be usual and similar to the other items in the questionnaire.

Can you say it in your own words what is this item set intended to measure?

In the opinion of 12 of the 20 participants, the items are intended to measure a personal belief whether "someone is in control of his or her life", whether a person is responsible for the course life or "thinks that other people are more in charge". Even

term “external forces” crops up in the responses of participants: “It is asked whether one is in charge of one’s own affairs or hands over control to some external forces.” Seven other participants reply that these items ask about life and relationship to others. One participant replies that the items are intended to ask about relationship between friends.

Do you have any difficulties understanding or answering the items?

Two participants with a low level of education indicate that Item N4 (I am successful only because of my own efforts and involvement. [German: Erfolg habe ich nur, wenn ich mich selbst anstrengung und einsetze.]) is not easy to comprehend. They ask to have it repeated again in order to get the meaning of the expression. Five participants with a low level of education indicate that item N6 (My life is largely determined by others. [German: Mein Leben wird zum großen Teil von anderen bestimmt.]) is difficult to answer because it has no concrete context. They argue that it depends whether it is in the context of work or of private life. No further problems in comprehension of the items are reported.

Are there any repetitions in these items?

None of the respondents reports that four items selected for the IE-4 are semantically redundant.

Do you have any difficulties in rating your answer on this response scale?

All 20 participants report that they had no difficulties in rating their answers using the five-point response scale used in pilot study (cf. 7.1.1.2).

7.2.3 Modification of Items N4 and N6

In regard to the responses of the interviewees and recommendations of Rolf Porst and Peter Prüfer, two items of the IE-4 were modified in their syntactic structure: Item N4 (I am successful only because of my own efforts and involvement. [German: Erfolg habe ich nur, wenn ich mich selbst anstrengung und einsetze.]) caused difficulties for respondents with a low level of education. In the opinion of the experts of the cognitive interview, these difficulties were caused by the causal structure of the sentence. It was suggested to revise the syntactic structure by changing the position of the main and subordinate clauses. Moreover, the grammatical structure of the main clause was modified and focused more on the near future tense. Hence, N4 was changed from “I am successful only because of my own efforts and involvement” [German: Erfolg habe ich nur, wenn ich mich selbst anstrengung und einsetze.] to “If I work hard, I will succeed. [German: Wenn ich mich anstrengung und einsetze, werde ich auch Erfolg haben.]”

Item N6 (My life is largely determined by others. [German: Mein Leben wird zum großen Teil von anderen bestimmt.]) was also difficult to answer for the respondents

with a low level of education. They claimed that they were not sure in their answer because they were not asked about a concrete context or life situation. One of the comments was: “(...) it depends whether it is in my job or in my private life”. The item was reworded as follows: “Whether at work or in my private life: What I do is mainly determined by others. [German: Egal ob privat oder im Beruf: Mein Leben wird zum großen Teil von anderen bestimmt.]”. The inclusion of “whether at work or in my private life” focuses the meaning of the item without changing the semantic structures of the sentence (Table 25). Moreover, the revised syntactic structure underlined the generality of the question and elicited an appraisal of life in general.

Table 25 Revision of the item wording

	Initial wording	Revised wording
N4 (ILOC)	I am successful only because of my own efforts and involvement. [German: Erfolg habe ich nur, wenn ich mich selbst anstrengte und einsetze]	If I work hard, I will succeed. [German: Wenn ich mich anstrengte und einsetze, werde ich auch Erfolg haben]
N6 (ELOC)	My life is largely determined by others. [German: Mein Leben wird zum großen Teil von anderen bestimmt]	Whether at work or in my private life: What I do is mainly determined by others. [German: Egal ob privat oder im Beruf: Mein Leben wird zum großen Teil von anderen bestimmt]

Note. N = fixed item number of the initial item pool, ILOC = Internal Locus of Control scale, ELOC = External Locus of Control scale.

7.2.4 Comments on the cognitive interview

The cognitive interviews were aimed to prove the face validity of the IE-4 and to identify the potential for response bias known in connection with the low level of education (cf. Rammstedt, Goldberg, & Borg, 2010). In sum, when paraphrasing of the content of item block in their own words, respondents used expressions which were close to the core components of the working definition of LOC (cf. sections 2.3 and Chapter 6). These responses revealed the face validity of the short scale and empirically supported the initially identified content validity of the items.

The cognitive interviews enabled the identification of the weak points of the syntactic structure of two items of the IE-4 scale. The reactions of the respondents with a low level of secondary education to the items N4 and N6 were very helpful. The syntactic structure of both items was modified according to their answers. This allowed the semantic structure of the items to be kept. The contents of all four items complement each other in assessing the core components of the LOC orientation according to the aforementioned working definition (Chapter 6). Respondents also reported that each of the four items of the IE-4 had its own content.

Respondents reported to have no difficulties in comprehending and using the five-point fully-labeled Likert scale. The cognitive interview experts R. Porst and P. Prüfer also supported the choice of verbal labels of the five-point scale.

The English and German versions of the modified IE-4 scale are given in Table 26.

Table 26 The four-item scale for the assessment of locus of control (IE-4)

	English	German
	Internal Locus of Control	Internale Kontrollüberzeugung
N4	If I work hard, I will succeed.	Wenn ich mich anstrengende und einsetze, werde ich auch Erfolg haben.
N9	I'm my own boss.	Ich habe mein Leben selbst in der Hand.
	External Locus of Control	Externale Kontrollüberzeugung
N6	Whether at work or in my private life: What I do is mainly determined by others.	Egal ob privat oder im Beruf: Mein Leben wird zum großen Teil von anderen bestimmt.
N10	Fate often gets in the way of my plans.	Meine Pläne werden oft vom Schicksal durchkreuzt.

Note. N = fixed item number of the initial item pool. English translation was done by two translators working independently of each other.

7.3 Discussion to the construction of the IE-4

When constructing the IE-4, a psychological screening tool for the assessment of LOC orientation, best practices for questionnaire development were followed (cf. Wills, 2005; Sudman et al., 1996): A pilot study was carried out using a student sample. Additionally, the syntactic structure of the items was tested in cognitive interviews. The quantitative analysis resulted in the reduction of the initial ten-item pool to a four-item set. The reduction of the item-pool was implemented according to the descriptive statistics and item-total correlations. Since the exploratory factor analysis revealed an unambiguous structure of two factors, factor loadings were also considered by the reduction. Moreover, the crucial aspects of the theoretical background of LOC regarded in the working definition (cf. Chapter 6) were taken into consideration by the composition of the four-item set. The first version of the IE-4 scale measured the four main aspects of LOC definition with sufficient psychometric quality already mentioned in Chapter 6.

The process of empirical reduction was completed by the qualitative analysis of the cognitive interviews. The content validity that was identified by the initial semantic reduction of the item pool from 20 to ten items was supported by the face

validity of the IE-4 scale revealed by the cognitive interviews: The interviewees' replies included the core components of LOC which were pointed out in the working definition of LOC (cf. section 2.3). The interviewees did not find any semantically redundant items in the IE-4. Moreover, two items were modified because of the responses of the participants with the low level of secondary education, who found the syntactic structure of the expressions to be confusing.

The use of triangulation of the quantitative (pilot study) and qualitative analysis (cognitive interview) undertaken by the construction of the IE-4 allowed to test the first version of the IE-4 scale in a more comprehensive way. Such comprehensive testing is recommended by the construction of scales for the assessment in large heterogeneous samples as is usually the case by survey sampling (cf. Kelle, 2007; Morse, 2003; Onwuegbuzie & Leech, 2005; Reeve et al., 2011). Here the data of the psychometrical characteristics of the items are enhanced with the results of the cognitive interviews. In this respect, in the present cognitive interviews the responses of the participants with a low level of education were very important, because every difficulty caused in comprehension of the items might lead to the accumulation of the error variance that might result in further problems in measurement and estimation of the researched construct. This was especially important in the present context of the extreme short subscales, which assess dimensions with only two items.

The second important contribution of the cognitive interviews was the test of an answering scale. It was confirmed that the five-point Likert scale caused no difficulties to use it.

In sum, the first version of the IE-4 is developed and proved for the possible answering bias known in connection with the different level of education of respondents. The face- and content validity of the IE-4 have to have further empirical support of factorial and construct validity. The combined assessment of locus of control with the IE-4 and another LOC tool enables its factorial and construct validity to be assessed. Moreover, because the aim of this thesis is to construct a measurement tool that can be used on heterogeneous samples and in different research fields, the psychometric properties of the IE-4 must be confirmed using data from an extended sample stratified according to the key socio-demographic variables of gender, age and levels of education of the current German population. A further validation step is now called for, namely the assessment of the IE-4 and the KMKB using an extended heterogeneous sample.

8 Step 4: Validation of the IE-4

The second objective of this thesis is to prove the efficiency of the IE-4 comparing its psychometric quality to that of a scale currently used in German surveys. Such simultaneous cross validation of two scales not only allows comparison of psychometric values but also the validation of the factorial structures and latent constructs assessed by both scales. The literature review presented in Chapters 2 and 3 revealed the need for the studies reporting psychometric properties of the scales currently used in German surveys. To meet this need, the psychometric properties of the GSOEP short scale and the KMKB (Jacoby & Jakob, 1999) was taken into consideration (Chapter 5). My analysis revealed that the KMKB scales had clear factorial structure and sufficient psychometric properties (section 5.3). The KMKB was found to be an appropriate questionnaire for the validation of the newly developed scale. Hence, the IE-4 and KMKB were used as part of a psychological survey conceptualized within the framework of a GESIS project devoted to the construction of standardized psychological screening tools for survey research. The present study is aimed to cross-validate the psychometric properties and factorial structure of both questionnaires in an extended sample. In order to indicate the stability of the findings the test-retest design was chosen.

8.1 Method

8.1.1 Sample

An extended occasional sample ($N = 546$; 52% females) stratified according to the distribution of gender, age, and levels of education in the German Microcensus 2008 was recruited for this part of the present study. Again, four age groups and three levels of education (cf. section 5.1.1.1) are used in order to describe the present sample (Table 27).

The socio-demographic distribution of the total sample as well as separately for males and females is presented in Table 27. The age of respondents ranges between 18 and 88 with a mean of 46.6 (SD 15.2). The largest number of participants was recruited among the citizens with a low level of education (46.1%) in correspondence to the distribution of the German Microcensus 2008, which reported that 42.4% of the German population have a low level of education. Respondents report to have at average 10.00 years of schooling (SD 1.2 years).

At the end of the interview, the participants were asked to take part in the retest interview. After stratification of the volunteers according to the same criteria of gender, age, and education, the present retest sample ($N = 343$) was obtained. There were six to ten weeks between the test- and retest interviews. As in the previous studies, the missing values were handled by listwise deletion. This yielded a sample of 539 participants for the first assessment and 338 participants for the retest.

Table 27 Socio-demographic characteristics of the sample used for the IE-4 validation

	Total Sample		¹ GM (Females 50.9%)	Males (N = 259/164; 47.5%/47.8%)		Females (N = 287/179; 52.5%/52.2%)	
	Freq.	%		Freq.	%	Freq.	%
Age							
18-25 years	53/31	9.7/9.0	12.9	26/16	10.0/9.8	27/15	9.4/8.4
26-45 years	197/117	36.1/43.1	33.3	94/57	36.3/34.8	103/60	35.9/33.5
46-65 years	228/154	41.8/44.9	31.1	108/71	41.7/43.3	120/83	41.8/46.4
> 65 years	65/40	11.9/11.7	22.7	31/20	12.0/12.2	34/20	11.8/11.2
n. a.	3/1	1.0/0.3	0.0	0/0	0.0/0.0	3/1	1.0/0.6
M_{age} (SD)	46.6/46.7 (15.2)/(15.2)		48.8 (18.5)	46.4/46.4 (15.3)/(15.7)		46.9/46.9 (15.2)/(14.7)	
Level of education							
Low	262/155	46.1/45.5	42.4	109/68	41.5/42.0	143/86	49.8/47
Intermediate	165/109	30.2/31.8	29.7	77/49	30.1/29.6	88/60	30.7/33.5
High	129/79	23.6/23.0	26.8	73/47	28.5/28.4	56/33	19.5/18.4
n. a.	0	0.0/0.0	1.0	0	0.0/0.0	0	0.0/0.0
$M_{years\ of\ schooling}$ (SD)	10.0/10.0 (1.2)/(1.18)		10.1 (2.0)	10.1/10.2 (1.3)/(1.2)		9.9/9.8 (1.1)/(1.1)	
Total	546/343	100/100	100/100	259/164	100/100	287/179	100/100

Note. (N = 546/N = 343); Freq. = absolute frequencies, % = relative frequencies, n.a. = not applicable, M = mean, SD = standard deviation; ¹GM = Distribution of gender, age and education in German population (N = 83,144,698) calculated according to the German Microcensus 2008 is presented for comparison; low level of education = no secondary school qualification or qualification after 9 years at school; intermediate level of education = secondary school qualification after 10 years schooling; high level of education = university/university of applied sciences entrance qualification after up to 13 years of schooling. The data of the first assessment time are before the slash, the data of the second assessment time are after the slash. Mean values are in italic.

8.1.2 Procedure

The data of the present study were assessed within the framework of study aimed at constructing short psychological scales for sociological surveys. The study was conducted as a paper-and-pencil-interview (PAPI) by Marplan Ltd., a commercial enterprise. The items of the IE-4 and the KMKB (Jakoby & Jacob, 1999) were mixed

and assessed in a one-item block. The five-point fully-labeled Likert scale described in section 7.1.1.2 was used for both measurement tools. The test and retest interviews had the same structure.

8.1.3 Statistical analyses

Descriptive statistics, internal homogeneities of the subscales (Hancock's H), and retest reliabilities were calculated in order to evaluate the psychometric properties of the IE-4 scale. The present results of the IE-4 items were compared to the corresponding scores of the KMKB. Analysis of variance for studies with repeated-measures design (repeated-measures ANOVA) and a t-test for the dependent samples was conducted to investigate the consistency in means and standard deviations across time and subscales.

The factorial structure of the IE-4 was proved with CFA. A model with two latent dimensions and four manifest variables of the IE-4 and two latent dimensions and six manifest variables of the KMKB was estimated. Its fit was judged according to the set of five indices defined in section 5.1.1.3.

To render the investigation of the stability of across time meaningful, it is necessary to address the issue of measurement invariance (MI) and demonstrate that the IE-4 scale measures the same underlying factors in the first and the second assessment. The term 'same factor' is used to indicate that a factor has exactly the same conceptual interpretation at both assessment times. The interpretation of a latent factor depends on the content of the manifest items that are related to the factor, and on the strength of these relations. Consequently, for a factor to have an identical interpretation across time, it is necessary that the relations of the observed variables and the underlying factor are exactly the same at both data collection times. Multi-group confirmatory factor analysis (MGCFA) (Billiet, 2002; Jöreskog, 1971; Joreskog & Sorbom, 1993) has been accepted as a powerful and versatile tool for testing the measurement invariance of the assessment tools with a known factorial structure (Behling & Law, 2000; Lubke, Dolan, Kelderman, & Melenbergh, 2003; Steenkamp & Baumgartner, 1998). The basic idea of MGCFA as opposed to single group analysis is to fit factor models in several groups (in this case the first and second assessment of the scales) simultaneously. A key advantage of MGCFA is that all aspects of measurement invariance can be examined within one model (i.e. factor loadings, intercepts, residual variances, factor variances, factor covariances).

Testing the measurement invariance entails a fixed sequence of progressively stricter statistical tests, i.e. fixed sequence of models nesting in each other. First, the test for conceptual invariance is done, which is then followed by the tests for metric and scalar invariances. However, the latter tests are performed only if the previous test has been passed.

Conceptual invariance tests the assumption whether the pattern of salient and non-salient loadings defines the structure of the scale. It implies that the items of the tested scales reveal the same structure of factor loadings across the assessment times (Steinmetz, Schmidt, Tina-Booh, Wiczorek, & Schwartz, 2009). Conceptual

invariance is supported if the data of both assessment times fit a specified model (Steenkamp & Baumgartner, 1998). The metric invariance test is carried out only if conceptual invariance has been established. The test for metric invariance examines whether factor loadings are constant across groups. If metric invariance is established, it means that the participants respond to both scales in the same way in test and retest. In terms of personality research, this implies that further support for the stability of the construct is gained. Finally, scalar invariance involves the testing of differences in the observed intercepts and residuals (Steenkamp & Baumgartner, 1998).

The measurement invariance can be evaluated using either the single- or multiple-group input matrix. Single-group approach combines both assessment waves in one single input matrix. In the multiple-group approach each group is represented by a different wave of assessment (e.g., Group 1 = test, Group 2 = retest). In this respect, the assessment waves are represented by separate matrices. Both single- and multiple-group approaches have their advantages and disadvantages (cf. Vandenberg & Lance, 2000; Vandenberg, 2002). The single-sample approach provides estimation of the complete data structure; that is, the lagged relationships among latent variables in addition to the within-time covariances. The matrix-part of the first wave should be equal to the matrix-part of the second one. In the multiple-group approach, only the within-time covariances of the latent variables are input to the analysis. A primary disadvantage of employing a single-matrix approach is a larger matrix. Accordingly, the single-group approach, especially in connection with a lower number of participants and a model with only two manifest variables for a latent variable, may be prone to underestimation or improper solutions, which are resulted from the complexity of the model (cf. Brown, 2006; Kline, 2000). The present analysis aims to support the construct structure of the IE-4 across the time. Although multiple-group approach, does not provide the estimation of the lagged relationships among latent variables in the present study it is a more reliable way to prove the invariance of the construct across the time because it allows to keep the complete data-matrix of the first assessment time and to estimate lower number of free parameters that increase the possibility of proper solution.

Modelling the MGCFA simultaneously for the IE-4 and the KMKB not only enabled the MI of the manifest variables to be monitored over time but also allowed the relations of the latent factors to be followed over the time span. Construct validity of the IE-4 scale and its stability is to be proved with the MGCFA. The set of fit indices described in section 5.1.1.3 is used to estimate the model fit. Additionally, Brown (2006) recommends the use of the Tucker Lewis Index (TLI) because "(...) the TLI has a feature that compensate for the effect of model complexity (...) the TLI includes a penalty function for adding freely estimated parameters that do not markedly improve the fit of the model" (p. 85). The TLI, or non-normed comparative fit index, is used to enhance the estimation of the model fit (cf. Brown, 2006).

In order to explore the reported findings regarding the effect of gender, age, and levels of education on LOC (cf. Cole & Cole, 1974; Krampen, 1981b; Krampen & Wieberg, 1981; Lao, 1978; Mahler, 1974; Rossier et al., 2002) a multivariate analysis of

variance (MANOVA) was conducted. Both ILOC and ELOC were assessed twice within the questionnaire first time with the IE-4 scale and second time in about five minutes with the KMKB scales. Thus a repeated measures design was used to investigate the impact of socio-demographic variables on ILOC and ELOC. Post-hoc tests were conducted using Scheffé-test. In order to prove the findings reported in connection with the level of secondary education (Jakoby & Jacob, 1999) the Spearman correlation of the ILOC and ELOC dimension and the level of education was calculated. The results were compared to those previously reported for the KMKB (cf. section 5.2.2). In order to maintain the maximum of information this analysis focuses on the data of the first assessment time.

8.2 Results

8.2.1 Descriptive statistics and reliability

Descriptive statistics are used to determine the means, standard deviations, skewness and kurtosis of the IE-4 items and to compare them across the two assessment times. Descriptive statistics of the two assessment times of the IE-4 and the KMKB are presented in Table 28. In the present study, the item means of the IE-4 scale range between 2.48 and 3.92 at the first and 2.52 and 3.89 at the second assessment time, which indicates that there are no severe ceiling or bottom effects. ANOVA with a repeated measures factor is conducted to test the differences in the subscale means across time. None of the observed differences in means is found to be significant. The slight fluctuations in the standard deviations do influence the homogeneity of the variance either (Table 28). The Levene test supports the homogeneity of error variances of depended variables. The skewness of the IE-4 subscales varies across time between 0.55 and 0.39, and kurtosis ranges from 0.60 to 0.17, thus indicating no severe violations against normal distribution (cf. Muthén & Kaplan, 1985)

Table 28 Descriptive Statistics of the IE-4 and the KMKB scales, comparison of the first and second assessment times

	<i>M</i>	<i>SD</i>	Skew.	Kurt.
IE-4				
N4	3.92/3.88	0.84/0.80	-0.54/-0.71	-0.09/-0.91
N9	3.93/3.89	0.84/0.80	-0.47/-0.40	-0.24/-0.22
<i>M</i> _{ILOC subscale}	3.92/3.89	0.84/0.80	-0.50/-0.55	-0.17/-0.56
<i>Levene statistic</i> (1, 873)	2.28 (n.s)			
<i>F</i> (1, 873)	.70 (n.s)			
N6	2.48/2.52	1.02/0.98	0.36/0.16	-0.44/-0.62
N10	2.63/2.67	0.99/1.06	0.42/0.32	-0.27/-0.58
<i>M</i> _{ELOC subscale}	2.55/2.59	1.00/1.02	0.39/0.24	-0.35/-0.60
<i>Levene statistic</i> (1, 873)	1.94 (n.s)			
<i>F</i> (1, 873)	.40 (n.s)			
KMKB				
Item 1	3.63/3.64	0.98/0.98	-0.56/-0.43	-0.02/-0.27
Item 2	3.99/3.99	0.87/0.81	-0.56/-0.40	-0.13/-0.49
Item 3	3.65/3.65	0.79/0.75	-0.16/-0.49	-0.27/-0.51
<i>M</i> _{ILOC subscale}	3.76/3.76	0.88/0.85	-0.43/-0.44	-0.14/-0.42
<i>Levene statistic</i> (1, 873)	1.75 (n.s)			
<i>F</i> (1, 873)	0.02 (n.s)			
Item 4	2.86/2.95	0.96/0.90	0.18/0.05	-0.37/-0.13
Item 5	2.49/2.54	0.99/0.97	0.47/0.37	-0.23/-0.45
Item 6	2.54/2.59	0.94/0.88	0.13/0.11	-0.46/-0.40
<i>M</i> _{ELOC subscale}	2.63/2.69	0.96/0.92	0.26/0.18	-0.35/-0.33
<i>Levene statistic</i> (1, 873)	1.27 (n.s)			
<i>F</i> (1, 873)	2.25 (n.s)			

Note. ($N = 539/N = 338$); Items are labeled with their numbers. *M* = mean, *SD* = standard deviation, Skew. = Skewness, Kurt. = kurtosis, r_{it} = item-total correlation. *N* = fixed item number of the initial item pool. The data of first assessment time are before the slash, and the data of the second assessment time are presented after the slash. Levene statistic test, *F* values and mean values are in italic. Explanation in text.

At the first assessment time, the scale means of the ILOC subscales of the IE-4 ($t(538) = 23.15$ ($p < .001$); Cohen's $d = 1.26$) and the KMKB ($t(538) = 21.42$ ($p < .001$); Cohen's $d = 1.01$) are found to be significantly higher than those of the ELOC subscales. At the retest the differences in ILOC and ELOC subscale means are also observed, namely $t(337) = 17.59$ ($p < .001$); Cohen's $d = 1.17$ for the IE-4 and $t(337) = 16.66$ ($p < .001$); Cohen's $d = 1.17$ for the KMKB.

Two measures to assess the reliability of the scales are used in the present study, namely Hancock's H and retest reliability. Hancock's H for the first (H_1) and of the second (H_2) assessment times are presented in Table 29 in the first two columns. The subscale homogeneities of the IE-4 fluctuate from the first to the second assessment time from .73 to .69 for ILOC and from the .67 to .70 for ELOC, resulting in a mean of .71 for the ILOC- and .68 for the ELOC subscale. Although the KMKB scale has three items in every subscale, that is, 50% more than in the IE-4 scale, the internal homogeneities of the KMKB scales are comparable in size: they range from .60 to .76 at the first assessment time and from .66 to .74 at the second assessment time. In order to compare the Hancock's H of the IE-4 subscales with the KMKB subscales, the correction of the reliability coefficients after the extension to three items per subscale using the Spearman-Brown formula is calculated. Corrected values for the IE-4 subscales result in reliability coefficients from .75 to .80.

The values of the test-retest reliability are to be found in the last column of Table 29. For the IE-4 subscales test-retest reliability coefficients are .56 for ILOC and .64 for ELOC, which yielded a total mean of .60. Reliability coefficients for the KMKB scales are .55 and .53 for ILOC and ELOC, respectively, with total mean of .54.

Table 29 Hancock's H and test-retest reliability of the IE-4 and the KMKB scales

	H_1	H_2	H_{mean}	r_{tt}
IE-4 (ILOC)	.73 (.80) ¹	.69 (.77)	.71 (.79)	.56
IE-4 (ELOC)	.67 (.75) ¹	.70 (.78)	.68 (.77)	.64
KMKB (ILOC)	.76	.74	.75	.55
KMKB (ELOC)	.60	.66	.63	.53

Note. ($N = 539/N = 338$); H_1 = Hancock's H of the first assessment time, H_2 = Hancock's H of the second assessment time, H_{mean} = total mean over both assessment, r_{tt} = test-retest reliability. ¹Reliability of the IE-4 subscales corrected to the three items per subscale according to the Spearman-Brown formula.

8.2.2 Factorial structure

CFA is performed to prove the factorial structure of the IE-4 and the KMKB based on the data of the first assessment time. The criteria used to judge the goodness of the model fit are the same as those described in section 5.1.1.3. A model with four cor-

related latent dimensions and ten manifest variables is to be investigated (Figure 5). The model is comprised of two factors of the IE-4 with four items and two factors of the KMKB with six items. All four latent factors are correlated with each other. The estimated model is supported with the good fit indices ($\chi^2/df = 2.02$; RMSEA = .04 (90% CI = .03 to .06); CFI = .98; SRMR = .03). The model is also proved to fit in its parsimony index CAIC of 247.73 in comparison to the CAIC of the independent model of 1772.82. Multiple squared correlation coefficients of the manifest variables range from .45 to .60 for the IE-4 and from .27 to .48 for the KMKB. The standardized regression weights on the manifest variables of the IE-4 scale range from .65 to .77. The regression weights on the KMKB items are from .52 to .74. The latent factors of the IE-4 correlate negative to each other at .62. There is also a negative correlation of ILOC and ELOC dimensions of the KMKB of .59. Both ILOC factors correlate to each other to .92 and both ELOC factors correlate to .97.

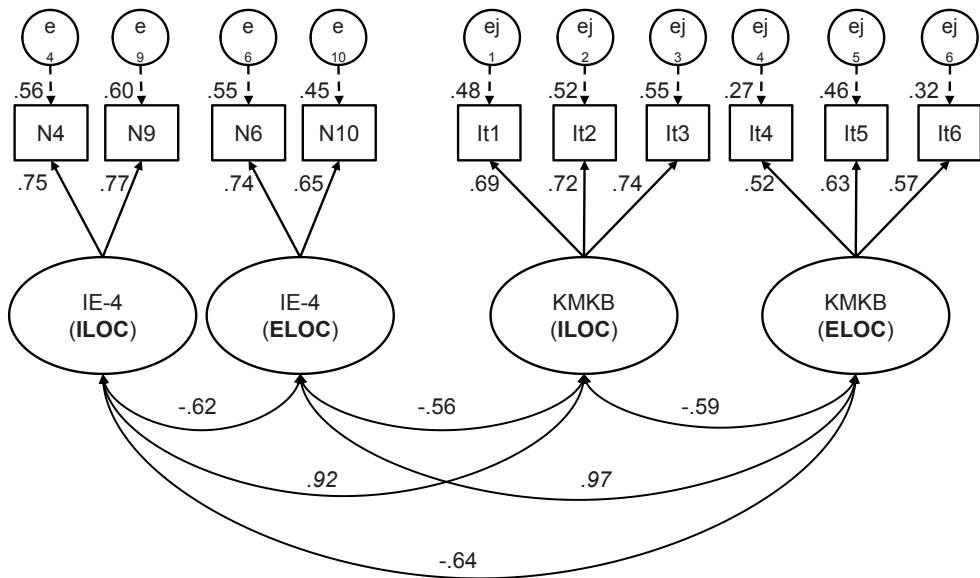


Figure 5 Confirmatory factor analysis, model of the factorial validity of the IE-4 and the KMKB scales. Completely standardized robust maximum likelihood parameter estimates. Large ovals represent latent factors (subscales), rectangles stay for the manifest variables (items), and the residual terms are indicated in round elements.

8.2.3 Construct validity

MGCFA was conducted with AMOS (version 19.0) testing for invariance of the IE-4. The analysis is performed, specifying a common model with two factors of the IE-4 scale and two factors of the KMKB scale across the two assessment times. Four latent

and ten manifest variables are encompassed in the model. The MGCFCA algorithm allows testing of the invariance of the latent ILOC and ELOC variables of both measurement tools to be measured across time. Assessment time is taken as a grouping variable in order to maintain a maximum of information and to monitor the model fit, factor loadings and covariances over the time span. Factor loadings for the items N4 and N6 of the IE-4 and Item 1 and Item 4 of the KMKB are set to 1 for model identification. Figure 6 shows the model that is kept constant for both assessment times.

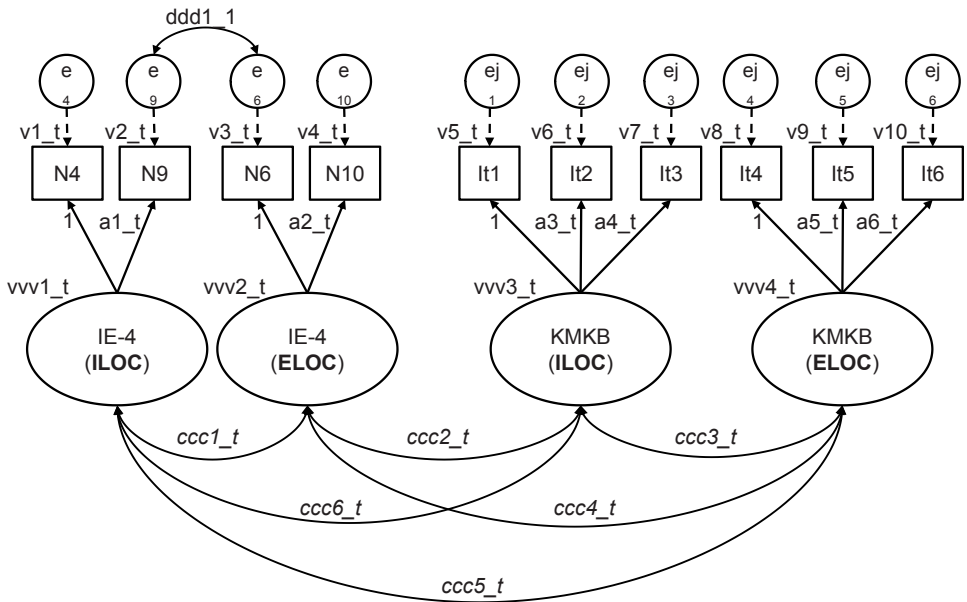


Figure 6 Multigroup confirmatory factor analysis, model of the longitudinal invariance of the IE-4 and the KMKB scales. $v1_t$ - $v10_t$ = multiple squared correlation coefficients, $a1_t$ - $a6_t$ = regression weights, $vvv1_t$ - $vvv4_t$ = latent variances, $ccc1_t$ - $ccc5_t$ = correlations between latent variables, $ddd1_t$ = correlation between error variances, t = assessment time. Large ovals represent latent factors (subscales), rectangles stay for the manifest variables (items), and the residual terms are indicated in round elements.

The fit indices of the common longitudinal model for LOC assessed with the IE-4 and the KMKB scales are summarized in Table 30. In order to show the influence of constraints on the model, the fit indices are reported here with three digits after the decimal point. Insertion of all restrictions caused significant changes of the χ^2 values. Nevertheless, the increase in the degrees of freedom results not only in an increase but also in a decline in the χ^2 -ratio presented in Table 30.

Table 30 Longitudinal invariance of the measurement model for LOC assessed with the IE-4 and the KMKB scales

	χ^2/df	$\Delta\chi^2/df$	RMSEA(90% CI)	CFI	ΔCFI	TLI	ΔTLI	CAIC	SRMR
Equal form	2.151		.036 (.027-.045)	.977		.963		365.495	.027
Factor loadings	2.225	<i>0.074</i>	.037 (.029-.046)	.973	<i>.004</i>	.961	<i>.002</i>	370.988	.034
Item intercepts	2.002	<i>0.223</i>	.034 (.026-.042)	.974	<i>.001</i>	.968	<i>.007</i>	357.229	.035
Item residuals	1.887	<i>0.225</i>	.032 (.024-.040)	.974	<i>.000</i>	.972	<i>.004</i>	347.858	.036

Note. ($N = 539/N = 338$); χ^2/df = normed χ^2 , RMSEA = Root Mean Square Error of Approximation, 90% CI = Confidence Interval for RMSEA, CFI = Comparative Fit Index, TLI = Tucker Lewis Index, CAIC = Consistent Akaike Information Criteria, SRMR = Standardized Root Mean Square Residual, Δ = difference coefficients are in italic.

The fit indices of the unconstrained model support the configural invariance of the model at both assessment times ($\chi^2/df = 2.151$; RMSEA = .036 (90% CI = .027 to .045); CFI = .977; TLI=.963; SRMR = .027) (cf. Kline, 2005). The insertion of the equality of the factor loadings results in a decline in the model fit ($\Delta\chi^2/df = .074$; $\Delta CFI = .004$; $\Delta TLI = .002$). However, the model fit still remains on a good level, thereby evidencing the metric invariance of the two assessment tools across the time span ($\chi^2/df = 2.225$; RMSEA = .037 (90% CI = .029 to .045); CFI = .973; TLI=.961; SRMR = .034). Keeping the equality constraints of the factor loadings in place, the next model imposes additional equality constraints on the indicator intercepts. These restrictions also lead to a significant change in model fit ($\Delta\chi^2/df = .223$; $\Delta CFI = .001$; $\Delta TLI = .007$). The final analysis tests for the equality of the indicators' error variances also results in significant change of the model fit ($\Delta\chi^2/df = .225$; $\Delta CFI = .000$; $\Delta TLI = .004$).

The fully standardized regression weights of the estimated model of the longitudinal invariance of the IE-4 and the KMKB measurement are found to maintain the rank order at both assessment times. Table 31 summarizes the standardized regression weights of the longitudinal model. The total mean standardized regression weight for the IE-4 items (N4-N10) is .74, thus the total mean of the KMKB items is .64.

Table 31 Completely standardized robust maximum likelihood parameter estimates of the measurement model for LOC assessed with the IE-4 and the KMKB scales, comparison of the first and second assessment times

	Latent factor	Equal form	Factor loadings	Item intercepts	Item residuals
N4	<IE-4(ILOC)	.76/.76	.77/.74	.75/.77	.76/.76
N9	<IE-4(ILOC)	.77/.65	.76/.68	.74/.71	.73/.73
N6	<IE-4(ELOC)	.73/.69	.70/.73	.71/.72	.72/.72
N10	<IE-4(ELOC)	.66/.76	.69/.72	.70/.70	.69/.69
Item 1	<KMKB(ILOC)	.70/.74	.72/.70	.71/.72	.71/.71
Item 2	<KMKB(ILOC)	.73/.67	.72/.69	.71/.71	.71/.71
Item 3	<KMKB(ILOC)	.74/.70	.73/.71	.72/.73	.73/.73
Item 4	<KMKB(ELOC)	.53/.53	.52/.54	.51/.55	.53/.53
Item 5	<KMKB(ELOC)	.65/.75	.67/.70	.67/.71	.68/.68
Item 6	<KMKB(ELOC)	.57/.45	.53/.52	.52/.53	.53/.53

Note. ($N = 539/N = 338$); Manifest variable labeled with their numbers. Latent factor = target factor, Equal form = regression coefficients for the unconstrained model, Factor loadings = regression coefficients for the model with equal factor loadings, Item intercepts = regression coefficients for the model with equal indicator intercepts, Item residuals = regression coefficients for the model with equal indicator error variances. The data of first assessment time are before the slash, and the data of the second assessment time are presented after the slash.

Table 32 presents the correlations of the ILOC and ELOC dimensions of both questionnaires. The first and second rows include correlation coefficients of the latent dimensions indicating the convergent validity of the IE-4 and the KMKB. The correlation of both ILOC dimensions are of .92 at first and at .96 second assessment time; also both ELOC dimensions correlate to each other to .98 at first and to .96 at second assessment time. The restrictions of nested models support the stability of the measurement of the IE-4 and the KMKB, i.e. the assumption that both scales consistently assess two highly similar latent constructs (cf. Brown, 2006, p. 131).

The third and fourth rows of Table 32 show the intercorrelation of the dimensions within a questionnaire. The ILOC and ELOC dimensions of both scales display negative correlation to each other ranging from .55 to .57 for the IE-4 and from .59 to .64 for the KMKB scales. The intercorrelations of the ILOC and ELOC dimensions across the questionnaires are reported in fifth and sixth rows of the Table 32. Here a negative correlation from .52 to .67 can also be reported.

Table 32 Correlations of the latent variables of the measurement model for LOC assessed with the IE-4 and the KMKB scales, comparison of the first and second assessment times

Lat. var.		Lat. var.	Equal form	Factor loadings	Item intercepts	Item residuals
IE-4(ILOC)	<>	KMKB(ILOC)	.92/.96	.92/.96	.94/.94	.93/.93
IE-4(ELOC)	<>	KMKB(ELOC)	.96/.98	.97/.98	.97/.97	.97/.97
IE-4(ILOC)	<>	IE-4(ELOC)	-.58/-.55	-.57/-.57	-.57/-.57	-.57/-.57
KMKB(ILOC)	<>	KMKB(ELOC)	-.60/-.60	-.59/-.64	-.61/-.61	-.61/-.61
IE-4(ELOC)	<>	KMKB(ILOC)	-.57/-.50	-.57/-.52	-.55/-.55	-.55/-.55
IE-4(ILOC)	<>	KMKB(ELOC)	-.64/-.65	-.63/-.67	-.64/-.64	-.64/-.64
e2	<>	e3	-.17/-.30	-.18/-.29	-.17/-.31	-.17/-.31

Note. ($N = 539/N = 338$); Completely standardized robust maximum likelihood parameter estimates. Lat. var. = latent variable, <> = correlation of latent variables, Equal form = correlation coefficients for the unconstrained model, Factor loadings = correlation coefficients for the model with equal factor loadings, Item intercepts = correlation coefficients for the model with equal indicator intercepts, Item residuals = correlation coefficients for the model with equal indicator error variances. The data of first assessment time are before the slash, and the data of the second assessment time are presented after the slash.

The only deficit in the longitudinal model is the correlation of the error variances between e2 and e3. The low correlation to the first assessment time (.17-.18) is boosted at the second assessment time (.29-.31). The analysis of the pretest data reported in section 8.2.2 evidence that that the error correlation occurs only in the retest model. Handling the calculation conservatively, the correlation of the error variances is added to the common model.

8.2.4 Socio-demographic criteria

As the stability of the measurement over the time span has been established, the present report is focused on the data of the first assessment time. A MANOVA with repeated measures design is conducted using SPSS 19.0; the socio-demographic variables gender, age, and education are simultaneously considered as independent variables; and ILOC and ELOC assessed with the IE-4 and the KMKB scale as dependent variables. Table 33 presents the resulting socio-demographic effects. Means and standard deviations are reported separately for both genders, for the four age groups and the three educational groups defined by the analysis of the GSOEP short scale for the assessment of LOC (cf. section 5.1.1.1).

Table 33 MANOVA results by age, gender, and level of education separately

	IE-4 _{ILOC}		EI-4 _{ELOC}		KMKB _{ILOC}		KMKB _{ELOC}	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender								
Male	3.96	0.72	2.50	0.83	3.83	0.69	2.61	0.71
Female	3.89	0.78	2.60	0.90	3.69	0.76	2.64	0.74
<i>F</i> _(1, 512)	.19		.27		1.61		.02	
η^2	<.001		<.001		<.001		<.001	
Age								
18-25 years	3.86	0.73	2.70	0.78	3.65	0.69	2.77	0.74
26-45 years	3.92	0.80	2.60	0.98	3.71	0.75	2.64	0.79
46-65 years	3.96	0.72	2.51	0.81	3.82	0.74	2.62	0.70
> 65 years	3.89	0.73	2.41	0.78	3.76	0.68	2.48	0.60
<i>F</i> _(3, 512)	.37		.99		1.46		1.84	
η^2	.003		.006		.011		.011	
Level of education								
Low	3.77	0.78	2.65	0.85	3.56	0.72	2.75	0.69
Medium	3.99	0.76	2.55	0.95	3.88	0.75	2.57	0.77
High	4.13	0.60	2.36	0.74	3.98	0.63	2.45	0.69
<i>F</i> _(2, 512)	7.25***		2.85		9.07***		2.79	
η^2	.028		.016		.034		.021	
Age & Gender	<i>F</i> _(3, 512)	.04	.06	.73	.03			
η^2	<.001		<.001		<.001		<.001	
Age & Education	<i>F</i> _(6, 512)	1.03	.49	.52	1.23			
η^2	.012		.006		.006		.014	
Education & Gender	<i>F</i> _(2, 512)	.45	.70	.11	.20			
η^2	.002		.003		<.001		<.001	
Age, Gender & Education	<i>F</i> _(6, 512)	.40	.57	.74	.16			
η^2	.005		.007		.009		.002	

Note. (*N* = 539); *M* = means, *SD* = standard deviation. ****p* < .001

As has been previously reported for German samples (cf. Krampen & Wieberg, 1981), no significant effect of gender is found either for ILOC or for ELOC (Hotelling's Trace: $F_{(1, 512)} = .35, p = .555, \eta^2 = .001$; $F_{(1, 512)} = 1.05, p = .305, \eta^2 = .002$). In addition, no significant effect of age is found for ILOC (Hotelling's Trace: $F_{(3, 512)} = 1.75, p = .155, \eta^2 = .010$) or for ELOC (Hotelling's Trace: $F_{(3, 512)} = 1.13, p = .337, \eta^2 = .007$) (cf. Krampen, 1981b).

In line with previous findings for LOC scales (e.g., Jakoby & Jakob, 1999; Rossier et al., 2002), the multivariate tests yield significant overall main effect of levels of education. In this respect, the effect was found only for ILOC (Hotelling's Trace: $F_{(2, 512)} = 9.12, p < .000, \eta^2 = .035$), but not for ELOC (Hotelling's Trace: $F_{(2, 512)} = 1.77, p = .172, \eta^2 = .007$). No interaction effects of gender, age, and levels of education are identified.

The post-hoc tests reveal effect for levels of education for both ILOC subscales, with participants with a low level of education scoring the lowest on the ILOC subscale of the IE-4 scale ($F_{(2, 512)} = 7.25, p < .001, \eta^2 = .028$) and of the KMKB scale ($F_{(2, 512)} = 9.07, p < .001, \eta^2 = .034$). There is no difference between the answers of the respondents with intermediate and high levels of education.

Jakoby and Jacob (1999) have already reported on the correlation of ILOC and ELOC to the level of education (Jakoby & Jacob, 1999). In order to compare the present results to those already reported, the Spearman correlation of both dimensions with the level of secondary education is calculated, and the attenuation correction of the coefficients is undertaken. The resulting coefficients are presented in Table 34 together with the coefficients reported by Jakoby and Jacob (1999) (cf. Table 18, p.64).

Table 34 Nonparametric correlation of the level of education with ILOC and ELOC

Level of secondary education	Internal Locus of Control	External Locus of Control
¹ KMKB ($N = 2,979$)	.25	-.27
¹ KMKB ($N = 3,132$)	.27	-.22
² KMKB ($N = 10,030$)	.15	-.13
KMKB ($N = 539$)	.24	-.17
IE-4 ($N = 539$)	.20	-.13
<i>Mean</i>	<i>.22</i>	<i>-.18</i>

Note. Mean correlations are in italic. ¹Coefficients are taken from Jakoby and Jacob (1999) p.67. ²Kovaleva et al., 2010.

The highest correlation coefficient of the ILOC dimension with the level of secondary education (.27) is reported by Jakoby and Jacob (1999), the lowest (.15) is found by analyzing the data of the Family Survey 2000 (cf. section 5.2.2). In addition, the highest correlation coefficient of the ELOC dimension (-.27) is found in literature

(Jakoby & Jacob, 1999) and the lowest (-.13) is reported by the cross-validation of the KMKB with the data of the Family Survey 2000 (cf. section 5.2.2). In sum, the level of secondary education correlates positively with the ILOC dimension (mean correlation .22) and negative with the ELOC dimension (mean correlation -.18). The present results support the findings reported in connection with the ILOC dimension. The reported level of the correlation between the level of secondary education and the ELOC dimension has not been achieved.

8.3 Comments on the validation of the IE-4

Summarizing the results of the validation study, it can be concluded that IE-4 assesses LOC with good psychometric quality even though it only utilizes two items per dimension: (1) The items of the IE-4 scale produce stable and rank ordered descriptive statistics; (2) the subscales possess good reliability; (3) the two-factor structure is supported by confirmatory factor analysis; (4) its stability is proved by multi-group confirmatory factor analysis; and (5) the effect of gender, age and level of education on the IE-4 subscales is tested and compared with the effect on the KMKB scales.

To focus on each point of the present validation study separately: (1) The descriptive statistics of the IE-4 items are rank ordered based on the degree of the empirical results of the pilot study (cf. section 7.1.2.1). This is even so when the validation study is conducted using the data of extended stratified quota sample, and the occasional student sample has been recruited for the pilot study. Since it is known that the descriptive statistics of psychological questionnaires calculated on the data of heterogeneous samples may differ from those of homogenous ones (cf. Rammstedt et al., 2010). The reported significant difference in means of the ILOC and ELOC subscales is in line with the previous findings reported for the IPC (cf. Krampen, 1981a; Mielke, 1979) and already reported in the present thesis for the GSOEP short scale and the KMKB scales (cf. sections 5.1.2.1 and 5.2.2.1). The higher means of the ILOC subscales seem to be connected with the construct of internality. For the IPC, this effect remains in findings reported for different cultures (cf. Cole & Cole, 1974; Kaufmann, Welsh, & Bushmarin, 1995; Krampen & Wieberg, 1981; Lao, 1978; Mahler, 1974; Malikosi & Ryckman, 1977; Rossier et al., 2002).

(2) Both ILOC and ELOC subscales have a sufficient degree of scale homogeneity even though they consist only of two items. The level of the test-retest reliability found in the present study for the IE-4 scale is consistent with the findings reported in connection with the ROT-IE and the IPC (cf. Chapter 3 of the present work) that confirm the level of the test-retest reliabilities ranging around .60 (e.g., Collins, 1974; Harris & Salomone, 1981; Krampen, 1982; Levenson, 1974; Mikula, 1975; Phares, 1976; Rotter, 1966).

(3) The confirmatory factor analysis clearly supports the two factorial structure of the IE-4. Two factors of the IE-4 explain more variance in their manifest variables

than two factors of the KMKB do (cf. section 8.2.2). The high degree of correlation between ILOC and ELOC latent dimensions of both questionnaires suggests the same latent constructs (cf. Brown, 2006, p. 131) and evidences the high convergent validity of the IE-4 and KMKB scales.

(4) All restrictions of the nested MGCFA model also evidence the measurement invariance of the IE-4 across the time span and support the stability of the factor structure. The construct validity is supported even through the limitation of the retest model. The correlation of the error variances between e_2 and e_3 is caused by the lower number of participants in the retest. This deficit is in line with the empirical findings in the methodology of the short scale assessment on samples with about 300 participants already addressed in this thesis (cf. Scott et al., 2009, Thomas & Bremer, 2011). Models with two manifest variables for every latent are prone to underestimation that may result in correlation of error variances, Haywood cases or other problems in solutions, the more so, the less number of data is used to estimate the model (cf. Brown, 2006).

(5) Finally, the effect of key socio-demographic variables on the on the IE-4 and the KMKB scales is also investigated. In spite of the reported findings relating to gender differences in LOC revealed by studies using Russian, Chinese, Japanese, and French samples (Kaufmann et al., 1995; Lao, 1978; Mahler, 1974; Rossier et al., 2002), no effect of gender was found for German, Greek and American samples (Cole & Cole, 1974; Krampen & Wieberg, 1981; Malikosi & Ryckman, 1977). In line with previous findings for German samples, no gender effect was found in the validation study. In line with the findings reported by Krampen (1981b) for IPC, no significant differences between the four age groups and LOC dimensions have been found either, even though it is more likely to be the case in the specific context of health-related research issues (cf. Albani et al., 2007; Skinner et al., 1990). The significant effect of level of education has been supported by the present analysis. This is in line with the reported findings for LOC scales (e.g., Jakoby & Jakob, 1999; Rossier et al., 2002). Significant differences between the group of participants with a low level of secondary education and participants with an intermediate or a high level of education are found in the present analysis for the ILOC dimensions of the IE-4 and the KMKB scales. No effect was found for either of the ELOC subscales. The calculation of the Spearman correlation between the ILOC and ELOC dimensions and the level of secondary education allowed comparing the present results to those previously reported in connection with the KMKB scales. The level of the correlations coefficients with the ILOC dimension is comparable to the one reported by Jakoby and Jacob (1999). Nevertheless the level of the correlation to the ELOC dimension achieved in the present analysis, and in the analysis done with the data of the Family Survey 2000 is lower as reported by Jakoby and Jacob. My analyses with the data of the Family Survey 2000 and with the data of the validation study reveal lower correlational coefficients for the ELOC dimension in regard to the level of secondary education either for the KMKB subscale or for the newly developed IE-4 subscale.

9 Discussion

9.1 General discussion of the present thesis

Perception of control over life events is considered to be one of the key variables determining behavior, well-being, health, life course, and even longevity. Locus of control, a construct proposed by Rotter (1966), captures belief in the contingency – or absence of contingency – between personal behavior and the precise life experiences. The conviction that outcomes are contingent upon one's own actions is referred to as 'internal locus of control', while 'external locus of control' refers to the belief that situational outcomes are determined by external forces such as luck or powerful others. Researchers from numerous scientific fields have frequently employed these two dimensions to explain various aspects of human behavior. Examples of such research are clinical studies (Andrasik & Holroyd, 1980; Carlson, 1982; Crisson & Keefe, 1988; Gehlert, 1994; Spector et al., 2001), studies of learning behavior (Bar-Tal & Bar-Zohar, 1977; Hank et al., 2009; Rotter, et al., 1972; Skinner et al., 1990), studies of vocational behavior (Burger, 1985; De Hoogh & Den Hartog, 2009; DeNeve & Cooper, 1998; Gable et al., 1976; Nolte et al., 1997; Wang et al., 2010), or studies of socio-political behavior (Levenson & Miller, 1976; McCarty & Shrum, 2001; Scaturo & Smalley, 1980).

Social survey researchers are increasingly interested in detecting and tracking socio-cultural change and population dynamics. When doing so, they frequently make use of psychological constructs – all the more so because these constructs have been found to be important for issues addressed in social surveys (e.g., Klandermans & Roggeband, 2007; Mayer, 2002; Staudinger & Lindenberger, 2002; Van Stekelenburg & Klandermans, 2007).

The present thesis was prompted by the ever-growing demand for an efficient psychometric tool for the measurement of locus of control that can be applied in situations where assessment time is limited. This is particularly the case in interdisciplinary research and social surveys. 'Efficiency' is understood here not only in terms of the minimum number of items necessary but also in the sense of the adequateness of the instrument's psychometric properties. The Current evidence with regard to the efficiency and validity of psychological short scales, which has been furnished by methodological research (cf. Scott et al., 2009; Thomas & Bremer, 2011), suggests that scales comprising two items per dimension can possess adequate psychometric properties. Hence, the first objective of this thesis is to construct and validate the IE-4 scale, a two-dimensional, four-item psychometric tool for the assessment of locus of control (LOC). The second objective is to provide the first empirical evidence for the efficiency of the IE-4 validating it in an extended heterogeneous sample and comparing its data with the data of the scale for the assessment of LOC that is already established in survey research.

This thesis consists of two parts – (I) the review of the literature about the theoretical development of the construct and research with locus of control and (II) the review of the empirical studies conducted within the present thesis. In the first part,

(i) the results of the literature research that are relevant to the second – empirical – part have been reported and analyzed. Selected postulates of Rotter's social learning theory, crucial contributions by Lefcourt (1966) and Levenson (1972), and the translation and adaption of the concept to German realized by Mielke (1979) and Krampen (1979, 1981a, 1991) yield the working definition of LOC employed in the present study. (ii) Empirical findings with regard to such elaborate assessment tools as the ROT-IE (Rotter, 1966) and the IPC (Levenson, 1972) are compared to those reported for two scales constructed by German survey researchers (Jakoby & Jacob, 1999; Nolte et al., 1997).

The empirical part of the thesis comprises the four research steps required for the construction of the IE-4 scale: (1) the analysis of the psychometric properties of two LOC scales constructed by German survey researchers; (2) the construction of a new item pool for the assessment of LOC; (3) the development of the first version of the IE-4 in a pilot study and its modification with the help of cognitive interviews; (4) the validation of the IE-4 scale.

Further, I would like to discuss each point of the present thesis separately: (i) An overview of the theoretical and empirical works connected with locus of control reveals a number of complexities. One of the complexities in the concept stems from the fact that the theoretical works in this area have not clearly distinguished the holding of ILOC and ELOC beliefs from the implementation application of these beliefs to one's own personal situation. Moreover no clear theoretical distinction has been made between the share in the LOC construct accounted for by the individual's own ability to exert control over life experiences and by the belief in ability of people in general to exert such control. In the works of Rotter (1954, 1966) it was implicitly assumed that LOC represents the subjective evaluation of the individual's own characteristics in various life situations, in which control or absence of control are experienced. However, the questions in the Rotter Internal-External Control scale comprise two types of items. One type refers to the respondent's own life situation; the other taps into beliefs about what causes success or failure for people generally. Moreover, this lack of clarity in the concept leads to a certain overlap between LOC and other control variables such as self-efficacy, collective efficacy, control judgments, sense of control, or efficacy expectations.

A further difficulty in LOC research stems from Rotter's conceptualization of LOC as a unidimensional construct. He assumed LOC to be a dynamic construct, the form and quality of which shifts according to the experience gained through interaction with the 'meaningful environment' or through a change in attitude to personal characteristics (Rotter, 1966). This implies that LOC was initially postulated to be one dimension with extreme internality at one end and extreme externality at the other. This assumption was based on the observations of Phares (1955), who reported a direct relationship between the extent of coping behavior and the expectancy that one's skills or abilities are important in achieving desired effects. However, in light of methodological findings indicating that LOC is, in fact, a multidimensional construct, the assumption of unidimensionality was abandoned and the construct is being reconceptualized in a number of different ways (cf. Lefcourt, 1966; Lev-

enson, 1972, Krampen, 1991). These new ways of interpretation the Rotter's theory suggest different measures for the assessment of LOC. The problems of convergent and discriminant validity which are associated with the suggested questionnaires often cause difficulties for researchers and sometimes even lead to poor data quality. Nevertheless, even after years of research with LOC Rotter (1975) maintains the assumption of the unidimensionality of the construct.

Important contributions to the LOC theory were made by Levenson (1972), who distinguished not only between the ILOC and the ELOC dimensions, but also between two facets of the ELOC dimension, namely 'Powerful Others' and 'Chance'. In this way, she facilitated the understanding of LOC as a complex psychological construct. However, the validation studies of Levenson's IPC scale have revealed correlations between the two subdimensions of ELOC and have thus not succeeded in supporting an unambiguous structure comprising three independent factors (cf. section 3.2) Applications of Krampen's Action Theory-Based Partial Model of Personality (1991), a further useful reconceptualization of the LOC construct, have not yielded a clear factorial structure of the LOC dimensions either (cf. Ahle, 2002).

(ii) The interpretation of LOC-related research results is also problematic. Findings with scales described in Chapter 3 show the difficulties to provide the empirical support for the theoretical assumptions of the authors: Both the ROT-IE and the IPC have no clear factorial structure. Regardless of the way in which LOC is assessed, most empirical findings are still interpreted by comparing high internals with high externals in a manner that suggests that locus of control is still assumed to be one dimension (cf. Rotter, 1975). Even the manuals of the multidimensional questionnaires for the assessment of LOC (e.g., FKK, Krampen, 1991) instruct users to summarize the scores of the different dimensions in one general index of LOC. The dilemma of all these difficulties of the research with LOC on the one hand and the extreme demand for the studies analyzing the psychometric properties of the existed scales constructed by survey researchers on the other hand was the motivation for this thesis. The fulfillment of the objectives for the present thesis, namely to construct and validate an efficient psychometric measure for LOC applicable in context of strict time constraints of survey research could be done only after analysis of the psychometric properties of the existed questionnaires which are already used in surveys.

(1) My analysis of the psychometric properties of the GSOEP short scale and the KMKB shows that the KMKB is more reliable and has clear factorial structure in comparison to the GSOEP short scale. Although the problematic empirical structure of the LOC questionnaires is well-known by established psychological scales, these findings of low psychometric quality of the scale are crucial in regard to the annual GSOEP short scale in GSOEP Youth Questionnaire. Moreover, in regard to the strict time constraints of surveys the GSOEP short scale with its eight items is not as sufficient as the KMKB with six ones. Nevertheless, with six items the efficiency of a questionnaire assessing LOC aimed in this thesis is still not achieved. As far as the psychometrical quality of the KMKB has been supported it can be taken as reliable measure for comparison to the newly developed scale.

(2) The new item pool for the IE-4 has been developed on the basis of the items of established questionnaires in concern with the postulated working definition. Drawing on the items from the established psychological scales ensured the content validity of the new developed items. A challenge in developing a new item pool was to produce context free items. I have aimed to cull the semantic structures which can meet core points of the construct the best. The triangulation of quantitative (pilot study) and qualitative (cognitive interviews) analysis by the development of the IE-4 turned out to be useful and reliable method to ensure the good quality of the assessed data.

(3) Both the pilot study and cognitive interviews have been acknowledged to be necessary for the construction of the IE-4. Usually cognitive interview goes ahead in order to filter and modify polysemantic, ambiguous, or simply awkward sentences. The Verbal Probing techniques supply information on the cognitive processes of comprehension of the tested items by the participants and allow proving the face validity of the assessed constructs. Regarding the fact that the initial item pool was based on the items of the established and sufficient validated questionnaires assessing LOC have been already reduced for semantic, stylistic and content awkwardness from 20 to ten items, this usual order, namely first the cognitive interview then the pilot study, has been altered within this thesis. Cognitive interviews were implemented parallel to the pilot study. As the ROT-IE and the IPC both do not provide non-ambiguous factorial structure (cf. sections 3.1 and 3.2) the robust factorial structure of a new questionnaire was as important as the unambiguity of the item comprehension. Recruiting the student sample for the pilot study allowed implementing both development steps parallel to each other. The analysis of the psychometric properties and factorial structure was enhanced by the qualitative analysis while developing the IE-4 scale.

In this connection, the valuable contribution of cognitive interviews was the demand for the syntactic modification of the two items reported by the respondents with a low level of education, although these items proved to have the good psychometric properties in the student sample. These findings are in line with the bias of the level of education found by Rammstedt et al. (2010), who report the poor fit of the factorial structure of the Big Five in extended heterogeneous samples.

(4) Arguing for efficiency in terms of the least number of items combined with sufficient psychometric properties demanded empirical evidence of the IE-4 efficiency. Hence, the last empirical step of the present thesis has to provide a comprehensive test of psychometric properties of the IE-4 comparing them to those of the KMKB. Descriptive statistics were found to be ranked in the same order as found in the pilot study. The significant difference in scale means of ILOC and ELOC dimensions is in line with the findings known in connection with the IPC (cf. Cole & Cole, 1974; Kaufmann et al., 1995; Krampen, 1981b; Krampen & Wieberg, 1981; Lao, 1978; Levenson, 1981; Mahler, 1974; Malikosi & Ryckman, 1977; Manso-Pinto & Ruggieri-Vega, 1985; Rossier et al., 2002; Mielke, 1979) and already reported for the KMKB (Jacoby & Jakob, 1999). These findings are plausible with regard to the importance of the internal control over the life events for the psychological and

physical health of a human been (cf. Antonovsky, 1987; DeCharms, 1968; Skinner, 1996). Moreover, internal control is reported to be one of the most robust predictors of psychic and physical resilience (Skinner et al., 1988). The IE-4 subscales proved to be reliable. The factorial structure and construct validity of the scale was also supported by CFA and by MGCFA. In sum, the first empirical support for the sufficient reliability, factorial and construct validity of the IE-4 is provided: The four items of the IE-4 are proved to measure the same latent factors which are measured by the six items of the KMKB scales.

The effect of gender, age and level of secondary education of the IE-4 is also in line with that found for the KMKB. Moreover, the findings of the validation study in respect to the level of secondary education are ranked in the same order as those of the KMKB scales (cf. Jakoby & Jacob, 1999).

9.2 Contributions of the present thesis

This thesis makes several contributions to research with locus of control:

First, the assumption that scales comprising two items per dimension retain adequate psychometric properties is supported by a number of empirical data presented here. The objective to construct an efficient psychometric tool for the assessment of locus of control that is suitable for use under time constraints has been achieved. The IE-4 subscales reveal stable descriptive statistics, constant reliability, and sufficient retest-reliability. The face validity of the assessment tool is also confirmed in the cognitive interviews. Moreover, the factorial structure, construct validity and their stability are supported in the validation study.

Second, the demand for a psychometric analysis and cross-validation of the psychometric scales currently used by German surveys has been met. The results reveal that the items of the short scale for the assessment of locus of control used by the GSOEP have poor descriptive statistics and reliability. Furthermore, the factor structures of the GSOEP short scale cannot be supported. These results have been reported to the GSOEP and the IE-4 has been submitted for use in the GSOEP pretest interview in 2012.

To a large extent, the present analysis supported the initial validation of the KMKB (Jakoby & Jacob, 1999). The cross-validation of the KMKB is established using the data of the Family Survey 2000 and those of the IE-4 validation study. The important contribution made here concerns the relationship between the KMKB dimensions. The structure of two independent factors initially postulated cannot be supported. Rather, the ILOC and ELOC dimensions are shown to be correlated with each other.

Third, the effects of gender, age, and education on the IE-4 and the KMKB scales are investigated. In spite of reported findings relating to gender differences in LOC revealed by studies using Russian, Chinese, Japanese, and French samples (Kaufmann et al., 1995; Lao, 1978; Mahler, 1974; Rossier et al., 2002), no effect of

gender was found for German, Greek and American samples (Cole & Cole, 1974; Krampen & Wieberg, 1981; Malikosi & Ryckman, 1977). In line with previous findings for German samples, no gender effect is found in the validation study. No significant differences between the four age groups and LOC dimensions are found either. The significant effect of level of education is supported by the present analysis. This is in line with the reported findings for LOC scales (e.g., Jakoby & Jakob, 1999; Rossier et al., 2002). Significant differences between the groups of participants with different levels of secondary education are found for the ILOC dimensions of the IE-4 and the KMKB scales. No effect is found for either of the ELOC subscales. Considering that these results are achieved with short questionnaires, which assess only coarse information on the construct, more research needs to be done to prove the effect of gender, age, and education on the ELOC dimension. In doing so, it is important to use one of the extended scales for the assessment of LOC that is able to cover the different aspects of this broad dimension. It can also be important to use a scale that distinguishes between the external power of powerful others and the external power of chance or luck. Such results may enrich the understanding of effect of different processes of socialization, which people with different levels of secondary education undergo, on the ELOC dimension.

9.3 Desiderata for further research

Further research is called for with regard to methodological issues concerning the psychometric quality of the assessment tool developed here. Three points must be addressed in future studies:

(1) The development of the IE-4 scale is prompted by the ever-growing demand for an extremely brief psychometric tool with which LOC can be assessed reliably and validly in research contexts that are subject to high time constraints, for example, social surveys or correlational studies. For reasons of brevity, the two sub-dimensions of the ELOC factor proposed by Levenson (1972) were collapsed into one in the IE-4 scale. However, further research is called for in order to investigate the relationship between the ELOC subscale of the IE-4 and the dimensions of Powerful Others and Chance of the IPC scale. Moreover, it is necessary to compare the construct validity of the IE-4 with extended established questionnaires e.g., the IPC.

(2) Further studies should provide the research community with reference values of the IE-4. Drawing on the data of a sample representative of population the reference values allow comparison of research findings with the representative standard and deepen the interpretation of research findings on the level of the group differences. The reference values of the IE-4 for the German population are published by Kovaleva, Beierlein, Kemper, and Rammstedt (2012). The authors have also investigated the assessment time of the IE-4. The majority of participants (75%) answer the scale only in 51 seconds. The study providing the reference values and investigating the assessment time of the English version of the IE-4 is to be conducted.

(3) The observed effects of the socio-demographic variables on the IE-4 subscales are to a large extent supported by previously reported findings. However the majority of these findings have been reported in respect of extended scales such as the ROT-IE or the IPC. Hence, further studies with the IE-4 scale in different research contexts are called for e.g., health and aging research issues.

(4) An overview of the reported findings with regard to the effects of gender, age, and education on LOC dimensions reveals that the cultural context of the samples must always be taken into account when investigating the effects of socio-demographic variables. The translation of the IE-4 scale into other European languages would facilitate further research on cultural differences and the tracking of social change in such a multicultural community as the European Union.

10 Conclusions

Over decades, studies in sociology and psychology have reported a sense of control to be correlated with physical and mental well-being, social commitment, vocational behavior, coping with unemployment, various research issues about aging or health. In order to meet the demand for the assessment of locus of control (LOC) under strict time constraints of survey research an efficient questionnaire - the four-item scale for the assessment of internal and external LOC (IE-4), has been developed within this thesis.

Enhanced literature review on the development of theoretical background of different ways of operationalization of LOC and four empirical studies are undertaken in order to construct and validate the IE-4 scale. In sum, the IE-4 is constructed according to the classical test theory. Its construction is supported by the established theoretical background, exploratory and confirmatory factor analyses. Its items are developed with regard to the answering bias of the respondents with low level of education. The subscales of the IE-4 are proved to have sufficient psychometric properties, good scale homogeneities and retest reliabilities, stable factorial structure and construct validity. The investigation of the effect of socio-demographic variables reveals results similar with those reported for the extended psychological scales assessing LOC. Moreover the IE-4 scale with only four items is currently the shortest scale for the assessment of LOC and can be applied in research contexts with high time constraints.

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Locus of control describes a generalized belief about whether outcomes of behavior are determined by one's actions or by forces outside one's control. Over decades, studies in sociology and psychology have reported that a sense of control is correlated with physical and mental well-being, vocational behavior, general health, healthy aging, and coping with unemployment.

In order to assess locus of control within strict time constraints, as often required in survey research, an efficient questionnaire the four-item scale for the assessment of internal and external locus of control (Internal External Locus of Control-4, IE-4) was developed and validated. The IE-4 was constructed and validated in three studies. The scale proved to have a stable factorial structure and sufficient construct validity. The thesis concludes with a discussion of the efficiency of the IE-4, i.e. its satisfactory psychometric properties and brevity.

Kontrollüberzeugung beschreibt eine generalisierte Erwartung, ob die Verhaltensergebnisse von einer Person selbst kontrolliert werden oder von Kräften außerhalb der persönlichen Kontrolle. Soziowissenschaftliche und psychologische Studien zeigten über Jahrzehnte, dass Kontrollüberzeugung mit physischem und mentalem Wohlbefinden, berufsbezogenem Verhalten, allgemeiner Gesundheit und gesundem Altern sowie Umgang mit Verlust von Arbeit korreliert.

Die vorliegende Arbeit beschäftigt sich mit der Entwicklung und Validierung einer Vier-Item-Skala zur Messung von Kontrollüberzeugung (die Skala Internale-Externale-Kontrollüberzeugung-4, IE-4). Die IE-4 ist für den Einsatz unter engen zeitlichen Bedingungen, z.B. in Survey-Forschungen, gut geeignet. Die Entwicklung und Validierung der IE-4 basieren auf drei Studien. Die stabile faktorielle Struktur und Konstruktvalidität der Skala werden belegt. Abschließend werden psychometrischen Kennwerte und Kürze der Skala diskutiert.