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**Behavioural and Emotional Correlates of Age-Related Visual Decline:
Contextual and Self-Regulation Perspectives**

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vorgelegt von
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Preface

Visual decline, just as sensory loss in general, is associated with age and aging, not only biologically but also socio-culturally (Wahl & Heyl, submitted). In view of the pronounced improvements in the general state of health of older people in recent decades, it is remarkable that within the same period of time hardly any improvements in age-related sensory functioning (i.e., vision and hearing) have occurred (Freedman, Martin, & Schoeni, 2002). This might be seen as support for the notion that sensory functioning and sensory loss, respectively, are biological “age markers”, though it remains controversial whether it is actually prudent to look for such age markers (Wahl & Heyl, submitted).

From a philosophical as well as from a psychological point of view, vision is one of the basic modalities to perceive and explore the world. While hearing (and hearing loss, respectively) is particularly important for interaction with the social environment, vision (and vision loss, respectively) seems to be of particular importance for interaction with the spatial-physical environment (cf. Wahl & Tesch-Römer, 2001). To put it differently, being able to cope with the spatial world outside is likely to be most problematic for visually impaired individuals. Thus, one might hypothesize that in old age, when the focus of life tends to be on the home anyway (e.g., Saup, 1993), the onset of severe visual impairment might aggravate the risk of experiencing detachment from life and social isolation, yet affecting social environment through the back door, as it were.

These first considerations already show that visual impairment has direct implications for person-environment transactions in everyday life. Moreover, it is a prototypical example of how individuals deal with challenges in general. Though this is true for visual impairment at all ages, the coincidence of vision loss and old age is a particularly confrontational condition. Wahl and colleagues have argued that the experience of severe visual impairment in the later years may even be seen as a situation of accelerated aging that reveals dynamics of adaptation in time lapse, so to speak (Wahl, Heyl, Becker, Schilling, & Mollenkopf, in press).

There are two principal designs to investigate psychosocial correlates of vision in old age: focusing on severe vision loss (i.e., pathological age-related changes in vision; see 1.1.3.) or making use of the whole continuum of visual functioning. The latter can be accomplished by employing a general aging sample that is comprised of normal age-related changes in vision (see 1.1.2.) by the majority, but also includes cases with excellent vision as well as cases of more severe vision loss. Both designs have been employed by the author of the present thesis in different studies. To refer to normal as well as to pathological age-related alterations in vision simultaneously, the term age-related visual decline is used here.

This work presents five empirical papers dealing with behavioural, emotional, and contextual correlates of visual functioning in old age, and one empirical paper focusing on social context in old age from a more general perspective. According to recommendations on publication-based theses made by Gigerenzer, Rösler, Spada, Amelang, Bierhoff, Ferstl and colleagues (1999), this work is written in English language. Gigerenzer et al. noted that following the standards of other European countries, publication-based theses should consist of “(...) one, two, or three articles (published, in press, or submitted), preceded by an introductory text (...)” (p. 103, translation by the author of the present thesis). Thus, the reader is provided at first with the theoretical background of the studies (Part I), a summary of their empirical contributions (Part II), and an overall discussion (Part III). The papers are then provided in the appendix.

The author of the present thesis is part of a research group that has worked extensively on reviewing and synthesising existing empirical and theoretical literature in the field of visual impairment and beyond. Thus, Part I relies considerably on own scientific contributions (e.g., Wahl & Heyl, 2003, 2004; Wahl, Heyl, Becker, Schilling, & Mollenkopf, in press; Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002a, where the author oversaw sections concerning social relations). Due to the interdisciplinary nature of the field of vision, the empirical contributions of the author are published in or submitted to publication organs of different disciplinary orientations.

Of course, this work was only possible by support from significant others. Cordial thanks go to my doctoral advisor Prof. Dr. Hans-Werner Wahl for stimulating discussions and helpful feedbacks, for giving me the opportunity to continue to work in his department in spite of two phases of parental leave, for encouraging me to reap the fruit of my labour by writing a publication-based thesis, and for always conveying to me that I am doing a good job. Also, I would like to thank my second advisor Prof. Dr. Andreas Kruse for his interest and his readiness to give his expert opinion on this thesis. Further, I would like to thank all of my colleagues at the German Centre for Research on Ageing for the pleasant and stimulating working atmosphere, in particular Dr. Oliver Schilling for interesting discussions and amusing conversations. Many thanks go to Jan Cargile for proofreading my unprofessional English! Last, but by no means least, special thanks go to my family and friends: To my husband Peter for his never-ending patience, his encouraging support, and his considered opinion that I will make it, to Lara and Jonas for making me smile, and, finally, to their grandparents and to my friends for providing emotional support and for taking care of my children during the hot phase of this work.

Presented Papers¹

1. Heyl, V. & Wahl, H.-W. (2001b). On the long-term psychosocial adaptation to vision loss in the later years. In H.-W. Wahl & H.-E. Schulze (Eds.), *On the Special Needs of Blind and Low Vision Seniors: Research and Practice Concepts* (pp. 77-83). Amsterdam: IOS-Press.
2. Wahl, H.-W., Heyl, V. & Schilling, O. (2002). The role of vision impairment for the outdoor activity and life satisfaction of older adults. *Visual Impairment Research*, 4, 143-160.
3. Heyl, V., Wahl, H.-W., & Mollenkopf, H. (in press, a). Visual capacity, out-of-home activities and emotional well-being in old age: Basic relations and contextual variation. *Social Indicators Research*.
4. Heyl, V., Wahl, H.-W., & Mollenkopf, H. (in press, b). Vision, out-of-home activities and emotional well-being in old age: Do macro-contexts make a difference? *International Congress Series*.
5. Heyl, V., Wahl, H.-W., & Mollenkopf, H. (submitted). Affect regulation by tenacious goal pursuit and flexible goal adjustment under developmental constraints: The case of normal age-related visual decline. Submitted to *Psychology and Aging*.
6. Heyl, V. & Schmitt, M. (submitted). The contribution of adult personality and recalled parent-child relations to friendships in middle and old age. Submitted to *International Journal of Behavioral Development*.

¹ All journals in which this research is published or in press or to which this research has been submitted to are peer-reviewed journals. Chapters in which this research is published or in press underwent a peer review process as well.

Part I: Research Background and Research Questions

1. Theoretical and empirical background

1.1. Visual Functioning and Aging

Before going into detail about the psychological implications of age-related visual decline, the anatomical and physiological substrates of vision are presented very briefly, followed by an overview of normal and pathological age-related changes in visual functioning. Normal age-related changes in visual functioning are understood as visual deficits that typically occur with advancing adult age and affect the majority of the elderly (e.g., impairments of close vision; cf. Wahl & Heyl, submitted). In most cases, normal age-related changes are corrigible by appropriate eyeglasses. Conversely, pathological age-related changes in visual functioning are characterized by specific, non-corrigible symptoms and functional impairments. Pathological age-related changes in vision usually affect only a minority in a certain age group. This differentiation is based on the general distinction between normal, pathological, and optimal aging suggested by Gerok and Brandtstädter (1992).

1.1.1. Anatomy and Physiology of Vision

The visual system perceives, analyses, and interprets optical stimuli. It consists of the eye, the sub-cortical visual centres, and the visual cortex. Subsequently, a brief overview of the anatomy and physiology of the visual system is given. More detailed information can be found in Guski (1996), for example.

The white outer coat enclosing the eyeball is called the sclera. In the front, the sclera passes into the cornea, a transparent dome that serves as the outer window of the eye, permitting light waves from an object to enter the eye. The transparency of the cornea is due to the fact that it contains few cells and no blood vessels.

The space between the cornea and the crystalline lens is called the anterior chamber. It is filled with transparent aqueous humor that is produced by the ciliary body and circulates out of the eye through the canal of Schlemm. The amount of aqueous fluid determines the intraocular pressure.

The iris is a diaphragm that is suspended in the aqueous humor in front of the crystalline lens. The circular opening in the centre of the coloured iris is called pupil. The contractible pupil regulates the amount of light passing through the crystalline lens to the retina.

The crystalline lens is a biconvex transparent structure that changes shape, i.e., flattens and thickens (through relaxation and contraction of the ciliary muscle), to focus the incoming light from objects far away and nearby (accommodation). The space between the crystalline

lens and the retina is filled with the vitreous body, a transparent gelatinous mass (about 98% water).

The retina covers two-thirds of the back of the eyeball. It is a layer of nervous tissue that consists of nerve cells, nerve fibres, and light- and colour-sensitive receptor cells, i.e., the rods and cones. The densest accumulation of cones is in the fovea, the region of maximum visual acuity at the centre of the macula, a small yellowish area, lying slightly lateral to the centre of the retina. There are neither rods nor cones in the part of the retina where the optic nerve emerges (blind spot). While the rods function in dim light and enable night vision (scotopic vision) and the perception of shape, size, and brightness, the cones enable colour vision (photopic vision) and the perception of fine details. The retinal receptors transduce light energy into nervous system activity that is collected and processed by retinal ganglion cells, which subsequently converge to the optic nerve. Via the optic nerve and several sub-cortical structures, the visual information is carried to the visual cortex that translates these messages into images that we see.

1.1.2. Normal Age-Related Visual Decline

At the anatomical level, many changes occur with increasing adult age (cf. Wahl & Heyl, submitted). Age-related changes in the cornea are primarily related to its surface properties, e.g., the cornea yellows, its spherical shape turns into a more toric one, and cell density lessens. However, possibly emerging astigmatic refractive errors can be easily corrected with eyeglasses.

The outlet of the aqueous humor from the anterior chamber might cause problems with advancing age. This might lead to an increase of intraocular pressure.

Aging is also associated with a marked reduction in the diameter of the pupil (senile miosis). Thus, the amount of light reaching the retina is obviously reduced. This might represent, however, an adaptation to the conditions in the older eye, since smaller diameters of the pupil increase the contrast of the retinal picture (Schieber, 2003).

Most of the age-related alterations in the visual system presumably occur in the crystalline lens. Mild alterations affect almost all elders. For example, more than 90% of those aged 75 to 85 years show a pronounced yellowing of the crystalline lens (ibid.). Moreover, the crystalline lens thickens and loses part of its flexibility with age. Together with an age-related decline in the effectiveness of the ciliary muscle, this might result in a decrease of refraction power of the crystalline lens. Due to these alterations and the decrease of the

pupil diameter, the incidence of light on the retina is reduced, more scattered, and of spectral difference.

The number of retinal rods and cones decreases with advancing adult age. In concert with atrophic tendencies in the retinal ganglion cells and changes in retina-related metabolic processes, this leads to a decrease in intensity of the electrical impulses submitted by rods and cones.

With respect to the visual cortex, a decline in the density of neurons emerges with increasing age. Furthermore, a degeneration of dendrites and an increasing latency in evoked potentials have to be mentioned. Finally, empirical results indicate that the specialisation of cortical-visual regions becomes less selective in aging (*ibid.*).

Turning now to age-related changes at the level of different visual capacities, such as visual acuity or contrast sensitivity that result from an interaction of the diverse changes at the anatomical level described above, it has to be emphasized that there is high interindividual variability. That is, comparable changes in anatomy and physiology are not necessarily reflected in comparable changes in visual functioning (*cf. Wahl & Heyl, submitted*).

Good visual acuity is necessary, though not sufficient for good vision. Most research, however, has been done on visual acuity. Age-related changes in visual acuity are foremost changes in the amplitude of accommodation, resulting in increasing difficulties in near vision (presbyopia). Near vision impairments affect the majority of those 60 years or older. Most of these impairments are corrigible. Distance vision is high and rather stable until the age of 50. Subsequently, it declines continuously. There is a stronger decline in dynamic than in static acuity. Moreover, an age-related decline in stereopsis has been observed. To interpret these findings adequately, it has to be pointed out that from a visual acuity of 20/70 (about 0.30 in Snellen decimals) or less in the better eye (definition of low vision; Orr, 1992), massive problems in daily life arise. A visual acuity of 20/200 (or 0.10 in Snellen decimals) or less indicates legal blindness in the United States (Orr, 1992). Legal blindness may occur in conjunction with a variety of eye diseases, *i.e.*, pathological age-related changes in vision (see section 1.1.3.).

Contrast sensitivity is particularly important for mobility, especially for out-of-home mobility. Yet, an age-related decline in contrast sensitivity has been confirmed repeatedly, as well as an age-related increase in sensitivity to dazzle, and a decrease in dark adaptation with advancing adult age (see *Wahl & Heyl, submitted*). Also, negative age effects on night vision arise, that is, elders need more light to make use of their remaining powers of vision.

Moreover, a decline in colour vision has been observed regarding the ability to differentiate between similar colours. Finally, the size of the visual field decreases from age 50.

1.1.3. Pathological Age-Related Visual Decline

Severe vision impairment affects about 20% of those 65 years and older and about 25% of those 75 years and older (e.g., Lighthouse Research Institute, 1995). Age-related severe vision loss is mostly due to cataracts, age-related macular degeneration, glaucoma, or diabetic retinopathy. Some of these eye diseases are medically treatable, others are not.

Cataracts, the most common age-related eye condition, are characterized by a pronounced opacity of the crystalline lens. Approximately 50% of those 65 years and older are affected (see Wahl & Heyl, submitted). Cataracts result in impairments of visual acuity that are well treatable by surgery.

In the course of age-related macular degeneration pathological changes in the region of maximum visual acuity arise that lead to a deterioration of the central visual field. The peripheral visual field remains intact. Age-related macular degeneration is the leading cause of low vision in the industrialized countries. Approximately 18% of those 70 to 74 years old are affected by this condition, while almost half of the elders aged 85 years and older develop the condition. Despite this prevalence, there are very few medical treatment options.

Approximately 8% of those 65 years and older suffer from glaucoma which is marked by an intense increase of intraocular pressure. This increase can lead to complete blindness by gradual destruction of the optic nerve. However, glaucoma is treatable and early diagnosis is crucial.

Diabetic retinopathy, a potentially blinding complication of diabetes, is a vessel disease of the retina. After 10 to 15 years with diabetes, diabetic retinopathy affects about two-thirds of patients. Diabetes damages the tiny blood vessels in the retina. In the advanced, or proliferative, stage of the disease, new and fragile blood vessels grow along the retina and in the vitreous body. These new blood vessels can bleed, cloud vision, and destroy the retina. Yet even people with advanced retinopathy have a 90% chance of keeping their vision when they get treatment before the retina is severely damaged.

1.2. Age-Related Visual Decline as Challenge for Behavioural Competence

This part is concerned with behavioural correlates of age-related visual decline in general, but with a main emphasis on age-related low vision (i.e., visual acuity of 20/70 or less). First, conceptual perspectives relevant to this field of research are outlined. This appears to be of particular importance because research has addressed psychosocial consequences of age-related vision loss in a rather a-theoretical manner for a long time. Subsequently, an overview of important empirical contributions is given. Finally, conclusions are drawn with respect to own empirical work.

1.2.1. The Perspectives of Everyday Competence, Person-Environment, and Cognitive Functioning

To meet the challenges that accompany the greying of societies, an understanding of the behavioural functioning of aging people in everyday situations is crucial. Thus, the theoretical and empirical concept of everyday competence has received much attention in gerontological research since the 1990s (e.g., M. Baltes, Mayr, Borchelt, Maas, & Wilms, 1993; M. Baltes, Maas, Wilms, Borchelt, & Little, 1999; Diehl, 1998; Diehl, Willis, & Schaie, 1995; Wahl, Oswald, & Zimprich, 1999; Willis, 1991). The term everyday competence refers to a person's potential to perform activities that are essential for independent living (Diehl, 1998). Everyday competence can be conceptualized as outcome, process, and antecedent (Wahl et al., 1999). Though traditionally and mostly assessed as functional health, i.e., as basic and instrumental activities of daily living (ADL and IADL; Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963; Lawton & Brody, 1969), everyday competence comprises multiple domains (physical, psychological, and social domains of functioning) and multiple components (such as cognitive abilities, self-efficacy, and coping styles in the psychological domain; Diehl, 1998). In view of that, the widely used concepts of basic ADL (e.g., eating) and the more complex IADL (e.g., meal preparation) that are necessary to maintain autonomy should be at least complemented by the concept of leisure and lifestyle activities that are more optional in nature and touch also upon the social domain of functioning. This has been done in a model of everyday competence by M. Baltes and co-workers (M. Baltes et al., 1993, 1999; Marsiske, Klumb, & M. Baltes, 1997) by using the terms basic and expanded competencies (BaCo and ExCo). According to this model, BaCo is seen as essential to daily life, primarily depending on variables related to physical condition, while ExCo is echoed in more discretionary activities and is assumed to depend on BaCo, but also on a broader set of psychological variables. The main reason for this assumption is that behaviours pertaining to ExCo are not

necessary for fundamental independence, but relate to optional use of opportunity structures to improve one's quality of life.

From a lifespan developmental perspective, the balance of developmental gains and losses tends to tip toward the negative with advancing adult age (Heckhausen, Dixon, & P. Baltes, 1989). Thus, an understanding of everyday competence of aging people clearly has to consider the effects, in particular the long-term effects, of developmental constraints such as role losses and physical impairments. Increasing loss in behavioural competence might be expected over time due to the combination of growing older *and* being visually impaired. However, research concerned with long-term behavioural adaptation to the developmental constraint of age-related visual decline is very rare.

Moreover, Wahl, Heyl, and Schilling (2002) have argued that a distinction between everyday activities inside and outside the home is crucial with respect to age-related visual decline. While most individuals who are confronted with age-related visual decline are able to cope with everyday activities inside the persistent and predictable home environment quite well, out-of-home activities might be far more challenging. To strengthen this argument, a further theoretical perspective has to be introduced.

According to the person-environment perspective, the lower the competence of an elderly person, the stronger will be the impact of environmental conditions on his/her behaviour (environmental docility hypothesis; Lawton, 1982). Thus, negative environmental press should affect the behaviour of individuals with lower visual competence more negatively compared to individuals without losses in visual competence. Since negative environmental press in terms of unforeseeable and uncontrollable situations is more likely to be found in the complex out-of-home environment (e.g., precarious cross-walks or unanticipated road works) than inside the familiar home environment, out-of-home activities should be particularly affected by age-related visual decline. However, out-of-home activities have not been the focus in empirical work on age-related visual decline so far.

Finally, theoretical perspectives on the relationship between vision and cognitive functioning – in that both can be conceptualized as antecedents of everyday competence (Willis, 1991) – have to be mentioned here. Two alternative theoretical models have been proposed in the literature (see also Wahl & Heyl, 2003). The first model is based on Birren's (1964) cascade hypothesis. According to this hypothesis, losses in cognitive functioning are triggered by earlier losses in visual functioning. More precisely, it is assumed that the lowered rate or complete absence of flow of visual information to the brain results in a state of deficient stimulation (sensory deprivation) that, in turn, negatively affects cognitive

functioning. The alternative theoretical approach, called the common-cause hypothesis, states that age-related changes in the central nervous system (i.e., neuronal deteriorations) are responsible for both losses in visual as well as in cognitive functioning. This hypothesis relates to one of gerontology's big stories, i.e., the idea that sensory functioning has to be understood from a central nervous system perspective and must not be reduced to the functioning of peripheral end organs (Fozard, 1990). As it would seem, age-related sensory losses, in particular those that elude treatment, are mostly of neuronal origin (ibid.).

1.2.2. Empirical Findings

According to a comprehensive review of studies on behavioural consequences of age-related low vision (Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002a), activities of daily living appear as the best studied area in the visual impairment literature. In general, there is convergent evidence on significant associations between visual functioning as measured by visual acuity or contrast sensitivity and behavioural functioning as measured by ADL/IADL (e.g., Dargent-Molina, Hays & Breart, 1996; Marsiske et al., 1997; Rubin, Roche, Prasada-Rao, & Fried, 1994). Multivariate analyses of visual impairment among elderly people have convincingly demonstrated that visual impairment contributes uniquely to ADL/IADL performance after controlling for sociodemographic and health-related variables (e.g., Horowitz, 1994; Keller, Morton, Thomas, & Potter, 1999).

Regarding leisure activities (ExCo in the terminology of M. Baltes et al., 1993, 1999) and age-related visual decline, evidence is rather mixed (e.g., Kelly, 1995; Resnick, Fries, & Verbrugge, 1997). Research indicates that decline in leisure activities occurs mainly in those activities that require the greatest visual ability (Heinemann Colorez, Frank, & Taylor, 1988). However, from the perspective of the model of selective optimization with compensation (SOC-model, P. Baltes & M. Baltes, 1990), disengagement from vision-dependent leisure activities might be seen as an adaptive strategy for low vision elders, allowing them to focus on and develop other meaningful activities that are more rewarding. Results from Marsiske and colleagues (1997) revealed that the effect of vision on ExCo was completely mediated by intelligence. Moreover, support was provided for the everyday competence model, i.e., variance in sensorimotor variables was relatively more important for the prediction of BaCo, while variance in psychological variables was relatively more important for the prediction of ExCo.

Furthermore, even milder forms of age-related vision loss have obvious negative consequences for orientation and out-of-home mobility, especially when contrast sensitivity is

impaired (e.g., Rubin et al., 1994). By means of a group-comparison design (severely visually impaired vs. visually unimpaired), visual impairment was found to be a significant predictor of maximum action range after controlling for several variables, in particular for ADL/IADL (Wahl, Oswald, & Zimprich, 1999).

Finally, research examining vision and cognition in aging adults commonly supports the notion of substantial links between sensory and cognitive measures based on diverse methods of assessment and design (see Wahl & Heyl, 2003, for a review). For example, Lindenberger and P. Baltes (1994) found that vision and hearing predicted the largest portion of interindividual variance in intelligence in a model inclusive of age, sensory and cognitive functioning. Moreover, sensory measures appeared as better predictors of intelligence than sociobiographical variables such as years of education (Lindenberger & P. Baltes, 1997). Finally, it has been found that sensory functioning is more closely related to cognitive functioning in old age (70-103 years) than in adulthood (25-69 years) (P. Baltes & Lindenberger, 1997). This result has been interpreted as support for the common-cause hypothesis. In general, since sensory deficits do not consistently manifest themselves before the onset of cognitive decline (Rott, 1995), and no clear cause-effect relation between sensory and cognitive functioning has been detected so far, the common-cause hypothesis is favoured over the cascade hypothesis by the scientific community.

1.2.3. Conclusion

Based on the theoretical and empirical work considered above, the following conclusions are drawn with respect to own research projects.

First, in view of the lack of studies concerned with long-term behavioural outcomes of age-related visual decline, it is aimed at contributing to fill this gap in research.

Second, in view of the likely relevance of age-related visual decline for out-of-home activities of daily living and out-of-home leisure activities, and given the lack of research concerning this matter, it is aimed at investigating the role of visual functioning for out-of-home everyday functioning in old age.

Third, according to the logic of the everyday competence model (M. Baltes et al., 1993, 1999), it is aimed at investigating possible mediating effects of basic out-of-home activities, psychological and social variables on the relationship between visual functioning and out-of-home leisure activities.

Fourth, due to the strong connection between vision and cognition in old age as well as between cognition and everyday competence (e.g., Diehl, Willis, & Schaie, 1995), studies on behavioural correlates of age-related visual decline have to consider cognitive functioning.

1.3. Age-Related Visual Decline as Challenge for Emotional Adaptation

Complementing 1.2., this part is concerned with emotional correlates of age-related visual decline. The term emotional is used to emphasize the affective side of adaptation as opposed to the behavioural side. However, it is important to note that many of the outcomes of age-related visual decline that are called emotional in the context of the present work are not purely emotional in nature, but contain cognitive components as well (e.g., subjective well-being). Emotional outcomes of vision loss are usually investigated in terms of depression or different components of subjective well-being such as life satisfaction, future orientation, and positive and negative affect. Again, conceptual perspectives relevant to this field of research are outlined at first, followed by an overview of important empirical contributions and completed by conclusions with respect to own empirical work.

1.3.1. The Perspective of Self-Regulation

Emotional adaptation to chronic challenges such as age-related visual decline has been approached from the perspective of diverse coping strategies as well as from the more general perspective of self-regulation (Wahl & Kruse, 1999). Most essentially, the former approach provided evidence for a high interindividual and intraindividual variability of responses to chronic conditions among older adults (e.g., Kruse, 1987). The term self-regulation that will be the focus in the following section subsumes theoretical perspectives such as psychological resilience and coping that aim at explaining the maintenance of subjective well-being in spite of losses that typically are associated with age, such as age-related visual decline.

The finding that objectively adverse life circumstances in later life have a lower impact on subjective evaluations of well-being than one might expect has been called the well-being paradox (e.g., Staudinger, Fleeson, & P. Baltes, 1999). Evidence for this phenomenon has been typically derived from cross-sectional age-group comparisons. Yet, in a recent longitudinal analysis, Schilling (2004) has found an age-related decline in mean levels of life satisfaction among older adults. Whether this negative age effect can be considered as large enough to seriously challenge the paradox of subjective well-being, however, remained a moot question. In the psychological literature, stable personality traits and process-related self-regulatory mechanisms are discussed to support the well-being paradox. Personality traits

such as neuroticism or extraversion contribute to how a person typically perceives and behaves, thereby acting as psychological resources (Staudinger, Fleeson, & P. Baltes, 1999). The potential of self-regulatory processes that are at a person's disposal to maintain or regain subjective well-being also contributes to psychological resilience (Staudinger, Marsiske, & P. Baltes, 1995). Self-regulatory mechanisms are, for example, social and temporal comparisons, personal life investment (i.e., thought and effort invested in diverse life domains such as social relationships and health), control beliefs, and changes in aspiration level (Staudinger, 2000; Staudinger, Fleeson, & P. Baltes, 1999).

Within the framework of self-regulation, a life-span theory of general coping tendencies has been formulated by Brandtstädter and colleagues (e.g., Brandtstädter & Renner, 1990). The so-called dual-process model of self-regulation distinguishes two fundamental modes of dealing with perceived or anticipated discrepancies between actual and desired situations or developmental outcomes: The assimilative mode refers to strategies of adjusting situations to personal goals, while the accommodative mode refers to mechanisms of adjusting personal goals to situational constraints and changes in action resources. In the assimilative mode, the individual actively tries to achieve a goal (e.g., by intentionally modifying life circumstances or one's own behaviour), whereas in the accommodative mode, the individual withdraws from goals that resist goal-directed activities (e.g., by downgrading blocked goals, finding benefit in adversity, and channelling of resources toward alternative, feasible goals). Assimilative efforts appear adaptive as long as there is a realistic chance of attaining a goal. But when goal pursuit exceeds resources or aversive circumstances seem irreversible (a situation that becomes more common with advancing adult age), switching from assimilative to accommodative modes of coping helps to overcome feelings of helplessness and depression and to regain a global sense of control and efficacy. Yet Brandtstädter and Rothermund (2002) also have pointed to possible dysfunctional side effects of assimilative and accommodative processes when commitment to unfeasible goals endures (e.g., because of unrealistic overestimation of one's capacity) and when the difficulty of goals is overestimated or one's capacity is underestimated. So far, however, there are no studies testing for these theoretical considerations. Moreover, though there are theoretical and empirical hints to a regulatory dilemma when both assimilative and accommodative tendencies are strongly pronounced (Bak & Brandtstädter, 1998), there are no studies investigating possible mutually assistive or synergistic effects. Such effects would be quite conceivable when the approach-related components of accommodative tendencies are considered, e.g., the channelling of resources to feasible goals that constitute the basis for further assimilative efforts. Most

notably in general, the dual-process model of self-regulation has overcome the oversimplified classification of coping strategies into positive (e.g., instrumental or attentive coping; for an overview see Schwarzer & Schwarzer, 1996) and negative ones (e.g., avoidant or emotional coping) by emphasizing that certain coping behaviours are adaptive under certain circumstances but not under others.

1.3.2. Empirical Findings

The majority of studies reviewed by Burmedi, Becker, Heyl, Wahl, and Himmelsbach (2002b) support the notion of a significant link between low vision and lowered well-being (e.g., Reinhardt, 1996; Wahl, 1998). Vision loss appears to be accompanied by negative emotions (Jacobs, van Zandt, & Stinnett, 1983) as well as unhappiness and discontentment (Karlsson, 1998). Furthermore, multivariate analyses, controlling for sociodemographic variables, functional limitations, and social support, have shown poor vision to be a unique predictor of life satisfaction (Reinhardt, 1996) as well as morale (Bazargan, Baker, & Bazargan, 2001). Finally, there is clear indication that age-related visual impairment increases the risk of depression even when sociodemographic variables and co-morbidity are controlled for (Bazargan et al., 2001; Carabellese et al., 1993). But prior work also suggests that the extent to which visual impairment results in poor emotional adaptation might depend on factors such as everyday competence and social support (Brennan, 2002; Reinhardt, 1996, 2001). In fact, decline in everyday competence was among the most important correlates of depression reported in several studies (see Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002b). However, based on these findings it remains unclear whether visually impaired elders are able to maintain a certain, even if lowered, level of subjective well-being over time (as might be expected from the perspective of psychological resilience) or whether further decreases occur.

Interestingly, research focusing on age-related low vision has commonly failed to provide evidence for a relationship between the objective severity of vision loss as measured, for example, by visual acuity and the objective severity of depression. As it seems, the subjective evaluation of visual decline, rather than the objective severity, is particularly crucial for well-being and a risk factor for depression among visually impaired elders (e.g., Horowitz, Reinhardt, & Kennedy, 2005; Rovner & Casten, 2002; Wahl, 1998).

Research on coping with age-related vision loss has consistently documented that emotion-focused coping (i.e., regulation of the emotional response to a problem; Lazarus, 1991) predicts poor adaptation outcomes, while the role of problem-focused coping (i.e.,

alteration of a problem) for positive outcomes remained largely unclear (e.g., Benn, 1997). Thus, as Boerner (2004) concludes, research based on the distinction between emotion-focused and problem-focused coping has contributed more to an understanding of problematic than of adaptive coping patterns. There are only two studies so far that made use of the more sophisticated life span theory of general coping tendencies as proposed by Brandtstädter and associates (e.g., Brandtstädter & Renner, 1990) to investigate emotional adaptation to age-related visual impairment (Boerner, 2004; Wahl, Becker, Schilling, Burmedi, & Himmelsbach, 2005).

Results from the study by Boerner (2004) indicate that emotional adaptation benefits of accommodative processes might be stronger in a chronically impaired group compared to the general aging population. Moreover, evidence for a stronger impact of accommodative processes on mental health among older than among middle-aged visually impaired adults was found, but only when younger adults with lower levels of disability were compared with older adults. That is, while in the younger age group a beneficial effect of accommodative processes on mental health was lacking when disability was low, but was present when disability was high, in the older age group the beneficial effect emerged regardless of disability levels. This finding suggests that in a chronically impaired population a shift from assimilation to accommodation might occur much earlier in life than in the general population, where a shift is supposed to occur not until the manifestation of typical age-related losses and constraints (e.g., Brandtstädter, Wentura & Greve, 1993).

Findings from Wahl and colleagues (2005) confirm a decrease in assimilative tendencies among older adults with age-related macular degeneration across a one-year interval. However, no increase in accommodative tendencies emerged at the mean level during this period of time. Yet, T1-T2 difference scores in accommodation tended to predict positive affect at T2 in such a way that an increase in accommodation was related to higher positive affect. This effect disappeared when (the rather stable) positive affect at T1 was controlled. In general, the beneficial effect of assimilative tendencies on positive affect was considerably stronger than that of accommodative tendencies. However, Myers and Diener (1995) have argued that affective well-being includes both the “presence of positive affect” *and* the “absence of negative affect” (p.11). Thus, an examination of the potential of assimilative and accommodative tendencies to reduce negative affect accompanying age-related visual decline appears to be imperative.

1.3.3. Conclusion

The following research goals and general conclusions are derived from the theoretical and empirical background outlined above.

First, in view of the lack of studies concerned with long-term emotional outcomes of age-related visual decline, it is aimed at investigating the question of whether visually impaired elders are able to maintain a certain, even if lowered, level of subjective well-being over time.

Second, considering the prominent roles of both age-related vision impairment and everyday competence for emotional adaptation, it is aimed at investigating the question of whether everyday competence mediates the effect of visual impairment on emotional adaptation.

Third, in view of the significance of subjective vision in predicting emotional adaptation, it is concluded that research on emotional correlates of age-related visual decline should consider objective and subjective vision simultaneously, particularly when the focus is not on low vision elders, but on a general aging sample (that, besides visually unimpaired elders, comprises older people with age-related visual decline of presumably very different objective severity).

Fourth, since previous research has not provided thus far any in-depth view on how assimilative and accommodative tendencies exert their effects on affective well-being as a whole, it is aimed at investigating the question of whether processes pertaining to assimilation and accommodation are able to enhance affective well-being by promoting the presence of positive affect and preventing negative affect in general terms as well as under the developmental constraint of age-related visual decline.

Fifth, it is aimed at investigating possible dysfunctional side effects of assimilative and accommodative processes.

Sixth, it is aimed at testing for possible synergistic effects when both assimilative and accommodative tendencies are strongly pronounced.

1.4. Age-Related Visual Decline in Context

1.4.1. The Need for a Contextual Understanding of Age-Related Visual Decline

As outlined in the previous synopses and conclusions, to understand behaviour and emotion in old age it is essential to consider the role of context (see, for example, Wahl & Lang, 2004). Obviously, the term context has many facets, starting from proximate spatial-physical and

social contexts such as home environment and most close social relationships up to macro-environmental contexts such as urban and rural contexts, and society at large.

When using the term context with respect to age-related visual decline, the following aspects are particularly crucial (Wahl, Heyl, Becker, Schilling, & Mollenkopf, in press): First, age-related visual decline or, the other way round, visual functioning in old age does not operate in an isolated manner, but has to be considered always in the context of other resources (or constraints) that are substantial to the aging individual. Second, age-related visual decline represents a prototypical resource loss with direct impact on transactions between person and, most obviously, physical, but also social, context. Finally, age-related visual decline has to be viewed in the context of life-span development as a constraining condition for development in old age.

Research considering vision in spatial-physical or social context is limited so far. Though the impact of age-related visual decline on person-environment transactions in the nearby spatial-physical context has recently attracted some empirical interest (e.g., Wahl, 1998; Wahl, Oswald, & Zimprich, 1999), work on vision impairment has, for example, widely neglected the large-scale or macro-environmental (social) context, though its importance has been repeatedly pointed out (e.g., Diehl, 1998). Against this background and complementary to the more spatial-physical context-related work from the own research group, the own research interest focuses primarily on the social context of age-related visual decline, but also on aging in social context in general. Therefore, and since some of the theoretical and empirical work with respect to the spatial-physical environment has been outlined already under 1.2., the following paragraphs provide a more detailed synopsis of issues relating to visual decline in social context.

1.4.2. Age-Related Visual Decline in Social Context

Empirical studies on social relationships of individuals with age-related visual decline have usually focussed on social functioning, social support, or loneliness (cf. Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002b). Below, theoretical perspectives pertaining to these constructs are outlined, followed by an overview of important empirical contributions. Finally, conclusions with respect to own empirical work are drawn.

1.4.2.1. The Perspectives of Disengagement, Social Support, and Loneliness

Social functioning among elders with age-related visual decline has been approached by applying the well-known disengagement theory (Cumming & Henry, 1961). According to

disengagement theory, the elderly individual and society mutually withdraw from each other in an inevitable disengagement process. This process is considered as adaptive since it is assumed to free elders from potentially overtaxing responsibilities, thereby facilitating everyday behaviour in view of age-related losses (such as age-related visual decline). Moreover, disengagement is supposed to prepare the individual for the final phases of life. Within the framework of disengagement theory, society is thought of as being the crucial factor, that is, when society expects disengagement, disengagement is supposed to occur even if the elderly person is not yet ready, but when society is not ready for disengagement, the elderly person is assumed to stay engaged. Interestingly, disengagement theory already has emphasized the motivational role of age-related limitations in time perspective, as is also done by more recent theories of social relationships (e.g., Carstensen, Isaacowitz, & Charles, 1999; Lang, 2004). Moreover, a positive qualitative shift in social relationships has been hypothesized, though not due to diminishing future time perspective (as in socioemotional selectivity theory, Carstensen et al., 1999), but due to reductions in social interactions per se. A rather unique contribution of disengagement theory lies in the effort of combining micro level (individual aging) and macro level (how society deals with elderly members), which is an important theoretical challenge hardly met by most gerontological theories (Wahl & Heyl, 2004). Nevertheless, the emphasis on life span development in gerontology has brought about a perspective shift from seeing older adults as being more or less passively exposed to social opportunity structures (which they have to go along with) to regarding them as actively shaping their social environments, albeit sometimes under diverse developmental constraints (Kruse & Wahl, 1999).

Social support appears as the best studied domain of social relationships among visually impaired elders. Most basic social support has been defined in either quantitative (e.g., size of social network) or qualitative terms (e.g., satisfaction with social support). Currently, more elaborated definitions of social support (see Schwarzer & Leppin, 1991, for a review) refer to social support as social behaviour (received support) but also as cognitive schema (perceived support). Moreover, social support might be conceived as an environmental variable (resource provided by others; e.g., Cohen & Syme, 1985), but also as a personality variable (sense of acceptance; Sarason, Pierce, & Sarason, 1990). Finally, Schwarzer and Leppin (1991) have argued that since, as a rule, environment-related as well as person-related conditions are crucial, social support might be best understood from a transactional perspective. Several multidimensional models have been proposed with respect to the contents of social support (see Cutrona & Russell, 1990, for an overview). In general, it is differentiated between

emotional (e.g., consolation), instrumental (e.g., doing shopping), informational (e.g., giving advice), and affirmative (e.g., positive feedback) support as well as social integration (e.g., joint leisure activities). Weiss's theory of social provisions (1974) proceeds from the assumption that six key social provisions are required to maintain subjective well-being and to avoid loneliness, i.e., reliable alliance, guidance, attachment, reassurance of worth, social integration, and nurturance. Correspondingly, social support can be defined as perceived support quality in these six support components. Perceived support quality might be further differentiated by provider, for example, family and friends. Finally, an important issue related to social support is reciprocity. According to the basic tenets of equity theory (Walster, Walster, & Berscheid, 1978), individuals seek to maintain or achieve a balance between give and take in social relationships. Moreover, it is assumed that people feel uncomfortable with an imbalance.

Most of the studies that have dealt with loneliness among visually impaired elders employed a cognitive discrepancy perspective, defining loneliness according to Peplau (1985) as an unpleasant personal experience resulting from the subjective evaluation of social network as quantitatively or qualitatively less than desired (cf. Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002b). In the model of loneliness by deJong-Gierveld (1987), loneliness is supposed to depend largely on the subjective evaluation of deficits in social relationships that is based upon situational (e.g., network size) and dispositional (e.g., personality traits) factors. Depending on the rate of situational vs. dispositional factors influencing the subjective evaluation, loneliness can be more of a state or more of a trait (Russell, 1982). Most notably, cognitive discrepancy models consider the fact that the subjective experience of loneliness does not necessarily match the objective social situation, i.e., objective frequency or quality of social contacts.

1.4.2.2. Empirical Findings

Based on the notions of disengagement theory (Cumming & Henry, 1961), Edsall and Miller (1978) hypothesized that there is a link between social disengagement and age-related neurophysiological changes such as loss of visual acuity. However, they failed to demonstrate a significant relationship between diverse measures of disengagement and visual acuity. On the other hand, in a large study on nursing-home residents, increasing levels of visual impairment were associated with decreasing levels of social engagement, even when numerous covariates were controlled for (Resnick et al., 1997). Evans (1983) found that social activity decreased as a function of duration of blindness in a cross-sectional sample, and thus

assumed that social inactivity is associated with the chronic phase of visual impairment. Overall, there is rather mixed evidence in the work on age-related low vision and social functioning.

There is not much evidence in terms of effects of low vision on social support. Vision impairment-related variables such as type of impairment, age at onset of impairment, duration of impairment, and vision loss severity were not significantly associated with social support in a number of studies (e.g., Hersen, Kabacoff, Van Hasselt, Null, Ryan, et al., 1995; Reinhardt & Blieszner, 2000). However, on a more general level, higher chronic impairment and functional disability have been found to be associated with lower levels of friendship involvement (Johnson & Troll, 1994) and decreased instrumental friendship support (Reinhardt & Blieszner, 2000). Thus, by leading to functional disability, visual impairment might negatively affect social support. On the other hand, since there is some evidence for the buffering impact of social support as a coping means against negative effects of vision loss, there is reason to believe that social support may be able to mitigate vision-related functional disability in terms of limitations in everyday competence. However, behavioural outcomes of social support provided to older adults with age-related visual decline have been largely neglected so far. Regarding emotional outcomes in line with the stress-buffer hypothesis, Opegaard, Hansson, Morgan, Indart, Crutcher, and Hampton (1984) found quality of vision to be negatively associated with anxiety and depression, but only for subjects with low access to family support. Hersen et al. (1995) reported a negative relationship between social support and depression and a positive relationship between social support and assertiveness among visually impaired elders. Among middle-aged and older adults with vision loss, the perception of emotional support adequacy predicted higher levels of personal growth in a multiple regression analysis reported by Brennan (2002). Findings from a study by Reinhardt (1996) suggest that among elders suffering from diverse eye conditions higher social support quality is associated with fewer depressive symptoms, more life satisfaction, and better adaptation to vision loss. Moreover, although family members appeared to provide higher quality support (compared to close friends), friendship support added unique variance to well-being after accounting for health-related and sociodemographic variables as well as for family support. When both family and friendship support were added in a model predicting adaptation to vision loss, only friendship support emerged as a significant predictor. Thus, friendship support might be particularly important in the domain of adaptation to vision loss. McIlvane and Reinhardt (2001) confirmed and elaborated on these findings by considering interaction effects between family and friend support. Results indicate that having high qualitative

support (in terms of social provisions) from both family and friends seems to be crucial for well-being among visually impaired elderly women, while for visually impaired elderly men having high qualitative support at least from one source is also beneficial. Moreover, higher *qualitative* friend support and higher *quantitative* family support (in terms of family network size) were related to better adaptation to vision loss. In a recent study, Reinhardt, Boerner, and Benn (2003) have investigated change in social support over time among elders with age-related vision loss. Findings indicate an average decrease in all network and support variables over time. Yet, there was a considerable amount of individual variation in outcomes: Younger age and lower education predicted greater baseline friendship support, rehabilitation was associated with a lower decrease in friend network size, and higher functional disability was related to a lower decrease in family support over time. The issue of support provided by older adults with chronic visual impairment has been addressed by Boerner and Reinhardt (2003). According to their results, affective and instrumental support provided to family and friends decreased over time. Support receipt was positively related to support provision at all measurement occasions, thus indicating a balance in give and take. However, as the authors point out, no direct measures of reciprocity have been used in this study.

Loneliness, more precisely lack of loneliness, may be considered as one particular, i.e., socioemotional, dimension of subjective well-being (e.g., Dykstra, 1995), and thus also as an emotional outcome of social support. In accordance with this view, social support satisfaction has been found to be negatively related to loneliness in a number of studies (e.g., Barron, Foxall, Von Dollen, Shull, & Jones, 1992; Foxall, Barron, Von Dollen, Shull, & Jones, 1994). Several studies have failed to find a significant relationship between objective severity of visual impairment and degree of loneliness (e.g., Barron et al., 1992; Holmén, Andersson, Ericsson, Rydberg, & Winblad, 1994). Yet, again, there is evidence for a significant relationship between the subjective perception of visual difficulty and feelings of loneliness (Jones, Victor, & Vetter, 1985). Likewise, increasing levels of subjective vision impairment significantly increased the risk of experiencing loneliness among community-dwelling elders (Wallhagen, Strawbridge, Shema, Kurata, & Kaplan, 2001). The study by Jones and colleagues (1985) is one of the few exceptions that considered the impact of the macro context (i.e., rural vs. urban areas). In general, in line with opportunity-related considerations, more elderly from urban areas than from rural areas reported feeling lonely. However, the relationship between subjective vision and loneliness did not differ between samples.

1.4.3. Conclusion

Based on the theoretical and empirical work considered above, the following conclusions are drawn with respect to own research.

First, since research has so far not paid much attention to social support as a coping resource with respect to behavioural outcomes of age-related visual decline, it is aimed at investigating the interrelationships between age-related visual decline, social resources and everyday activities, more precisely out-of-home everyday activities.

Second, to correspond to the necessity of considering visual functioning in old age in the context of other resources that are substantial to the aging individual, the effects of vision, social and other resources on behavioural and emotional outcomes shall be considered in one comprehensive model.

Third, in view of the lack of studies that consider the macro-environmental context in which resources of everyday functioning and well-being operate, differentiations at the regional level (i.e., urban vs. rural) as well as at the societal level (i.e., East vs. West Germany; different countries) shall be taken into account.

Fourth, as outlined above, friendships appear to be a very important source of support among elders with vision loss. However, this is also true for older adults suffering from other impairments (e.g., heart disease, Janevic, Janz, Dodge, Wang, Lin, & Clark, 2004) as well as for older adults without major impairments (e.g., Lee & Ishii-Kuntz, 1987; Matt & Dean, 1993; Pinguart & Sörensen, 2003; Siu & Phillips, 2002). In addition, friend support appears to be even more powerful among the old-old than among the young-old (Matt & Dean, 1993). Based on observed gender-related cross-lagged panel effects between friend support and psychological distress in the old-old group (over the age of 70), but not in the young-old group (50 to 70 years), Matt and Dean (1993) argue that there is increased significance of friend support and psychological distress among the very old. In detail, old-old men were especially vulnerable to psychological distress at T2 because of their lower levels of friend support at T1, while old-old women were especially in danger of losing friend support at T2 because of their higher levels of psychological distress at T1. In general, when comparing friend and family support, research has repeatedly documented positive relationships between support provided by friends and psychological and physical well-being, while for support provided by children and other relatives, this relationship is lacking or equivocal at best (see Crohan & Antonucci, 1989; Lee & Ishii-Kuntz, 1987 for reviews). Some very recent studies highlight the importance of friendships for the maintenance of independence in advanced old age (Pin, Guilley, Spini, & Lalive d'Épinay, 2005) and even for 10 year survival in the very

old (Giles, Glonek, Luszcz, & Andrews, 2005). The latter prospective study revealed that after controlling for a range of variables, greater networks with friends reduced mortality risk among individuals aged 70 years or more in a 10 year follow-up period. No significant effects of social networks with children and relatives were found with respect to 10 year survival. Thus, to understand major aging outcomes, it seems rather crucial to understand what predicts friendship involvement in old age. In view of the ubiquitous importance of friendships for health and well-being that appears to increase with advancing age, it appears imperative to investigate correlates of friendships also on a general level, i.e., among older adults without any specific impairments.

1.5. Focusing Social Context: Correlates of Friendships

Two general theoretical approaches to friendship involvement in later life will be delineated. First, it is argued that attachment theory is apt to investigate social relationships in adulthood from a biographical perspective. Second, theories of regulation of social relationships are portrayed. Subsequently, an overview of important empirical contributions is provided and conclusions are drawn with respect to own empirical work.

1.5.1. The Perspectives of Attachment Theory and Relationship Regulation

From the perspective of attachment theory (Bowlby, 1969, 1973), internal working models of attachment relations that are based on experiences with the original attachment figures (i.e., parents) can be expected to have some influence on thoughts, feelings, and behaviour in close relationships throughout life. Sensitive and consistently responsive caregiving from a caregiver who is available in times of stress is supposed to induce a secure attachment style. Insensitive and unresponsive or inconsistently responsive caregiving increases the probability of developing an anxious-ambivalent or anxious-avoidant (preoccupied) attachment style (Ainsworth, Blehar, Waters, & Wall, 1978). Attachment styles are supposed to be fundamental for the development of internal working models that reflect beliefs and expectations about self, others, and the social world in general (Bowlby, 1973). During adolescence, the internal working model is supposed to become increasingly stable and trait-like. However, it has to be recognized that there is still development and that later events can influence (maintain, amplify, counteract) the impact of early experience (e.g., Skolnick, 1986). Bartholomew and Horowitz (1991) proposed two basic dimensions of the internal working model, i.e., a model of self, indicating sense of self-worth, and a model of others, indicating expectations about the availability and supportiveness of others. Based on these

basic dimensions, four types of adult attachment can be distinguished: secure (positive image of self and positive image of others), dismissing (positive image of self and negative image of others), preoccupied (negative image of self and positive image of others), and fearful attachment (negative image of self and negative image of others). A hierarchy of internal working models has been proposed by Collins and Read (1994), with a general model at the highest level, and relationship-specific models at a lower level. Across the life span, the internal working model is thought to affect behaviour in social relationships by functioning like a lens that filters social experiences (Ptacek, 1996). Proceeding from the notion that general schemata of social relationships can be traced back to early experiences, attachment theory provides the possibility to investigate friendships in adulthood from a biography-related perspective.

According to socioemotional selectivity theory (e.g., Carstensen et al., 1999), the regulation of social relationships is primarily associated with the perception of time that, again, is strongly associated with age. Basically, it is assumed that the salience of social motivation changes across the life span because of changes in time perspective, though knowledge-related and emotion-related goals are regarded as most essential social motives throughout life. Yet, when future time is perceived as expansive (as in young and middle age), the theory predicts that goals aiming at optimizing the future receive priority. Such goals commonly are related to acquiring knowledge or to seeking social contacts that might be useful in the long run. In contrast, when future time is perceived as limited (as in old age), emotion-related goals that typically aim at achieving short-term benefits become most important. This age-related change in salience of social motives is supposed to result in a greater selectivity regarding social relationships, i.e., a preference for emotionally meaningful relationships and a deliberate discontinuation of casual relationships in later life.

According to the goal-resource-congruence model (Lang, 2004), the regulation of social relationships is primarily associated with the availability of developmental resources. The subjective perception of one's future time as expansive is regarded as one important internal resource, besides personality traits, interpersonal skills, high education, etc., and external resources such as economic wealth. The term developmental is used to emphasize that these resources are relevant for the mastery of developmental challenges across the life span. Basically, the theory assumes that resource-rich individuals are more likely to pursue (and to benefit from pursuing) social agency goals that aim at seeking social relationships as a means to enhance the self as compared to others (e.g., to enhance social recognition). In contrast, resource-poor individuals are supposed to be more likely to pursue (and to benefit from

pursuing) belonging goals that aim at enhancing the quality of one's relationships or the well-being of a relationship partner. Social agency and belonging goals are expected to motivate social contacts throughout life with different priority, depending on the resource state of the individual.

Obviously, both the approach by Carstensen and colleagues and the approach by Lang are quite similar. However, the latter appears to argue on a more general level by identifying the total of developmental resources as determinants of social motivation rather than future time perspective alone. By that, Lang's approach is also less interwoven with (though still related to) time in terms of chronological age. Finally, the conception of social agency vs. belonging goals as social goals related to self vs. related to the relationship (partner) elaborates on the notion of knowledge- and emotion-related goals and corresponds to the more trait-like concepts of agency and communion that are used to describe two fundamental styles of how individuals relate to their social world (see Diehl, Owen, & Youngblade, 2004).

1.5.2. Empirical Findings

There are two main areas of empirical research on the impact of early relationship experiences with parents on adult relationships. The first one deals with measures of adult attachment styles (e.g., Bartholomew & Horowitz, 1991), while the second one employs measures of recalled parent-child relations such as memories of parental rearing behaviour (e.g., Perris, Jacobsson, Lindström, von Knorring, & Perris, 1980; Parker, Tupling, & Brown, 1979). Findings from the first empirical approach support the notion that adults' attachment styles are crucial for the quality of their relationships to family and friends (e.g., Asendorpf & Wilpers, 2000; Diehl, Elnick, Bourbeau, & Labouvie-Vief, 1998) as well as for their general functioning, e.g., in terms of subjective well-being (see Hazan & Shaver, 1994). The findings reported by Asendorpf and Wilpers (2000) point to the usefulness of conceptualizing and investigating attachment as a relationship-specific construct that predicts specific relationship qualities within rather than between different relationships (e.g., attachment to mother predicted perceived support from mother rather than perceived support from same-sex peers). However, from the traditional attachment perspective as well as from the more recent proposition of a hierarchy of working models, it may be expected that mental representations of early experiences with parents are to some extent related to general aspects of friendships in adulthood, such as importance of the friendship role.

To grasp the influence of early relationship experiences more directly from an autobiographical point of view, the second body of empirical work appears even more

important. In general, findings are quite consistent in showing that recalled parent-child relations are important in many respects. For example, recalled quality of parenting had an impact on well-being among elderly people, as reported by Andersson and Stevens (1993). Most important in the context of the present work, measures of recalled parent-child relations appear to be predictive of contemporary social relationships such as adult child-parent relationships (Whitbeck, Simons, & Conger, 1991; Bedford, 1992). Schumacher, Eisemann, Strauss, and Brähler (1999) found significant links between recalled parental rearing behaviour (rejection, emotional warmth, and control) and interpersonal problems as well as satisfaction with social relationships (social integration, marriage/partnership, and relations to own children). However, possible links between early relationship experiences with parents and friendship involvement in adulthood have been neglected so far.

Up to now, a number of studies has provided empirical support for the theoretical notions of socioemotional selectivity theory (see Carstensen et al., 1999). For example, although the age-related decrease in number of social ties is in part attributable to functional loss or death of social partners (i.e., passive selection effect), there is some evidence suggesting that elders deliberately discontinue relationships that are less close (i.e., active selection effect) (e.g., Lang & Carstensen, 1994). Moreover, under experimental limitation of future time perspective (an impending geographical move), younger as well as older individuals preferred familiar over novel social partners (Fredrickson & Carstensen, 1990). In contrast, under experimental expansion of future time perspective (new medical breakthrough would likely add 20 years to life), older individuals were no more likely than younger individuals to show a preference for familiar social partners (Fung, Carstensen, & Lutz, 1999). This suggests that social preferences are a function of time rather than age. Findings from Lang, Staudinger, and Carstensen (1998) have shown that more extraverted, more open, and less neurotic elders tend to have a larger number of social partners in their network. However, socioemotional selectivity – as indicated by the average emotional closeness to social network members – was unrelated to personality characteristics such as extraversion, openness and neuroticism. Thus, socioemotional selectivity seems to operate largely independent of interindividual differences in personality. Yet, this does not imply that personality traits would be unrelated to relationship qualities such as friendship involvement. Rather, as Lang (2001) has pointed out, “throughout their lives, individuals seem to regulate their social relationships in congruence with their personality dispositions” (p. 323), particularly at younger ages. Moreover, relationship qualities are outcomes rather than components of socioemotional selectivity. A recent study by Lang and Carstensen (2002) has shown that outcomes such as

greater social satisfaction and lesser perceived social strain were associated with prioritizing emotion-regulatory goals when individuals perceived their future as limited. Findings reported by Fung and Carstensen (2004) indicate that both time-limiting (impending moves) as well as goal-limiting situations (financial problems) are likely to motivate striving for emotional goals and disengagement from future-oriented goals. However, while time-limiting situations increased the desire for emotional meaning in social relationships, goal-limiting situations heightened the need for emotional support.

1.5.3. Conclusion

Finally, as in the previous sections, conclusions are drawn from the theoretical and empirical background with respect to own research endeavours.

First, in view of the lack of studies connecting adult friendships to biographical relationship experiences, it is aimed at exploring whether friendship involvement in middle and old age is related to recalled relationships to mother and father, respectively.

Second, it is assumed that knowledge-related and emotion-related social motives, respectively, highlight the beneficial potential of different antecedents of social relationships, such as different personality traits. Thus, it is aimed at investigating the impact of different personality traits on friendship involvement in different phases of life, i.e., in middle and old age, when different social motives are assumed to be salient.

2. Research Questions

In light of the conclusions drawn from the theoretical and empirical backgrounds provided above, the following key and subordinate research questions are posed. These research questions were investigated in different own empirical contributions that are consolidated in the context of the present thesis. Summaries of own empirical contributions are given in Part II. Papers in total (published, in press, and submitted) are presented in the appendix.

1. Visual impairment as constraint in the context of life-span development: What are the long-term behavioural and emotional correlates of age-related low vision?
 - a. Does behavioural competence of legally blind elders further decrease over time due to growing vulnerability resulting from age- and vision loss-related person-environment misfits?
 - b. Are legally blind elders able to maintain a certain, even if lowered, level of emotional adaptation over time?
 - c. Do the courses of behavioural competence and emotional adaptation among legally blind elders differ from those among sighted elders?
2. Which of the correlates of age-related visual decline (in terms of objective and subjective vision) are context-dependent, which are context-independent?
 - a. What role does age-related visual decline play for out-of-home everyday functioning and well-being within the context of other important resources?
 - i. Do out-of-home ADL/IADL, psychological (i.e., cognitive functioning, outdoor motivation) and social resources mediate the effect of age-related visual decline on out-of-home leisure activities?
 - ii. Does out-of-home everyday functioning mediate the effect of age-related visual decline on well-being?
 - b. What differences in interrelationships emerge when regional (i.e., urban vs. rural) and societal contexts (i.e., different countries; East vs. West Germany) are considered?
 - i. Are there basic relations between age, vision, cognitive functioning, out-of-home everyday functioning, and emotional well-being that are comparable across different macro-contexts?

- ii. What kind of differentiation emerges when these basic relations are framed within a more comprehensive model that considers additional predictors, i.e., social and financial resources and outdoor motivation?
3. Do assimilative and accommodative tendencies moderate the relationship between age-related visual decline and affective well-being?
 - a. Is assimilative tenacity able to counteract decline in positive affect due to age-related visual decline?
 - b. Is accommodative flexibility able to counteract increase in negative affect due to age-related visual decline?
 - c. Are there any dysfunctional side effects of assimilative and accommodative tendencies on affect regulation when objective visual functioning is over- and underestimated, respectively?
 - d. At high levels of assimilative and accommodative tendencies: Regulatory dilemma or mutually assistive synergy?
4. How are autobiographical and personality variables related to friendship involvement in middle and old age?
 - a. Is there a significant link between recalled relations to mother and father, respectively, and adult friendship involvement?
 - b. Are distinct personality traits differentially related to friendship involvement in middle and old age?

Part II: Empirical Contributions

1. Long-Term Behavioural and Emotional Correlates of Age-Related Visual Decline *(Paper 1)*

Three studies have dealt with long-term behavioural and emotional correlates of age-related visual decline by analyzing follow-up interviews with visually impaired and sighted elders that were conducted five (Wahl, Schilling, Oswald, & Heyl, 1999), six (Heyl & Wahl, 2001a), and seven years (*Paper 1*: Heyl & Wahl, 2001b) after initial assessment (Wahl, 1997). Studies were driven by two key research questions: (1) Does behavioural competence of legally blind elders further decrease over time? (2) Are legally blind elders able to maintain a certain level of emotional adaptation over time, even if lowered when compared to sighted elders?

Visual impairment was defined according to the visual acuity criterion of legal blindness in the United States, that is, a visual acuity of 20/200 or less in the better eye. The original research design included: (1) a group of 42 severely visually impaired elders with visual acuities between 20/200 and 20/600 and no severe visual field defects, (2) a group of 42 blind elders with visual acuities of 20/600 or less and/or severe visual field defects, and (3) a control group of 42 sighted elders. In all cases, visual impairment occurred after the age of 55, existed at T1 for at least three months, and was diagnosed as irreversible. There were no significant differences between the groups with respect to age (with mean ages ranging from 75 to 77 at T1), education, income, and objective health. All subjects lived in private households, and none had severe cognitive or hearing impairment. Within the observation period of seven years, the sighted group gradually decreased from 42 to 22, the severely visually impaired group gradually decreased from 42 to 13, and the blind group gradually decreased from 42 to 11. Thus, both visually impaired groups were merged to one group of legally blind elders to enhance sample size for statistical testing. A second reason for giving up the initially relevant distinction between severe visual impairment and blindness was the high probability that at least some of the severely visually impaired at T1 have become blind in the long run.

Data was collected at five measurement occasions, namely four, five, six, and seven years after initial assessment. At the first measurement point, data was collected in face-to-face interviews (Wahl, 1997). Follow-up assessments (T2-T5) were made by phone, employing a subset of the original measurement program. However, all variables considered to be critical to the research endeavour were also represented in the short version. Thus, to assess behavioural competence, a subset of items from the original ADL/IADL and the leisure activity scales (Schneekloth & Potthoff, 1993) was used, consisting of six items each. In addition, the measurement of independent use of outdoor resources critical for daily

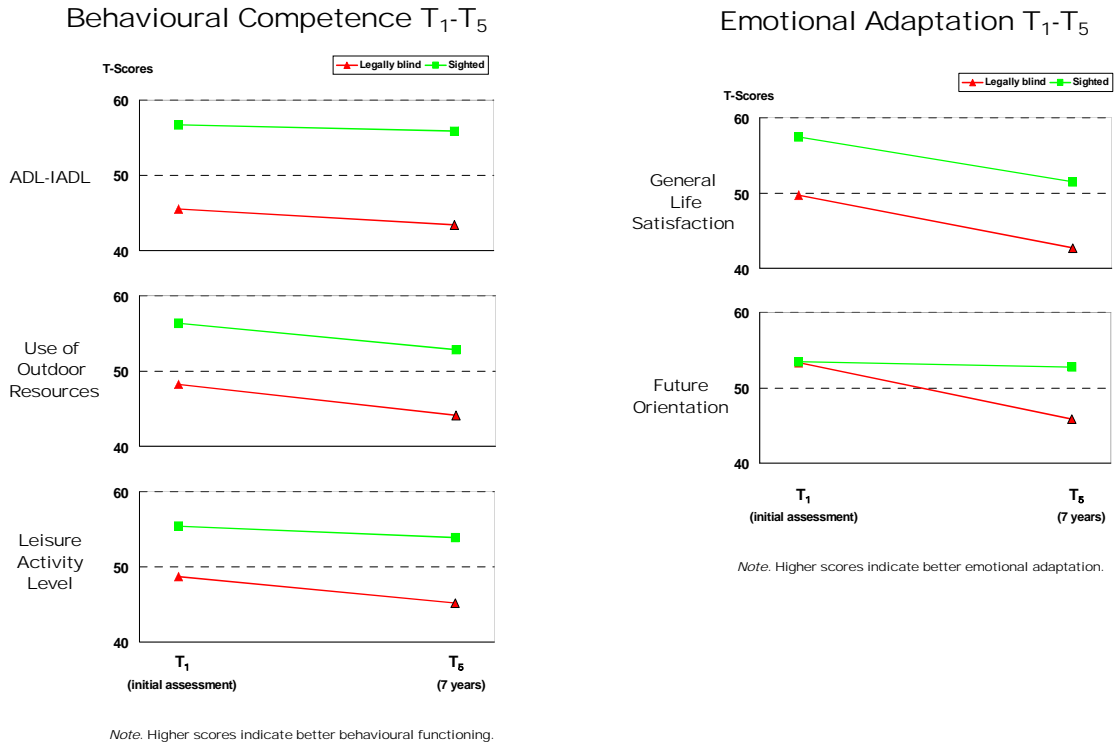
functioning (such as supermarket or pharmacy) was repeated, using a scale consisting of seven items (see Wahl, 1997). To assess emotional adaptation, a sub-scale from the Philadelphia Geriatric Center Morale Scale was employed (Lawton, 1975), i.e., general life satisfaction. Finally, future orientation was assessed by a one-item measure on a 5-point scale ranging from very good to poor.

Dropout analyses (logistic regressions) showed that scores at T1 did not predict participation in later measurement occasions very well. Only leisure activity level and age at T1 were statistically significant predictors of participation across the whole observation period. Those persons who had a higher leisure activity level at T1 and those who were younger at T1 were more likely to remain in the sample, indicating that there is a positive selection tendency. Moreover, it should be stressed at this point that caution is necessary with respect to statistical analyses reported in the following because of the reduced sample sizes over time.

Regarding the first research question, results revealed behavioural competence to be generally rather stable over time (Figure 1). In detail, findings showed that in the sighted as well as in the legally blind group ADL/IADL performance was quite stable over the seven-year interval. Steadily, however, the legally blind participants functioned at a significantly lower level than the sighted older adults. In both groups, use of outdoor resources declined comparably over time. Mean levels between groups were significantly different over time, with lower levels on the part of the legally blind group. Leisure activity level was rather stable over time among both groups, with significantly and consistently lower levels in the legally blind group.

Regarding the second research question, results point to limits of psychological resilience in visually impaired older adults in the long run (Figure 1). In detail, findings showed that general life satisfaction declined over time to a significant, though similar, extent in both groups, with significantly lower levels on the part of the legally blind participants every time. Yet, while both groups started from virtually the same future orientation scores at initial assessment, further development was quite different, as indicated by a significant group x time interaction effect. While future orientation among the sighted participants remained stable over time, it declined pronouncedly among the legally blind older adults.

Figure 1
Trajectories of indicators of behavioural competence and emotional adaptation



2. Context-Dependent and Context-Independent Correlates of Age-Related Visual Decline (*Papers 2, 3, and 4*)

The paper by Wahl, Heyl, & Schilling (2002; *Paper 2*) addressed the effects of age-related visual functioning in the context of other important resource variables on out-of-home everyday functioning and life satisfaction among 404 elders (55-99 years; mean age: 73 years) living in private households in rural areas. Data stem from a larger study with the original purpose of an interdisciplinary analysis of out-of-home mobility of older adults residing in remote areas. From the wide range of measures employed in this study, those relevant to the present research endeavour are summarized in Table 1. Latent constructs for structural equation modelling were created by using two observed variables or by dividing one observed variable into two odd-even split halves after ranking the items by difficulty.

The logic of the everyday competence model suggested by M. Baltes and colleagues (1993, 1999) was applied to out-of-home everyday functioning. According to this reasoning, sensorimotor and health-related variables such as vision and physical mobility can be expected to be related primarily to basic out-of-home ADL/IADL, while the more expanded out-of-home leisure activities should depend on out-of-home ADL/IADL performance but also on psychological variables such as outdoor motivation. Different outdoor-related motivations and interests that are assumed to develop across the adult life span (Hartig, Bökk, Garvill, Olsson, & Gärling, 1996; Kaplan, 1995; Korpela & Hartig, 1996) should become

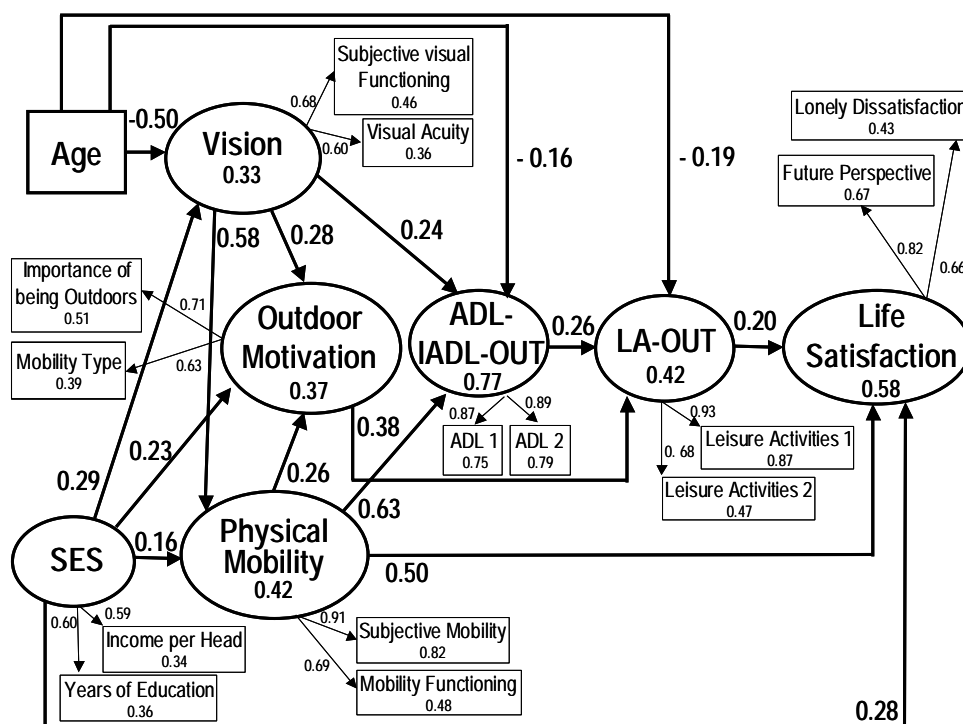
Table 1
Measures used in the study by Wahl, Heyl, & Schilling (2002)

Construct	Measure
Socioeconomic status	Years of education
	Income-per-head
Vision	Visual Acuity Screening (Sachsenweger, 1987)
	Subjective visual functioning (1-item measure)
Physical mobility	Disease-related mobility impairment (1-item measure)
	Subjective mobility (1-item measure)
Outdoor motivation	Importance of being out-of-home (1-item measure)
	Indoor/outdoor type (1-item measure)
Out-of-home ADL/IADL	Ability to perform 5 ADL (e.g., climbing stairs) and 1 IADL (shopping)
Out-of-home leisure activities	Participation in 18 out-of-home leisure activities (e.g., going to a café)
Life satisfaction	Lonely Dissatisfaction (Lawton, 1975)
	Future perspective (1-item measure)

particularly relevant in old age when one of the most salient reasons to leave the home, i.e., to pursue a profession, vanishes.

Structural equation modelling confirmed the assumption that vision and physical mobility impact directly only on basic out-of-home activities (ADL-IADL-OUT), while motivation-related variables impact directly only on out-of-home leisure activities (LA-OUT). As has been hypothesized, there was an indirect impact of vision on LA-OUT via ADL-IADL-OUT and outdoor motivation (Figure 2). Though not theoretically expected, no direct link between chronological age and mobility was necessary. Instead, the common variance of both of these variables was mediated by vision. Also, much of the common variance between vision and life satisfaction was mediated by out-of-home everyday functioning, i.e., by ADL-IADL-OUT having an impact on LA-OUT. Thus, results underline the importance of analyzing psychosocial correlates of age-related visual functioning and decline, respectively, in the context of other functional losses as well as against the background of psychological mediators.

Figure 2
Hypothesized structural model empirically optimized



Note. For all standardized paths coefficients $p < .05$. Model fit: $\chi^2 = 145.78$; $df = 75$; $p < .05$; RMSEA = .048; CFI = .995. ADL-IADL-OUT = out-of-home activities of daily living; LA-OUT = out-of-home leisure activities.

The study reported above was limited, however, mainly because it was comprised of only elders from rural areas and it did not consider some important variables that might also strongly influence out-of-home activities of older adults, such as cognitive functioning and aspects of the social environment. Yet, the social situation of older adults living in urban vs. rural areas is usually considered to be quite different, in that rural communities are expected to provide more opportunities for integration of older individuals (e.g., Jones et al., 1985). To account for the shortcomings of *Paper 2*, further analyses based on data from a large European project (MOBILATE, Mollenkopf, Marcellini, Ruoppila, Széman, & Tacken, in press) were conducted (*Paper 3*: Heyl, Wahl, & Mollenkopf, in press, a).

The study by Heyl and colleagues was driven by two fundamental questions: (1) Are there basic relations between age, vision, cognitive functioning, out-of-home everyday functioning, and emotional well-being that are comparable across urban and rural regions in East and West Germany? Robust relations were hypothesized against the background of conceptual considerations from similarly framed earlier work (Marsiske et al., 1997). (2) What kind of differentiation does emerge when these basic relations are framed within a more comprehensive model that considers additional predictors, i.e., social and financial resources, and outdoor motivation?

Table 2
Measures used in the study by Heyl, Wahl, & Mollenkopf (in press, a)

Construct	Measure
Vision	Visual Acuity Screening (Sachsenweger, 1987) Subjective visual functioning (1-item measure)
Cognition ²	Digit-Symbol-Substitution Test (Oswald & Fleischmann, 1995)
Outdoor motivation	Importance of being out-of-home (1-item measure) Indoor/outdoor type (1-item measure)
Social resources	Out-of-home social network Face-to-face contact frequency with the two most important persons Telephone contact frequency with the two most important persons
Financial resources	Income-per-head
Out-of-home ADL/IADL	Ability to perform 5 ADL (e.g., climbing stairs) and 1 IADL (shopping)
Out-of-home leisure activities	Participation in 18 out-of-home leisure activities (e.g., going to a café)
Emotional well-being	Positive affect schedule (Watson, Clark, & Tellegen, 1988)

² Cognition is used as a technical term here; measurement was based on the strongest single indicator of cognitive functioning, i.e., the Digit-Symbol-Substitution Test (Oswald & Fleischmann, 1995).

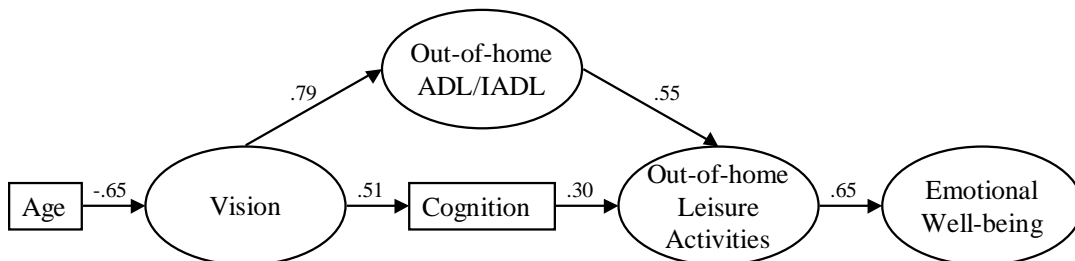
Data stem from 1,519 community-dwelling older adults aged 55 to 98 years from East and West Germany (n=768 and n=751) that participated in the MOBILATE project. Half of the participants resided in urban areas, while the other half resided in rural regions. Measures used are displayed in Table 2.

Results supported the assumption of robust basic relations that are comparable across urban and rural regions in East and West Germany. A model in which all of the parameters were restricted to equality across subgroups could be accepted as final model. In this model, vision mediated the effect of age on overall out-of-home everyday functioning, while cognition mediated the effect of vision on out-of-home leisure activities. All effects on emotional well-being were mediated by out-of-home leisure activities (Figure 3). Moreover, this pattern could be fully replicated in a further analysis (*Paper 4*: Heyl, Wahl, & Mollenkopf, in press, b), taking advantage of two additional comparative samples of the MOBILATE project, i.e., participants from Finland (n=610) and Italy (n=600).

As expected, framing the basic relations within a more comprehensive model (that additionally considered outdoor motivation, and social and financial resources) revealed some macro-contextual differences between East and West German urban and rural subgroups. First, social resources turned out to contribute more to out-of-home leisure activities in the rural than in the urban samples. Second, outdoor motivation was significantly related to social resources in the urban, but not in the rural samples. Third, financial resources contributed modestly but significantly to out-of-home leisure activities in East Germany, but not in West Germany.

Figure 3

Basic model (restricted to identity across subgroups)



Note. For all standardized paths coefficients $p < .05$. Model fit: $\chi^2 = 633.04$; $df = 196$; $p < .05$; RMSEA = .038; TLI = .987; CFI = .989.

3. Influences of Assimilative and Accommodative Tendencies on the Relationship between Age-Related Visual Decline and Affective Well-Being (*Paper 5*)

The work by Heyl, Wahl, & Mollenkopf (submitted; *Paper 5*) has investigated the relationships between assimilative and accommodative modes of self-regulation (TGP and FGA, Brandtstädter & Renner, 1990) and positive and negative affect (PA, NA, Watson, Clark, & Tellegen, 1988). The study was driven by three key research questions: (1) Are processes pertaining to assimilative persistence and accommodative flexibility, respectively, able to enhance affective well-being (AWB) by promoting the presence of PA and preventing from NA? (2) Are there any dysfunctional side effects of assimilative and accommodative tendencies on affect regulation when objective visual functioning is over- and underestimated, respectively? (3) Is there just a regulatory dilemma or also mutually assistive synergy when both assimilative and accommodative tendencies are strongly pronounced?

Data stem from 751 community-dwelling German older adults aged 55 to 98 years (mean age 71 years; 372 women, 379 men) that participated in the European MOBILATE project (Mollenkopf et al., in press). Measures used in the context of the present study are displayed in Table 3. Social network served as control variable. The rationale to control for social network was that it was related to AWB in a number of studies (e.g., Finch, 1998; McCaskill & Lakey, 2000; Heyl, Wahl, & Mollenkopf, in press, a). Moreover, background information on age, gender, and years of education were gathered and controlled for as well.

Regarding the first research question, it was assumed that, due to their different foci, assimilative tenacity and accommodative flexibility impact on AWB in different ways. By definition, assimilative tenacity focuses on pursuing goals and modifying the environment, while accommodative flexibility focuses on adjusting goals and modifying oneself. According to the dual-channel hypothesis (e.g., Lawton, Winter, Kleban, & Ruckdeschel, 1999), engagement with the environment is apt to enhance PA but not to influence NA, while

Table 3
Measures used in the study by Heyl, Wahl, & Mollenkopf (submitted)

Construct	Measure
Subjective vision	Subjective visual functioning (1-item measure)
Objective vision	Visual Acuity Screening (Sachsenweger, 1987)
Self-regulation variables	TGP and FGA scales (Brandtstädter & Renner, 1990)
Affective well-being	Positive Affect Negative Affect Schedule (Watson, Clark, & Tellegen, 1988)
Social network	Number of persons who are important for emotional and personal reasons

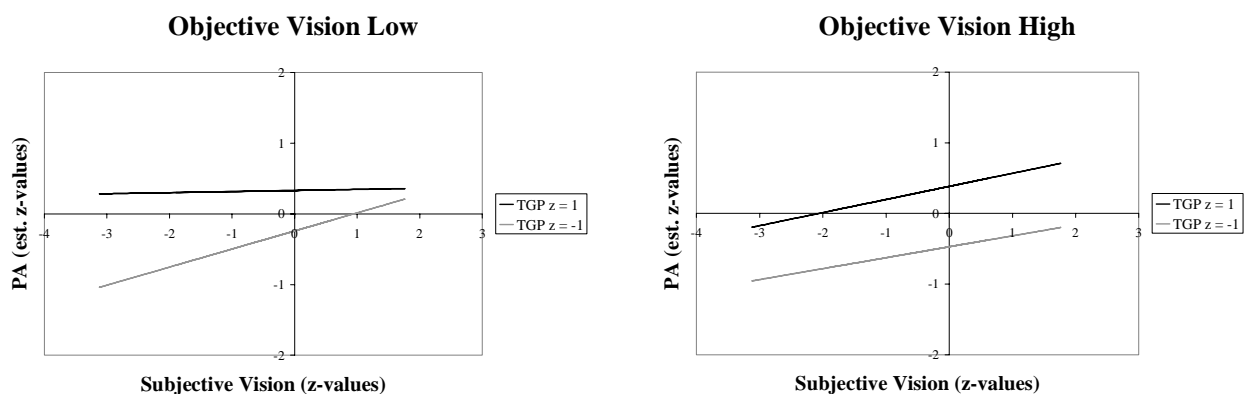
intrapersonal conditions are apt to contribute to NA but not to influence PA. Moreover, it seems reasonable to conceive assimilative processes primarily as approach strategies (approaching desired outcomes) that aim at realizing positive outcomes, and accommodative processes primarily as withdrawal strategies (withdrawal from desired outcomes that have turned out to be unattainable) that aim at preventing negative outcomes (cf. Regulatory Focus Theory, Higgins, 1997, 1998). From this motivational perspective as well as from the perspective of the dual-channel hypothesis, one would expect that assimilative approach processes nurture AWB primarily by promoting PA, and accommodative withdrawal processes nurture AWB primarily by preventing from NA. Accordingly, it was assumed that TGP should be positively related to PA, while FGA should be negatively related to NA. This hypothesis could be confirmed at the level of bivariate relations as well as at the level of multivariate analyses. Neither significant zero-order correlations nor main effects were observed with respect to TGP and NA and with respect to FGA and PA.

Regarding the second research question, it was hypothesized that when goals are subjectively perceived as, but actually are *not* blocked by objective visual impairment (i.e., when one's capacity to reach given goals is underestimated), individuals should not profit any longer from being high in FGA, coined as a dysfunctional side effect of accommodative processes (Brandtstädter & Rothermund, 2002, p. 128). Thus, it was assumed that possible main and moderating effects of FGA with respect to NA are qualified when subjective and objective vision impairment is considered simultaneously. Moreover, it was hypothesized that when objective vision impairment undermines important goals such as maintaining out-of-home activities significantly, individuals overestimating their subjective visual functioning and scoring high in TGP should have more problems to let these goals go and to discover new sources of PA (dysfunctional side effect of assimilative processes; cf. Brandtstädter & Rothermund, 2002, p. 128). Thus, it was assumed that possible main and moderating effects of TGP with respect to PA are qualified when subjective and objective vision impairment is considered simultaneously. No evidence has been found for a dysfunctional side effect of FGA for those underestimating their objective visual capacity. That is, contrary to hypothesis, as far as the absence of NA is concerned, individuals seem to benefit from being high in FGA even when they underestimate their visual capacity. However, with respect to the presence of PA the combination of being high in FGA and underestimating one's objective visual capacity tends to result in a dysfunctional side effect. The interaction of FGA x subjective x objective vision had a significant β -weight, but did not contribute significantly to cumulative R^2 . An inspection of the conditional regression plots revealed that under the condition of high

objective vision, high scores in FGA aggravate the relationship between subjective vision and PA (that is, lower scores in subjective vision are more strongly associated with lower PA). These results indicate that dysfunctional side effects of FGA tend to affect the presence of PA, but not the absence of NA. Moreover, our findings partly support the notion of dysfunctional side effects of TGP in individuals that overestimate their objective visual functioning. Though no evidence was found for an actually disadvantageous effect of TGP, our analyses revealed, however, that individuals with high subjective, but low objective vision take no more advantage of being high in TGP (Figure 4). Thus, the dysfunctional side effect of TGP seems to consist in a loss of its PA-promoting potential.

Regarding the third research question, based on hints to a regulatory dilemma between TGP and FGA when both dispositions are strongly pronounced (Bak & Brandtstädter, 1998; Brandtstädter & Rothermund, 2002), it was hypothesized that a possible moderating effect of FGA on the relationship between subjective vision impairment and NA should be weaker in individuals high in TGP compared to individuals low in TGP. However, with respect to PA, it was assumed that individuals scoring high in TGP *and* FGA are generally best prepared to maximize their possibilities to experience PA: While TGP should enhance PA directly, besides its postulated NA-preventing effect, FGA is supposed to establish new, feasible domains for assimilative activities (that will enhance PA in turn). Accordingly, it was

Figure 4
Positive affect predicted by subjective vision at low vs. high levels of
Tenacious Goal Pursuit under the condition of low vs. high levels of objective vision

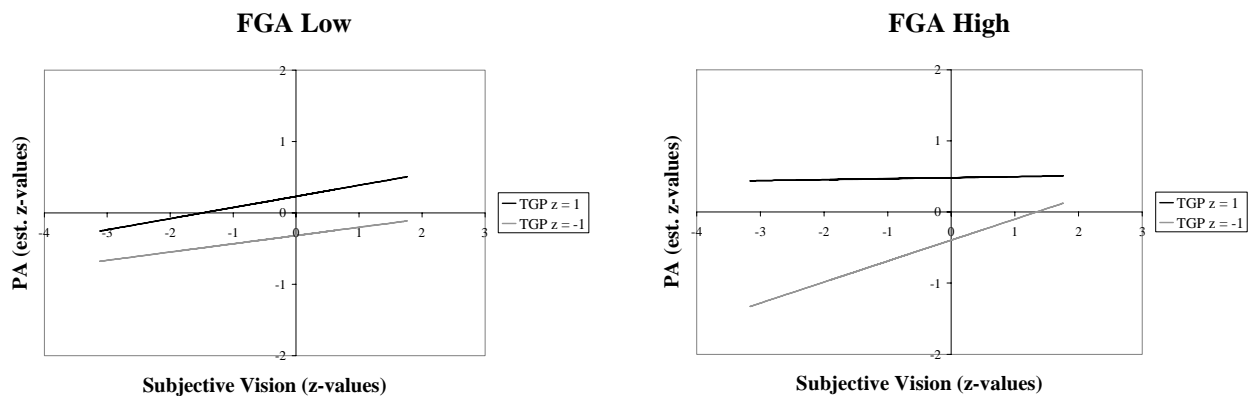


Note. PA = Positive Affect; TGP = Tenacious Goal Pursuit; est. = estimated.

hypothesized that a possible moderating effect of TGP on the relationship between subjective vision impairment and PA should be stronger in individuals high in FGA compared to individuals low in FGA. Though the results did not provide evidence for a regulatory dilemma between TGP and FGA with respect to NA regulation associated with age-related visual decline, the notion of antagonistic tendencies was nevertheless supported, but independent of age-related vision loss. The beneficial (i.e., decreasing) main effect of FGA on NA was less pronounced for those high in TGP, indicating that those with high scores in TGP might have more difficulties to switch to the accommodative mode to reduce NA effectively. Furthermore, it could be documented that high TGP does not mitigate the relationship between PA and subjective vision until FGA is high, too, indicating that FGA adds synergistically to the beneficial main effect of TGP (Figure 5). Thus, the moderating potential of assimilative tendencies seems to depend on accommodative tendencies.

Figure 5

Positive affect predicted by subjective vision at low vs. high levels of Tenacious Goal Pursuit under the condition of low vs. high levels of Flexible Goal Adjustment



Note. PA = Positive Affect; TGP = Tenacious Goal Pursuit; est. = estimated.

4. Focusing Social Context: Biographical and Personality Correlates of Friendship Involvement in Middle and Old Age (*Paper 6*)

The study by Heyl & Schmitt (submitted; Paper 6) examined personality and biographical relationship experiences as predictors of friendship involvement in middle and old age. The focus was on friendships because friendships are a form of social relationship that is important throughout life and that has very strong effects on health and well-being in old age (e.g., Matt & Dean, 1993; Giles et al., 2005). It was aimed at investigating both of the following research questions: (1) Are distinct personality traits differentially related to friendship involvement in middle and old age? (2) Is there a significant link between recalled relations to mother and father, respectively, and adult friendship involvement?

The study concentrated on the personality traits openness to experience and agreeableness which are part of the five-factor model of personality (e.g., Digman, 1990). These two traits were focused on because they are in congruence with the most essential motives for social behaviour throughout life as suggested by socioemotional selectivity theory (e.g., Carstensen et al., 1999), i.e. knowledge- and emotion-related motives. Characteristics of open individuals such as imagination, curiosity, and creativity match knowledge-related motives, while characteristics of agreeable individuals such as kindness, cooperativeness, and sensitivity match emotion-related motives. It was assumed that knowledge-related goals might be best attained with individuals high in openness, while emotion-related goals might be best attained with individuals high in agreeableness. Accordingly, in middle age open individuals and in old age agreeable individuals should be very attractive for their peers. This should result in a higher probability of being involved in friendships for those individuals. Thus, we expected openness to be related to friendship involvement in middle age, while agreeableness should be related to friendship involvement in old age.

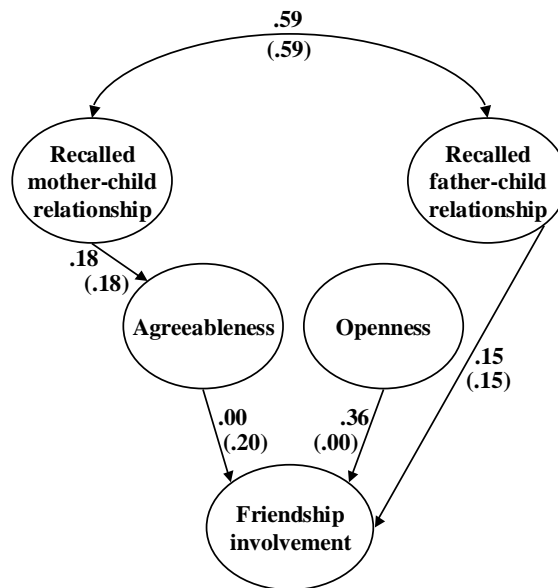
Based on the theoretical assumptions of attachment theory (Bowlby, 1969, 1973) and the empirical findings on the link between recalled parent-child relations and social relationships in adulthood outlined in Part I, it was hypothesized that recalled parent-child relations should be related to friendship involvement in middle and old age. Since findings from autobiographical memory research indicate that what one remembers about one's personal history and one's personal relationships is related to personality traits (e.g., Safer, Levine, & Drapalski, 2002), it was argued that considering personality traits is crucial when investigating the contribution of recalled relationships to social relationships in adulthood. This was done in a first step by considering the focused personality traits, namely, openness to experience and agreeableness. A model that assumed complete interconnectedness among

recalled parent-child relations, personality traits, and friendship involvement was specified (all effects model). This model was tested against two basic alternatives: First, against a model assuming an indirect association between recalled parent-child relations and friendship involvement through the personality traits (mediator model), and second, against a model assuming that personality traits and recalled parent-child relations contribute independently to friendship involvement (independence model). To check the robustness of the resulting final model in the second step, the remaining three personality traits of the five-factor model were included, i.e. extraversion, neuroticism, and conscientiousness.

The sample consisted of 392 middle aged (43-46 years) and 345 older participants (61-64 years) in the first wave of the Interdisciplinary Longitudinal Study of Adult Development (ILSE). All of the participants were brought up by mother *and* father during childhood and youth. We employed separate measures of recalled mother-child and father-child relationship. Three ratings each were available from the biographical interview section of the ILSE study, i.e., emotional tone of the recalled relationship and recalled maternal and paternal appreciation and control. Two ratings of friendship involvement were available from the interview section on the individual's current life situation: cognitive-emotional friendship involvement that was rated in terms of concern with the friendship role, and behavioural friendship involvement that was rated in terms of activity. Finally, personality was assessed with Costa and McCrae's (1989) NEO Five-Factor Inventory.

Results from structural equation modelling supported the notion of age-differential relations among openness and agreeableness, respectively, and adult friendship involvement. Considering also recalled parent-child relations, in both age groups, there was a significant link between recalled mother-child relation and agreeableness, while no paths were needed from recalled father-child relation to agreeableness as well as from both recalled relationships to openness (Figure 6). Further, the recalled quality of the father-child relation contributed more clearly to adult friendship involvement (independent of personality traits) than the recalled quality of the mother-child relationship (mediated by agreeableness). Moreover, the model again suggests that openness is crucial for friendship involvement in middle age, while agreeableness is crucial for friendship involvement in old age.

Figure 6
Final model of adult friendship involvement for both age groups



Note. Numbers in brackets refer to the older age group. For all standardized path coefficients that are greater than zero $p < .05$. Model fit statistics: $\chi^2 = 538.65$; $df = 177$; $p < .05$; $RMSEA = .053$; $TLI = .985$; $CFI = .988$.

Descriptive analyses with all dimensions of the five-factor model of personality showed that older participants remembered their relationships to parents more positively than younger participants. Moreover, structural equation modelling revealed that older participants' recollections were less congruent with their personality: While, in the older age group, the inclusion of conscientiousness, neuroticism, and extraversion, did not yield any additional significant paths, in the younger age group significant paths from recalled mother-child relation to conscientiousness and neuroticism, and from recalled father-child relation to extraversion emerged. There were no significant links between personality traits and friendship involvement in both age groups, besides the differential paths from openness and agreeableness, respectively.

Part III: Summary and Concluding Remarks

The present work has considered age-related visual decline from various perspectives. First, samples of older adults suffering from severe vision loss were employed, as well as general aging samples comprising a wide range of visual functioning. Second, within a contextual perspective, several facets were examined. Seeing age-related visual decline as a constraining condition in the context of life-span development, the long-term behavioural and emotional outcomes of severe vision loss were investigated (*Paper 1*). Moreover, visual functioning was examined in the context of other substantial predictors of out-of-home everyday functioning and well-being (*Papers 2-4*), emphasizing micro- and macro-environmental aspects of social relationships (*Paper 3*). Third, age-related visual decline was investigated from a self-regulatory perspective (*Paper 5*). Finally, and this time independent of age-related visual decline, aging in social context was stressed (*Paper 6*).

Results from *Paper 1* have shown that, in the long run, legally blind older adults were largely able to maintain their, albeit low, level of behavioural competence. Some decline occurred in the use of outdoor resources, but just to a comparable extent as in the sighted group. Thus, contrary to expectations based on person-environment perspective and the combination of growing older and being visually impaired, no significant further behavioural loss emerged. This might, in part, be due to a variety of compensations exerted by the legally blind (Wahl, Oswald, & Zimprich, 1999). It should be noted, however, that already at T1, mean level of functioning among visually impaired older adults was about one standard deviation below the level of sighted elders. With the exception of future orientation, the courses of mean levels of behavioural competence and emotional adaptation indicators were quite similar among legally blind and sighted elders. At T1, the comparable future orientation scores among legally blind and sighted older adults appeared to support a psychological resilience interpretation. Yet, in the long run, the significant decrease in future orientation among the legally blind indicates that there is a limit to the resilience of older adults. It has to be emphasized, however, that just the outcome perspective was considered in this study, not the perspective of self-regulatory mechanisms that might moderate the relationship between age-related visual decline and outcomes such as well-being. Moreover, other substantial predictors of major aging outcomes such as other functional losses, psychological variables, and social resources were not considered. To account for these shortcomings, further studies were conducted that considered additional possibly important antecedents of behavioural competence and emotional adaptation (*Papers 2-4*), and assimilative and accommodative processes of self-regulation (*Paper 5*). Finally, more sophisticated methods of analysis (e.g., latent growth curve modelling) would also have been informative about interindividual

differences in patterns of change of behavioural competence and emotional adaptation over time. Yet, such methods presuppose large samples and, thus, were out of the question in this study.

In *Paper 2*, support was found for the hypothesis that sensorimotor and health-related variables such as vision and physical mobility play a significant role in the prediction of out-of-home ADL/IADL, while no direct paths between these variables and out-of-home leisure activities were needed. Also, the notion of a direct impact of outdoor-related motivation on out-of-home leisure activities, but not on out-of-home ADL/IADL, accorded very well with the empirical data. Finally, the hypothesized impact from vision via out-of-home ADL/IADL on out-of-home leisure activities and from out-of-home leisure activities on life satisfaction was also confirmed. From a general point of view, the study presented in *Paper 2* provides support for the usefulness of distinguishing between a more basic and a more expanded component (M. Baltes et al., 1993, 1999), even if out-of-home everyday competence is focused. Moreover, findings underscore that visual functioning is important for out-of-home behavioural competence. But they also underscore the need for a broader view, including a scope of relevant variables when examining outcomes of age-related visual decline. There are several major aspects limiting the validity of the work presented in *Paper 2*. First of all, cross-sectional data were used. As a consequence, statements on quasi-causal relationships can be made at best. Second, major variables such as physical mobility were measured only with self-reports. However, findings obtained with subjective measures of physical mobility were comparable to those in studies using objective measures such as balance and gait tests (e.g., M. Baltes et al., 1999). Finally, as already mentioned, cognitive measures and social resources were not considered and only elders living in rural regions were included. But interrelationships between variables might be different in urban settings, in particular when social relationship variables are included.

Research presented in *Paper 3* has documented robust relations in a basic model connecting age, vision, out-of-home everyday functioning, and positive well-being. Interrelationships were invariant across urban and rural contexts in Germany. Moreover, as shown in *Paper 4*, they were also comparable across different countries. These findings replicate results from similarly framed earlier work (Marsiske et al., 1997), and extend foregoing research in showing that this pattern of relations is independent from macro-contextual influences. As expected, the comprehensive model revealed some context-related differences: The finding that social resources contributed more to out-of-home leisure activities in the rural than in the urban samples confirms expectations on regional differences

in social situation, and is in accordance with classic urban-rural cultural differences in that social resources and social control are expected to be stronger in the rural context (Golant, 2004). Since we have assessed social resources in terms of out-of-home social network, the finding that outdoor motivation was significantly related to social resources in the urban, but not in the rural samples, might be related to the greater geographical distances to most important persons in the urban regions under investigation (Mollenkopf, Kaspar, Marcellini, Ruoppila, Széman, et al., 2004). That is, in urban regions one might have to be motivated to go out to maintain social resources, since these resources are usually farther away than in rural areas. But, since the direction of the path is not meaningful in this cross-sectional model, it might also be that in urban regions social resources enhanced outdoor motivation because social contacts with others living farther away might be an important reason to go out. The finding that financial resources contributed to out-of-home leisure activities in East, but not in West Germany suggests that in West Germany out-of-home leisure activities are within everyone's means (since they are independent from financial resources), while in East Germany they tend to be left up to those with a relatively higher income. Last but not least, it seems that social resources are most effective in enhancing out-of-home leisure activities in environmental contexts where they are unrelated to visual functioning. There was no link between social resources and vision in the rural samples where social resources contributed more to out-of-home leisure activities than in the urban samples where social resources were indirectly related to vision via outdoor motivation. Thus, the effectiveness of resources such as social networks appears to depend in part on the macro-context. Concisely, in different macro contexts different resources appear to enhance everyday functioning of older individuals, and visual capacity always plays a considerable, though not all-dominant, role within this network of resources.

Findings from *Paper 5* support the notion of domain-specific links between assimilative and accommodative tendencies, respectively, and affective well-being. While higher TGP was significantly related to higher PA, higher FGA was significantly related to lower NA. This result provides support for the dual-channel hypothesis suggesting a dual-antecedent pattern for PA and NA (Lawton et al., 1999). Moreover, given that subjective well-being is enhanced by both the presence of positive affect and positive evaluations as well as the absence of negative affect and negative evaluations, the result of affect-specific links suggests that the same-directional correlations between TGP and FGA, respectively, and subjective well-being reported in the literature might have arisen differently; on the one hand through the promotion of positive aspects by TGP, and on the other hand, through the protection from negative

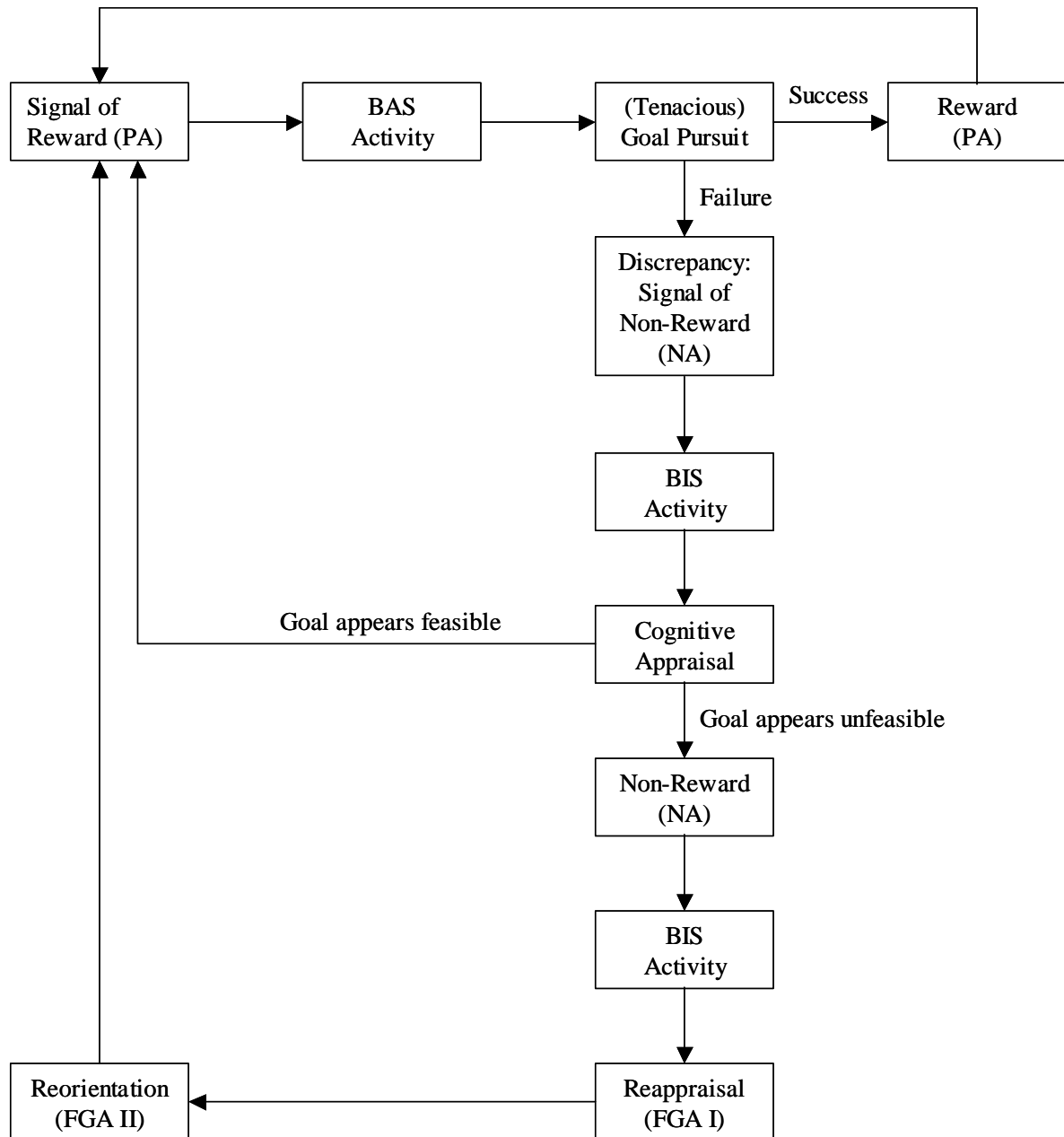
aspects by FGA. Results further indicate that dysfunctional side effects of accommodative processes in case of underestimation of objective vision tend to affect the presence of PA, but not the absence of NA. Similarly, the dysfunctional side effect of TGP in case of strong overestimation of objective vision seems to consist in a loss of its PA-promoting potential. It has to be noted here that some overestimation of one's capacity can be absolutely beneficial for emotional adaptation (Colvin & Block, 1994; Taylor & Brown, 1988). However, since virtually the same level of PA would be predicted for those that evaluated their objectively low vision as poor, but were high in TGP, and those that strongly overestimated their objectively low vision and were high *or* low in TGP, the combination of strongly overestimating one's capacity and high TGP apparently does not yield any added value. Thus, it appears rather as a matter of 'either or'. In general, dysfunctional side effects of both TGP and FGA appear to be restricted to the presence of PA. Finally, results supported the assumption that the conflicting aspects of TGP and FGA are reflected in their combined effects on NA, and their mutually assistive or synergistic aspects are reflected in their combined effects on PA.

In general, according to the results of this study, individuals should be best prepared to deal with challenges of life when they dispose of both high assimilative and high accommodative tendencies. That somewhat reflects the well-known serenity prayer (presumably going back to the German-American theologian Reinhold Niebuhr), cited and translated into German by Theodor Wilhelm (1951, p. 251):

“God grant me the serenity to accept things I cannot change,
the courage to change the things I can,
and the wisdom to know the difference.”

Even though assimilative and accommodative tendencies might conflict sometimes, such conflicts that result in an increase of NA (or other negative consequences) should not be evaluated rashly as being only negative. Brandtstädter and Rothermund (2002) have pointed to the adaptive value of depressive states resulting from a conflict between assimilative and accommodative tendencies. From this perspective, it might be expected that NA increases until the switch from the assimilative to the accommodative modes (that is driven motivationally by its potential to reduce negative mood states; Brandtstädter & Rothermund, 2002) becomes inevitable and at last succeeds. Thus, NA might be regarded as a signifier of the necessity to change the mode of self-regulation. In terms of the serenity prayer, it may be even regarded as part of “the wisdom to know the difference”.

Figure 7
Tenacious Goal Pursuit and Flexible Goal Adjustment
as cognitive-behavioural agents of motivational systems



Note. PA = Positive Affect; NA = Negative Affect; BAS = Behavioural Activation System; BIS = Behavioural Inhibition System; FGA = Flexible Goal Adjustment.

Finally, results also add to a broader motivational perspective related to aging and adaptation. In light of our findings, assimilative and accommodative tendencies appear as cognitive-behavioural agents of the behaviour activation system (BAS) and the behaviour inhibition system (BIS) (Fowles, 1987), respectively (Figure 7): Signals of reward (PA) activate the BAS (Gray, 1994) that activates goal pursuit (cf. Watson, Wiese, Vaidya, & Tellegen, 1999). In case of success, the approach behaviour is rewarded with PA (that serves as motivating source of further approach behaviours). In case of failure, a discrepancy between the actual and the desired outcome is experienced, accompanied by NA, a signal of non-reward. Thus, the BIS is activated (Gray, 1994), the approach behaviour is inhibited, and a cognitive appraisal of goal feasibility occurs. In the case where the goal appears feasible, this new signal of reward activates the BAS again that activates goal pursuit, more precisely now *tenacious* goal pursuit that leads to success or failure again. In the case where the goal appears unfeasible, this reinforced signal of non-reward (NA) brings about a persistence of the BIS activity that now induces accommodative reappraisal, search for meaning, and/or identity transformation (Brandtstädter & Renner, 1990). Subsequently, as a second stage of FGA, as it were, the formation of new perspectives and the channelling of resources to feasible goals result in signals of reward (PA) that close the loop by serving as motivating sources of further approach behaviours.

Paper 6 presented a study focusing on friendships, a facet of the social context that is important throughout life. In middle age, when socioemotional selectivity theory proposes that knowledge-related social motives are salient (e.g., Carstensen et al., 1999), a significant association between openness and friendship involvement was found, but not between agreeableness and friendship involvement. The reverse was true for old age. In old age, when emotion-related social motives are supposed to be salient, a significant association between agreeableness and friendship involvement was found, but not between openness and friendship involvement. It was concluded that the beneficial effects of openness and agreeableness on social relationships depend on the congruence of trait and social goal. None of the other personality traits from the five-factor model contributed significantly to friendship involvement. This finding supports the assumption that openness to experience and agreeableness are particularly crucial for social relationships, presumably again because these personality traits match the most important social motives throughout life, i.e., knowledge-related and emotion-related motives.

The result of age-differential relations among openness and agreeableness, respectively, and adult friendship involvement can be framed in terms of the goal-resource-congruence

model (Lang, 2004) as well. According to the definition of developmental resources as age-related resources “(...) that are developmentally salient at specific phases of the life span” (Lang, 2004, p. 358), it can be argued that in different phases of life, i.e., in middle and old age, different personality traits might act as developmental resources. Middle age is characterized by developmental challenges related to managing career and family. It might be assumed that openness to experience supports coping with such managerial tasks, thus acting as a developmental resource in this phase of life. Old age, though, is characterized by enjoying achievements and dealing with losses. It might be assumed that agreeableness supports coping with such emotion-related tasks, thus acting as a developmental resource in this phase of life. Based on these assumptions, developmental outcomes (such as friendship involvement) should be differentially related to both of these personality traits in middle and old age.

Connections between recalled quality of parent-child relations, personality traits, and friendship involvement in middle and old age were explored as well. Findings suggest differential patterns regarding recalled mother-child and father-child relationship, respectively, and their impact on friendship involvement in adulthood. While maternal representations contributed to friendship involvement solely via agreeableness, paternal representations were directly connected to friendship involvement in middle and old age. That is, participants recalled their relationships to their fathers in ways that are partly consistent with their descriptions of their friendships. This seems to indicate that there are some similarities between both kinds of relationships. Research has shown that fathers spend a greater percentage of their time with children in play than mothers and that the quality of play is different between mothers (more inward oriented activities such as reading) and fathers (more outward and physically oriented activities) (for a review, see Parke & Buriel, 1998). Fathers of participants from the older age group were presumably part of a more authoritarian generation. At any rate, relations to fathers appear as relations to “the other” (that might have laid the foundation for later relations to non-kin, such as friendships), while ties to mothers might be rather remembered as nurturing relations (that might have laid the foundation for later kin relations, such as relations to own children). However, it has to be acknowledged that in the present study recalled father-child relations showed greater variability than recalled mother-child relations. Thus, from a technical point of view, it is more likely that recalled father-child relations would account for greater variation in another variable.

Finally, analyses suggest that in the older age-group the recall of relations to parents was scarcely biased by personality traits. Participants from the older age-group remembered the

ties to their parents in ways that were less consistent with their personality, but more positive than participants from the younger age group. This is in line with literature suggesting a general, i.e., independent from personality, tendency of older adults to reconstruct distant personal experiences positively (e.g., Kennedy, Mather, & Carstensen, 2004).

To conclude, work from the presented papers has shown that age-related vision loss, when considered separately, results in lessened levels in behavioural and emotional outcomes that persist or develop over time. Also, mediators (e.g., outdoor motivation, social resources) and moderators (assimilative and accommodative processes) of the relationship between age-related visual decline and behavioural competence and emotional adaptation were identified. Thus, depending on these mediators and moderators, psychosocial consequences of visual decline can be quite different. Further, context-independent correlates of age-related visual decline were found (age, cognitive functioning, and out-of-home ADL/IADL), but also correlation patterns that were different between macro-contexts (urban vs. rural areas, East vs. West Germany). In particular, social resources were more effective in enhancing out-of-home leisure activities in rural than in urban regions, presumably because access to social resources was easier in the rural areas, especially for those with visual problems (after all, social resources were not related to outdoor motivations and thus, also not to vision in the rural areas). The general importance of social relationships for major aging outcomes reported in the literature led to a focused analysis of biographical and personality antecedents of friendships in a common aging population. Friendships were regarded as a developmental outcome that itself, again, is an antecedent of major aging outcomes. Results highlighted the importance of different personality resources for friendship involvement in different phases of life. Biographical relationship experiences appeared to be crucial as well.

One major limitation of most of the studies was the cross-sectional nature of the data. The statistical power of the only study that made use of longitudinal data was limited due to small sample sizes. Thus, larger longitudinal studies are needed to clarify patterns of change in and causal relationships between variables. Further, though the presented studies have convincingly shown that also normal age-related visual decline is able to negatively impact on major aging outcomes and thus can be seen as a rather frequent development constraining chronic loss situation in old age, dynamics of aging with severe impairments might be still different and have to be studied separately. In a forthcoming study that will be conducted by the research group to which the author of the present work belongs to, older adults with severe vision loss and older adults with severe hearing impairments will be focused on and compared to elders without major impairments. Differential patterns of relationships between

cognitive, personality-related, spatial-physical, and social resources and emotional and behavioural outcomes are expected against the background of the idea that vision loss primarily impacts on interaction with the spatial-physical environment, and hearing loss primarily impacts on interaction with the social environment. For example, age-related chronic impairments might increase the readiness to develop new friendships with persons experiencing similar problems (cf. Reinhardt, Boerner, & Benn, 2003), i.e., such major challenges might selectively increase the salience of knowledge-related social goals, a condition rather uncharacteristic for old age. However, while this might be true for visually impaired elders, it should not, or to a lesser extent, be true for hearing impaired older adults, considering the notion of impaired interaction with the social environment.

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Appendix

Paper 1

Heyl, V. & Wahl, H.-W. (2001b). On the long-term psychosocial adaptation to vision loss in the later years. In H.-W. Wahl & H.-E. Schulze (Eds.), *On the Special Needs of Blind and Low Vision Seniors: Research and Practice Concepts* (pp. 77-83). Amsterdam: IOS-Press.

On the Long-term Psychosocial Adaptation to Vision Loss in the Later Years

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Abstract: The present study is intended to contribute to existing research on long-term psychosocial adaptation to age-related vision loss. The original sample included $n = 42$ blind ($M = 75.7$ years at T_1), $n = 42$ severely visually impaired ($M = 76.8$ years at T_1) and a control group of $n = 42$ sighted senior citizens ($M = 74.9$ years at T_1). Measures focused on behavioural as well as emotional adaptation and were based on multiple phone interviews across an observation period of seven years. The results show that in the long run, age-related vision impairment is associated with increasing losses in emotional as well as behavioural adaptation. In an applied perspective, our results empirically underscore the need for the earliest possible intervention and rehabilitation in order to prevent psychosocial harm to individuals suffering from severe, age-related visual impairment.

The majority of those affected by visual impairment – namely about 70% – are beyond the age of 60 [1]. Current psychosocial research shows that being confronted with severe visual loss in later life has a profound negative impact on life satisfaction (e.g., [2]), competence in activities of daily living (ADL), and leisure activities (e.g., [3]). However, most of this work is cross-sectional: Empirical studies on the long-term adaptation to age-related vision loss are rare. Having extended the observation period of our earlier long-term study [4] from five to seven years, the goal of the present paper is to report on new results in terms of behavioural competence in the domains of everyday functioning and leisure as well as aspects of emotional adaptation (such as subjective well-being and future orientation).

Conceptually, our study draws upon two psychological perspectives, namely environmental gerontology and research on psychological resilience. From the perspective of environmental gerontology, a significant loss of vision should lead to the increase of the docility of the ageing person for “environmental press”, as suggested by the press-competence model (e.g., [5]), and to a decrease in person-environment fit (e.g., [6]), both of which should negatively impact on the behavioural competence (see also, [4]). We therefore hypothesised that visually impaired elders will not only exhibit lower behavioural competence compared to sighted elders (which earlier research has already confirmed), but also greater loss in behavioural competence across the years due to the combination of growing older *and* being visually impaired. From the perspective of psychological resilience, that is, the fact that elderly people are remarkably adept at preserving a sense of well-being despite age-related losses (e.g., [7]), we hypothesised that visually impaired elderly should be able to maintain their level of well-being across the seven year observation period, although we again expected generally lower scores as compared to their sighted counterparts (which again has already

been confirmed by earlier research). The same expectation was held with respect to future orientation, a second indicator used in this study to address emotional adaptation.

Method

Sample

Visual impairment was defined in this study according to the visual acuity criterion of legal blindness in the U.S., that is, visual acuity of 20/200 or less in the better eye. The original research design included: (1) a group of 42 severely visually impaired elderly with a visual acuity between 20/200 and 20/600 and no severe visual field defects, (2) a group of 42 blind elderly with a visual acuity of 20/600 or less and/or severe visual field defects, and (3) a control group of 42 sighted elderly. In all cases, the visual impairment occurred after the age of 55, existed at T_1 for at least three months, and was diagnosed as irreversible. There were no significant differences between the groups according to age (with mean ages ranging from 75 to 77 at T_1), education, income and objective health. All subjects lived in private households, and none had severe cognitive or hearing impairment (see for more details of the sample [4, 8]).

The results of this study are based on a long-term observation of these elders over a seven-year period. While the data were collected at the first measurement point in face-to-face interviews, assessments seven years later (T_2) were done by phone, employing a subset of questions from the original measurement program.

At initial assessment, the mean age of the visually impaired, the blind, and the unimpaired group were 76.8 years, 75.7 years, and 74.9 years, respectively. Across the observation period of seven years, the blind and sighted elderly got somewhat younger, so to speak, i.e., in both groups, the younger participants were the most likely to remain in the sample. Also, as to be expected during seven years of observation, the sample sizes of the severely visually impaired and the blind group decreased from 42 to 13 and from 42 to 11, respectively. Because of these comparable but high dropout rates, both groups were aggregated. A second reason to give up the initially relevant distinction between severe visual impairment and blindness was that it is highly probable that at least some of the severely visually impaired at T_1 became blind over the assessment interval. Overall, among the 60 dropouts across all visually impaired subjects and all measurement points, 13 refused to participate further, 20 were deceased, and 27 could no longer be reached by phone. Within the sighted group, there were 20 dropouts across the seven-year interval; four of them refused to participate further, six were deceased, and 10 could no longer be reached by phone. The dropout category “could no longer be reached by phone” was only coded after many futile attempts to contact the subjects (over a period of four weeks, no less than ten attempts). Probably, most of these persons relocated to nursing homes. Dropout analyses based on an explorative logistic regression approach showed that scores at T_1 do not predict participation at T_2 very well. Only leisure activity level and age at T_1 were statistically significant predictors for participation across the observation period. Those persons who had a higher leisure activity level at T_1 and those who were younger at T_1 were more likely to remain in the sample, indicating that there was a slight positive selection tendency.

Measures

Follow-up and phone-based assessments required downsizing the original measurement program, but all constructs considered to be critical to our theoretical approach were represented in the shorter data protocol. Thus, to assess behavioural competence, we used a

subset of items from the original ADL/IADL and the leisure activity scales [9] consisting of six items each. In addition, we repeated our measurement of the independent use of outdoor resources critical for daily functioning (such as a supermarket or a pharmacy), a scale consisting of seven items (see [4, 8]). To assess emotional adaptation, we once again employed a subscale from the Philadelphia Geriatric Center Morale Scale (PGC, [10]; in the slightly revised version used in the Berlin Ageing Study, [11]), namely general life satisfaction, and repeated our measurement of future orientation (one-item measure on a 5-point scale). All of these measures showed satisfactory psychometric properties in terms of reliability [4].

Results

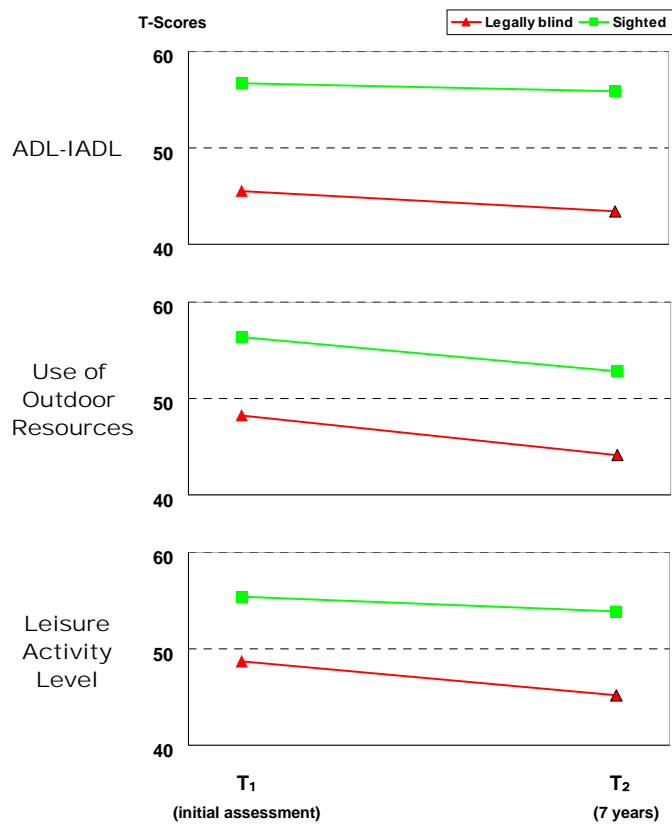
First of all, it should be stressed here that the significant reduction of sample sizes across the seven-year interval requires one to treat the findings with caution. With this in mind, repeated measures ANOVAs were run by considering the effects of group membership (legally blind vs. sighted) and time (T_1 and T_2). Dependent variables were the three outcome variables that indicate behavioural competence (ADL/IADL, use of outdoor resources, leisure activity level) as well as both of the indicators for emotional adaptation (general life satisfaction, future orientation).

Figure 1 shows the trajectories of the three indicators of behavioural competence for the 24 legally blind and the 22 sighted elderly who remained in the study across the period of seven years. For both groups, the competence in activities of daily living remained rather stable across the seven-year interval. However, at T_1 as well as at T_2 , the legally blind functioned at a statistically significant lower level than the sighted elderly, as indicated by F -values (1, 44) for the main effects of 50.74 ($p < .025$; T_1) and 33.56 ($p < .025$; T_2), respectively. The effect of time as well as the interaction of group X time were not statistically significant.

Furthermore, the use of outdoor resources revealed a decline in both groups, with, however, lower scores in the visually impaired group. Group differences remained statistically significant across time with F -values (1, 44) of 12.88 ($p < .025$) for T_1 and 9.28 ($p < .025$) for T_2 . Also, there was a main effect for time of measurement with an F -value (1, 44) of 13.37 ($p < .05$). The interaction of group X time was not statistically significant.

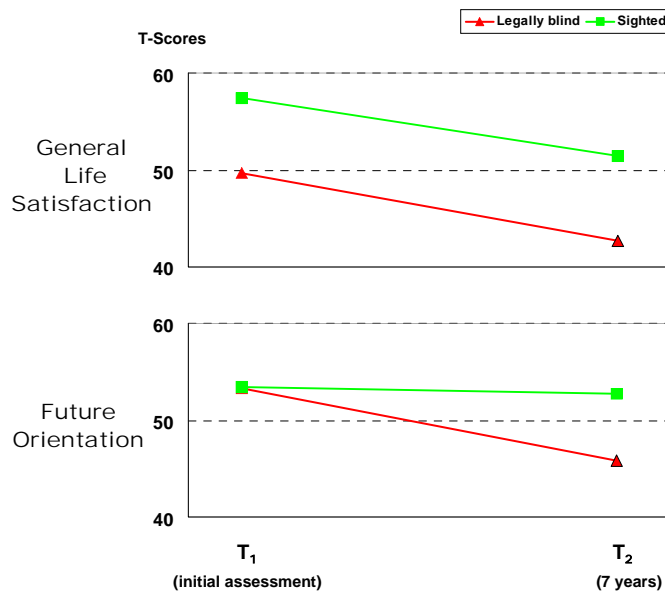
In the domain of leisure activities, once again group differences remained statistically significant across time with F -values (1, 44) of 8.69 ($p < .025$) for T_1 and 7.96 ($p < .025$) for T_2 . Among the sighted elderly, leisure activity level was high and rather stable across time, whereas leisure activity level among the legally blind elderly tended to decline more strongly. The effects of time as well as the interaction of group X time were, however, not statistically significant.

Figure 1: Trajectories of Three Indicators of Behavioural Competence Across Seven Years



Note. Higher scores indicate better behavioural functioning.

Figure 2: Trajectories of Two Indicators of Emotional Adaptation Across Seven Years



Note. Higher scores indicate better emotional adaptation.

Figure 2 depicts the trajectories of the two indicators of emotional adaptation over seven years. In both groups, general life satisfaction showed considerable decline from T₁ to T₂,

with lower levels on the part of the legally blind elderly at each measurement point. According to this, group differences were statistically significant at T₁ as well as at T₂ (T₁: $F_{1,44} = 7.47, p < .025$; T₂: $F_{1,44} = 12.51, p < .025$). Moreover, time of measurement was statistically significant because of the difference between T₁ and T₂ ($F_{1,44} = 17.18, p < .05$). The interaction of group X time was not statistically significant.

Regarding future orientation, by starting from virtually the same scores at T₁, the scores of the legally blind group showed a pronounced decline by T₂, whereas the scores of the sighted group remained at their high level across time. At T₂ the group difference was statistically significant with an F -value of 7.68 ($p < .025$). There was a statistically significant effect of time between T₁ and T₂ ($F_{1,44} = 8.98, p < .05$). Also, the interaction of group X time was statistically significant ($F_{1,44} = 5.92, p < .05$), indicating particular decline in the legally blind older adults ($F_{1,23} = 10.94; p < .025$).

Discussion

This study provides findings concerning the long-term (seven-year) psychosocial outcome of age-related vision loss. In light of the theoretical ideas used to predict this long-term course in terms of behavioural (environmental gerontology theorising such as the competence-press model, [5]; and the person-environment-fit-model, [6]) as well as emotional adaptation (psychological resiliency, [7]), we expected ongoing decline in behavioural adaptation and stability in emotional adaptation across the seven year period. With respect to the results, however, quite the contrary appeared in the data: In all three indicators of behavioural competence, scores tended to remain stable or revealed decline both in the visually impaired *and* the sighted group. That is, although all of these indicators were significantly lower in the visually impaired as compared to the sighted group, no further long-term loss attributable to the vision impairment was found. With respect to general life satisfaction, our first indicator of emotional adaptation, significant decline was observed both in the visually impaired as well as in the sighted group with consistently and significantly lower scores in the former. Finally, in case of future orientation, a no difference situation between groups turned into a significant loss (i.e., a more negative future orientation) in the visually impaired elders after seven years, while stable scores were observed in the sighted elderly.

First, these results replicate the findings of earlier research pointing to lower behavioural as well as emotional functioning of visually impaired elders (e.g., [2; 3; 4]) with the further differentiation that future orientation went to the negative side only across the years. Second, although the comparable future orientation scores at T₁ partially support a psychological resilience interpretation at T₁, the challenge posed by visual impairment may set limits to psychological resilience in older adults. Whereas general life-satisfaction already was about one standard deviation lower at T₁ in the visually impaired, another significant loss of about 0.75 standard deviation occurred seven years later. Although the sighted elders of this study suffered as well from decline in general life satisfaction (but not with respect to future orientation), it took place on a clearly higher level. Third, regarding behavioural competence, environmental gerontology theories may be helpful to explain the significant differences between visually and sighted elders, but the combination of growing old and suffering from visual impairment did not lead to further behavioural loss as was also hypothesised by us based on these concepts. Instead, and probably due to a whole variety of compensations exerted by visually impaired elders (see [12]), they seem at least in part (ADL-IADL, leisure activities, in this study) be able to keep their remaining functioning across the years or show comparable decline as their sighted counterparts (use of outdoor resources, in this study). One should not forget with respect to the latter result, however, that the level of

functioning in the visually impaired elders was already about one standard deviation lower at T₁.

To conclude, our results do not confirm the assumption that psychological resiliency helps visually impaired elders in order to keep their emotional adaptation stable across the years. Also unexpected but more positively, these elders seem nevertheless be able to counteract at least partly ongoing losses of their already significantly (as compared to sighted elders) reduced behavioural competence supporting the notion of a more behaviourally oriented resiliency which seem to work by extensive use of compensation mechanisms in order to give up as less as possible from the still remaining autonomy. All in all the results of this study demonstrate that severe age-related visual impairment is associated with negative psychosocial consequences which, in the long run, cannot be alleviated by “natural” resources and psychological hardiness alone. Psychosocial intervention programs therefore must be implemented as early as possible and are crucial to ensuring the proper care and emotional well-being of the visually impaired elderly.

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Paper 2

Wahl, H.-W., Heyl, V. & Schilling, O. (2002). The role of vision impairment for the outdoor activity and life satisfaction of older adults. *Visual Impairment Research*, 4, 143-160.

The Role of Vision Impairment for the Outdoor Activity and Life Satisfaction of Older

Adults:

A Multi-Faceted View

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Abstract

This work addresses the interrelations between vision impairment, outdoor activity and life satisfaction in older adults. Results are based on a sample of N=404 elders living in private households in rural Germany. Structural equation modeling supports the hypothesis that vision impairment directly affects basic outdoor activity (represented by basic and instrumental activities of daily living performed outside of the home, ADL-IADL-OUT), while only an indirect impact on the expanded component of outdoor activity (represented by leisure activities exerted outside of the home, LA-OUT) via ADL-IADL-OUT was found. LA-OUT was instead strongly influenced by the motivation to exert activities outside of the home. Furthermore, the findings indicate that vision impairment is but one important variable among others that affect outdoor activity, specifically impairment in physical mobility. Finally, the direct link hypothesized between outdoor activity and general life satisfaction was also confirmed.

Key words: Vision Impairment, Outdoor Activity, Life Satisfaction, Aging.

Introduction

This study seeks to theoretically and empirically contribute to research on how vision impairment, physical mobility impairment, and psychological factors influence the day-to-day behaviors of older adults. We will particularly concentrate in the present study on outdoor activities. Our theoretical argumentation will lead to the test of a model addressing the complex relations between these constructs; structural equation modeling is applied to a data set which was originally generated to address the outdoor mobility of rural elders in Germany¹. We assume that such data are particularly useful for testing our model because outdoor activity is critical for older adults' life satisfaction in remote areas due to existing barriers (e.g., lack of public transportation) that hinder the accessibility of key resources such as physicians, supermarkets and so on. Furthermore, we expect that visual impairment should be particularly important in exerting outdoor activities and that this dynamic should be particularly pronounced in rural regions. On a more general level, we thus view outdoor mobility to be a prerequisite and expression of quality of life and healthy aging (e.g.,^{2;3}).

The cornerstone of the present study is empirical research on sensory impairment and behavioral functioning. The impact of vision impairment on day-to-day activities, understood in terms of Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), has received a great amount of attention. ADL comprise basic activities such as dressing and eating, whereas IADL comprise more complex activities, such as preparing a meal or using public transportation⁴. The theoretical rationale behind this research track is that ADL and IADL performance depends strongly on one's visual capacity (e.g.,⁵). In a recent review, analyzing over 300 studies on the psychosocial impact of age-related vision impairment prepared by our research group^{6;7}, at least 35 studies used ADL-IADL measures as one of their primary outcomes. Rather convergent evidence in terms of method (i.e., regression analyses, relative risk analyses; cross-sectional versus longitudinal) as well as

setting (i.e., private home, institutional) from this broad empirical body of work supports the assumption that low vision is significantly related to lowered ADL-IADL functioning (e.g.,⁸⁻¹²). Furthermore, a number of studies show that low vision is associated with a reduction in leisure activities, such as visiting friends, going to the theatre, or simply going out for a stroll (e.g.,^{10; 12-14}). Another consistent finding in the current literature is that hearing is less important than vision for ADL-IADL and leisure activity ; this pattern of results has been observed in both cross-sectional and longitudinal studies (e.g.,^{11; 15;16}).

Furthermore, Burmedi et al.⁶ were able to identify a substantial number of studies supporting a significant link between low vision and lowered life satisfaction (e.g.,^{12; 17-19}). The main explanation for this finding is that severe loss in vision strongly and irreversibly undermines life-plans and future expectations that are critical for late-life development (such as traveling, reading, or volunteering) and thus provides a major threat to the aging self²⁰.

In addition to the effect of visual impairment, physical mobility impairment indicators (such as impairment in balance or gait) have been found to be of major importance in predicting ADL-IADL functioning (e.g.,^{1; 15; 16; 22-26}). Empirical evidence also supports the assumption that physical mobility impairment, on the objective and subjective level, adds to the explanation of life satisfaction of older adults (e.g.,²⁷).

That said, it is important to note that the literature has not explored much which psychological variables might mediate between sensory/physical impairment and outcomes such as ADL-IADL and leisure activity level. A closer look at empirical work framed within a model of everyday competence by M. Baltes et al.^{15; 22-24} is particularly helpful in this regard. A cornerstone of the model is its distinction between basic competencies (BaCo) and expanded competencies (ExCo). BaCo comprises the competence in necessary activities of daily living and is thus near to what we have called ADL-IADL, while ExCo comprises the competence in more optional activities of daily living (e.g., leisure activities). In this

theoretical model, BaCo is seen as a “must“ for keeping one’s fundamental autonomy in later life. It should thus depend not much on personality and motivational factors but strongly on variables such as vision and physical mobility impairment. Conversely, M. Baltes et al. argue that ExCo depends more heavily as compared to BaCo on a broader set of personality aspects and motivational forces. The main reason is that such behavior does not directly relate to one’s fundamental independence and has more to do with optional use of opportunity structures to improve one’s life quality^{2; 3}. M. Baltes et al.^{22; 24} as well as Marsiske et al.¹⁵ have also provided empirical support for this assumption. For example, in one of their structural equation analyses, sensory functioning only had a direct impact on BaCo, whereas psychological variables such as personality traits (e.g., extraversion and openness to experience) exerted their strongest influence on ExCo.

A major shortcoming of this and other empirical work is, that the physical-spatial environmental context—i.e., inside the home versus outside the home—has not been considered, even though the role of the environmental setting is highlighted in major theoretical models of late-life functional ability and processes of disablement^{21; 24; 28; 29}. This distinction is crucial; compared to the outdoor environment, the inside environment possesses much more potential for the compensation of functional losses. The inside home environment is persistently and predictably adaptable to functional losses, and this can be further enhanced by person-related compensation strategies such as following the same pathway through the apartment or simply “knowing everything” about one’s home setting^{30; 31}. Although both environment and person-related compensations can also be employed in areas outside of the home, they are generally less effective and in many instances very limited due to uncontrollable events in the environment (e.g., a familiar route in the neighborhood may turn into a risk situation when the sidewalk or road becomes a construction area). Rural settings require residents to travel longer distances and offer less environmental support (e.g., public

transportation), making outdoor activities such as shopping or visiting cultural events more difficult^{1; 32}.

The hypothesized structural model (HSM) used in the present study adheres to the logic of the everyday competence model suggested by M. Baltes et al. and applies this approach to the specific theoretical and empirical challenges that come with examining outdoor activity in later life framed within the dynamics of vision impairment, physical impairment, psychological influences as well as important background variables. As can be seen in Figure 1, a crucial element of the HSM is, in accordance with the M. Baltes model, the differentiation between basic activities outside the home (ADL-IADL-OUT) and expanded activities outside the home (leisure activities performed outside of the home, LA-OUT). Prototypical examples of ADL-IADL-OUT would be visiting a doctor's office or shopping, while activities such as gardening or visiting a park area are typical for LA-OUT. We assume that ADL-IADL-OUT strongly depends on variables such as vision and physical mobility impairment (note the arrows in Figure 1, with the additional assumption that vision capacity directly impacts on physical mobility), while LA-OUT should mainly depend on the capacity to conduct ADL-IADL-OUT as well as on psychological factors. A variety of such psychological factors might plausibly influence LA-OUT. Environmental psychology theory and findings dealing with the restorative function of outdoor worlds show that the interaction of personal needs and diverse experiences with environmental influences across the adult life-span leads to different outdoor-related motivations and interest in outdoor behaviors³³⁻³⁵. We assume that such motivation to exert activities outdoors becomes particularly relevant when one salient reason to leave the home, namely to pursue a profession, no longer exists or has significantly diminished. This is normally the case in old age. Furthermore, in a situation of less environmental support (e.g. the poor public transportation and long distances to resources and events that characterize remote areas), leisure activities, which are not critical for day-to-

day life maintenance, should be particularly strongly controlled by one's outdoor-related motivational mindset, that is, the outdoor motivation must be strong enough to overcome the environmental barriers. Also, we assume that this kind of motivation is influenced by visual functioning and physical mobility such that the presence of impairment lowers outdoor motivation (see again Figure 1).

There is empirical support in the literature on rural settings that behaviors outside of the home and its influence on medical treatment, social contact and the feeling of being involved in the cultural and political life of the community become quite important for the life satisfaction of older individuals^{1; 32; 36; 37}. For this reason, our HSM shows a direct relationship between LA-OUT and life satisfaction and an indirect influence between ADL-IADL-OUT and life satisfaction (mediated by LA-OUT). Furthermore, our HSM shows links between vision functioning, physical mobility impairment, and life satisfaction observed in the literature; lower functioning should have a direct, negative effect on life satisfaction.

Finally, we have included two exogenous variables, chronological age and socio-economic status (SES), into our HSM for the following reasons. First, research has repeatedly found a strong negative correlation between chronological age and capacities such as visual functioning, physical mobility and ADL-IADL and leisure activity level (e.g.,^{16; 24}). In contrast, life satisfaction has been found to be only weakly related to chronological age, which is the reason why our HSM has no path from age on this variable (e.g.,²⁷). Second, SES, reflected in variables such as education and income, has repeatedly shown a positive correlation with life satisfaction (e.g.,²⁷), but a weaker relation specifically to ADL-IADL (e.g.,²⁴). To be as parsimonious as possible, we therefore have only considered a path from SES to life satisfaction. However, we also expect that outdoor motivation to conduct outdoor activities is nurtured to some degree by socio-economic resources. To put it simply: Going out for lunch in the city depends upon the individual's motivation for novel stimulation, but in

more practical terms, without sufficient economic resources to pay for a cab, the motivation to go out should be very low. Also, the motivation related to cultural activities to be exerted outside of the home (e.g., visiting a theatre or concert) probably is related to education in the sense that higher education will strengthen such motivation. Finally, the positive relation between SES and both vision and physical mobility impairment in our HSM is based on the assumption that SES is especially important for rurally aging persons in terms of effective treatment, rehabilitation and prevention due to difficulties in mobilizing these resources in rural areas. SES can effectively compensate for these difficulties, a view which is also supported by health and care-related literature on aging in remote areas^{32; 36}.

(insert Figure 1 about here)

Materials and Methods

Sample

This study is based on a 1999 survey of 404 persons aged 55 years and older living in private households in two rural regions, one in East (former German Democratic Republic) and the other in West Germany, stratified by age (55 to 74 years versus 75 plus years) and gender. This stratification strategy assured comparable data strength in younger and older age groups as well as in comparisons between men and women. Data-collection was conducted by a commercial research institute (USUMA, Berlin). First, a probability selection of communities (less than 2000, 2000-5000 or 5000-20,000 inhabitants) in two typical rural regions in eastern (Oberspreewald-Lausitz) and western Germany (Rhein-Hunsrück) was performed. Subjects were then identified based on a random route strategy. Due to the fact that German law prohibits collecting data from those refusing to participate, no hard data on selective sampling are available. However, comparison with general census data did not reveal pronounced differences between our sample and the general population. Table 1 provides a description of the sample of in terms of selected socio-demographic variables and

subjective health, differentiated according to the sample stratification criteria East vs. West and gender. (We did not differentiate in Table 1 according to the stratification criterion of age, because chronological age will be used as a continuous variable in further analyses, whereas rural region and gender will serve as grouping variables in exploratory model tests.)

(insert Table 1 about here)

As can be seen in Table 1, the final sample consisted of 204 participants from East Germany and 200 participants from West Germany and 203 men and 201 women, respectively. Two series of t-tests and chi-square tests were run, one contrasting participants from East and West Germany, the other differentiating the sample by gender. Not surprisingly, elderly women were significantly less educated than elderly men. All of the subgroups (participants from East vs. West Germany, men vs. women) were comparable regarding household income-per-head. Because only very few participants declared their absolute household net income (N=150), we had to rely on a variable that requested participants to indicate their household net income category (10 categories ranging from “less than 400 DM” to “more than 4000 DM”). For our analyses, we used the midpoint of the indicated income category divided by the number of household members, in order to achieve an interval-like scale for income-per-head. The highest absolute net income indicated by the participants (5000 DM) served as an upper limit (“more than 4000 DM”). By this means, available data on the income-per-head variable increased to N=333. It deserves mentioning here that a substantial amount of missing values in terms of income is typical in surveys³⁸. Household composition was significantly different between subgroups. As expected, women were more likely than men to live alone. We also observed a higher percentage of single-person households in the East. The best explanation for this discrepancy seems to be the significantly higher mortality rate observed in the former German Democratic Republic, especially with respect to men³⁹. As a measure to roughly characterize the health status of

the sample, subjective health was assessed by a self-evaluation rating of health satisfaction based on an 11-point Likert-type scale ranging from “completely dissatisfied” to “completely satisfied.” As can be seen in Table 1, no statistically meaningful differences were found with this variable.

Measures

In the following, we describe how the observed variables were measured and how they were used to build the latent variables which form the HSM of the study.

Visual impairment. Two indicators of visual functioning were available. As a proxy for objective visual impairment, visual acuity was screened by successively presenting charts with “Pflüger-Haken” (“E-shaped” symbols) of various size (⁴⁰; see also ⁴¹). This measure provides a quick screening of visual acuity ranging from 1.0 (normal vision) to 0.02 or less (functional blindness according to criteria of the German Ophthalmological Society); the range of the measure, using the diction in the American literature, is 20/20 to 20/1000 (e.g., ⁴²). The subject’s task was to identify where the open side of the “E” symbol is located. Visual acuity was assessed by simultaneous examination of both eyes using the best correction available, based on a standard distance of 1 m, under optimal light conditions. Although the symbols employed in this test are unusual, this measure has the advantage of being nearly completely independent from any educational influence (that is, there is no need for the identification of numbers or letters), which still is particularly important for old and very old participants in rural regions. In our other studies ⁴³, this test correlates highly with other standard measures of visual acuity such as standardized letter charts used in clinical settings (around $r = .70$). In addition to objective visual acuity, subjective visual functioning was assessed by a self-evaluation rating based on a 5-point Likert-type scale ranging from “excellent” to “very poor.”

Physical mobility impairment. Two one-item measures served as indicators to measure physical mobility impairment. First, disease-related mobility functioning (or impairment) was assessed by asking: “Have you suffered for a long time from certain impairments or illnesses which permanently or from time to time hinder your movability?” (Answer possibilities: “Yes, permanently hindered,” “Yes, from time to time hindered,” or “No, not hindered”). One should note here that sensory impairments (especially vision) were not considered in this question and addressed in separate ratings. Second, subjects were asked to rate their physical mobility impairment on a 5-point Likert-type scale ranging from “excellent” to “very poor.”

Outdoor Motivation. There are no standard measures of outdoor motivation currently available. In our own attempt to address this important construct of our HSM, we followed a two indicator approach, namely one item addressing the Importance of Being Outdoors and one item addressing Mobility Type. Importance of Being Outdoors was measured by a self-evaluation rating based on an 11-point Likert-type scale ranging from “completely unimportant” to “very important.” Assessment of Mobility Type was based on the following question: “What kind of person are you? Do you prefer to stay at home or do you prefer to be on the go?” To answer this question, subjects were asked to make a mark on a 20-cm line between the two extremes “would like best to stay at home” and “would like best to be on the go.” Mobility Type scores used in the data analyses resulted from the exact length of the section the participants had marked (0.0-20.0 cm).

Socioeconomic status (SES). We considered chronological age and SES in the HSM as distal influences on outcomes. Two measures served as indicators of SES, namely years of education and income-per-head (see section on sample description for more details on the measure of income). As already described, the income-per-head variable contained a substantial amount of missing data (which is not unusual in empirical research), resulting in

N=333 (see again Table 1). For the latent variable analyses reported later, we used full information maximum likelihood estimation available in the AMOS 4 statistical program package (FIML; ^{44,45}), which permits observations with partially missing data to remain in the data set.

ADL-IADL outside of the home (ADL-IADL-OUT). Subjects were asked to rate the degree to which they required assistance (0="unable to perform," 1="able to perform with assistance," 2="able to perform without assistance") with 5 ADLs (bending over, climbing stairs, going outdoors, carrying something heavy, e.g., a full shopping bag or baggage, and walking at least 2 km) and 1 IADL (shopping) that are important for outdoor activity. The internal consistency of this scale amounted to .91 in the present study (Cronbach's alpha). As in the work of Baltes et al. ²³ and Marsiske et al. ¹⁵, items were ranked by item difficulty (the mean of the item within the sample), and then they were divided into two odd-even split halves (ADL1 and ADL2) that served as indicators for ADL-IADL-OUT in the latent variable analyses.

Leisure activities outside of the home (LA-OUT). Participants were asked whether they currently perform any of 18 leisure activities that normally are pursued outside the home (e.g., gardening, going to the cinema, theater or concert hall, playing a particular sport). A "Yes/No" format was used to indicate involvement in an activity. The score ranged from zero to 18. The internal consistency of this scale amounted to .76 in the present study (Cronbach's alpha). As with the basic activities, in order to obtain two equivalent indicators for expanded outdoor behaviors at the latent level, items were ranked by difficulty and were then divided into two odd-even split halves (leisure activities1 and leisure activities 2).

Life satisfaction. Two indicators were used to address this construct in terms of content and temporal characteristics (present and future). First, we used a 4-item subscale from the Philadelphia Geriatric Center Morale Scale, originally labeled "Lonely

Dissatisfaction” (PGCMS, ⁴⁶). An important feature of this subscale is that it addresses one’s relation to the social world (e.g., “To what extent do you feel lonely?”), as well as more general aspects of one’s current life evaluation (e.g., “How satisfied are you with your life today?”). In contrast to the original Lawton scale, a 5-point rating scale was used as response format, ranging from “strongly agree” to “strongly disagree” (comparable to BASE; c.f. ²⁷). In our study, the internal consistency (Cronbach’s alpha) of this subscale of the PGCMS amounted to .65. Second, subjects had to rate their future perspective on a 5-point Likert-type scale ranging from “excellent” to “very poor.”

Interviewers and Interview Setting

All interviewers employed by the commercial research institute for the data-collection. Specifically, one-day training sessions were offered both in the eastern and western data-collection setting in order to learn how to administer the psychological instruments and the visual acuity screening advice. Furthermore, regular phone conferences with the commercial research institute were held based on feedback from monitoring the interviewers over the data-collection period. The interview, including the visual screening test, took place in the home of the participants and lasted about one hour.

Results

Descriptive Results

Table 2 and 3 provide descriptive information on the major variables of our conceptual model.

(insert Table 2 and 3 about here)

Visual acuity was significantly different between East and West as well as between men and women (Table 2): Western German participants scored higher than eastern German participants and men scored higher than women. Regional differences probably result from the long-term consequences of different health and treatment regimens (e.g., with respect to

diabetes) with the eastern region tending to be of lower quality, especially in rural areas^{39, 47}. Lower visual functioning among women has also been found in major epidemiological studies (e.g.,⁴⁸). Moreover, subjective visual functioning was significantly higher among men than among women. Regarding mobility-related variables, no differences were found between the respective subgroups.

Furthermore, compared to participants from eastern Germany, participants from western Germany scored significantly higher regarding the importance of being outdoors, leisure activities, and future perspective (Table 3). This tends to be in line with other available survey data showing older adults from West Germany to be more active and generally more optimistic⁴⁷. Also, women were more disadvantaged than men in terms of activities of daily living and lonely dissatisfaction, which is in line with other studies in these fields of inquiry (e.g.,^{24; 27}).

Table 4a provides the reader with the zero-order correlation matrix of all theoretically important observed variables, while Table 4b displays estimated correlations among error-free constructs in the latent space (cf. initial measurement model as described in next section).

(insert Table 4a and Table 4b about here)

As can be seen, there were low to medium-sized correlations between many of the observed measures and medium-sized to large relations in the latent space. The correlations between both outdoor behavioral constructs and chronological age were substantial (-.50 and -.41). The correlation between life satisfaction and chronological age was, as expected, rather low (-.26), similar to the correlation between age and outdoor motivation (-.26). The latter may be regarded as support for our assumption that this construct is more strongly influenced by life-long experiences and personality aspects than by chronological age. Vision and physical mobility impairment correlated substantially higher with ADL-IADL-OUT than with LA-OUT (.66 and .82 compared to .46 and .45).

Testing the Hypothesized Structural Model by Use of Structural Equation Modeling

Model Testing Strategy

Computation was carried out by using the full information maximum likelihood (FIML) estimation procedure from the AMOS 4 program package^{44, 45}. This procedure allows for the inclusion of observations with substantial missing values, which was particularly crucial due to the quite large amount of missing data in terms of the income-per-head variable (see again Table 1). Whereas checking for univariate normality of the observed variables. (Shapiro-Wilk-test) indicated that some variables were not normally distributed, skewness and kurtosis were moderate with no absolute skewness values above 2 and the highest kurtosis value amounting to 3.48 (income, mean absolute kurtosis: 0.87). Following recommendations offered by West, Finch, and Curran⁴⁹, we computed maximum likelihood estimates and paid special attention to IFI- and CFI-values, which are widely acknowledged as fit-indices with an acceptable bias even under severe non-normality conditions. Since χ^2 tests for model fit may be too sensitive when the sample size is large⁵⁰ and inflated due to non-normality, evaluation of fit should mainly be based on other indices. Hence, evaluation of the model fit was based on inspection of CFI-, IFI-, and NFI-values, and the root mean squared error of approximation (RMSEA). As a general rule, NFI, IFI and CFI should be as near as possible to 1.00, whereas RMSEA should be $\leq .05$.

Model testing was conducted according to the following steps: First, we specified an initial measurement model (M1) that included all constructs and the observed variable of chronological age. In this model, all constructs and age were allowed to freely correlate with one another. Second, we analyzed the data with a structural equation model with latent variables (e.g.,⁵¹) according to our HSM as illustrated in Figure 1 (M2; latent variables in circles, observed variables in rectangles, disturbance terms unenclosed, straight arrows

representing directional paths; see (^{51, p. 33}). Third, unneeded paths were deleted on the basis of inspection of path significance (M3).

Results of Model Testing Strategy

The results of this model-testing strategy are given in Figure 2 and Table 5.

(insert Table 5 and Figure 2 about here)

As can be seen in Table 5, the initial measurement model (M1) already fit the empirical data quite well, although the chi-square statistic was significantly above zero. Some of the fit indices for M2, which tested the HSM, indicated an even better fit than did the respective fit indices for the measurement model. Furthermore, inspection of estimated regression weights revealed that two paths (age on physical mobility and vision on life satisfaction) were not significantly different from zero. These paths were dropped in M3, which is depicted in Figure 2. M3 did not differ significantly from M2 and was accepted as the final model since it also confirmed the theoretically important assumption that vision and physical mobility impairment impact directly only on ADL-IADL-OUT, while motivation-related variables impact directly only on LA-OUT. M3 was still more parsimonious compared to M2 due to the empirically confirmed (while not theoretically expected) fact that no direct link between chronological age and mobility was necessary. Instead, most of the common variance of both of these variables was mediated by vision. Also, most of the common variance between vision and life satisfaction was mediated by ADL-IADL-OUT and LA-OUT. In terms of variance explanation, age together with vision and physical mobility accounted for about 77% of the variation in ADL-IADL-OUT, age together with ADL-IADL-OUT and the outdoor motivation-related latent variable explained about 42% of the variance in LA-OUT, and finally, SES together with physical mobility and LA-OUT accounted for about 58% of the variance in life satisfaction.

As a final step of data analysis, which was not explicitly considered in the HSM and thus more exploratory in nature, we took advantage of the sample stratification according to East versus West place of residence and gender. The goal was to examine whether the more parsimonious form of our HSM (M3) fits the data from the subsamples examined in the study, i.e., for elders living in the eastern (former German Democratic Republic) and western region of Germany as well as for men and women. For this purpose, we applied multi-sample modeling (e.g.,^{51, 355ff}): We computed M3 as a multi-sample model differentiating between the East and West German sample and as another multi-sample model differentiating between the two gender groups. Both models were applied under several across-group equality-constraints; namely, we computed models without any such equality-constraints, models with structural parameters (path coefficients, variances of the variables of the structural model) constrained equally across groups, and models constrained absolutely equally (all parameters, except means and intercepts). We found that even the most restrictive models, which assume total equality, fit the data very well (model “Total”), though the difference in the χ^2 -value compared to the models without equality-constraints (“None”) was statistically significant. However, as stated above, these tests may be too conservative due to the non-normality of the data. Constraining the structural parts of the models equally (“Structural”) led to no relevant loss of fit compared to the unrestricted model. In conclusion, neither locale (East Germany vs. West Germany) nor gender seemed to be important for our HSM and therefore could be left out of the equation.

Discussion

The HSM of the present study was clearly confirmed by the empirical data. In particular, the hypothesis that vision and physical mobility play a significant role in the prediction of ADL-IADL exerted outside of the home, while no direct path between these variables and leisure activities is needed, accords very well with the empirical data. The same

was true with respect to our prediction of the differential impact of outdoor-related motivation on outdoor behaviors. Support was found for the hypothesis that this specific motivation impacts directly on the expanded component of outdoor behaviors (LA-OUT), and has less influence on ADL-IADL-OUT. Finally, the hypothesized direct impact of ADL-IADL-OUT on LA-OUT and of LA-OUT on life satisfaction was also confirmed. The confirmed HSM could be slightly optimized by the elimination of two hypothesized pathways which did not reveal themselves to be significant in the statistical analysis (see again Figure 2).

Based on this set of findings, we feel that the present study is able to contribute to the literature on the role of visual functioning and physical mobility impairment for outdoor activity (e.g., ^{15; 21-24; 28; 52}) as well as research addressing the psychosocial consequences of age-related low vision (e.g., ^{6, 7; 12; 53; 54}).

With respect to the literature on outdoor activity, our findings support the view inherent in existing psychological models of everyday competence ^{15; 21; 28; 52} that it is important to focus – in addition to variables of physical impairment such as loss in vision and mobility – on both socio-structural and psychological variables as well as their complex relations. More specifically, our findings underscore the usefulness of distinguishing theoretically between what one might call a more basic (ADL-IADL-OUT) and expanded (LA-OUT) component of outdoor everyday competence ²³. While the basic component is mostly shaped by the major goal of self-maintenance, the expanded component is determined by a range of psychological variables such as outdoor motivation, the factor highlighted in the present work. Seen from this perspective, our findings also provide another supporting piece of empirical evidence for the need to more strongly merge geriatric models such as the “disablement process” ²⁹ with psychological models of everyday competence ^{28; 23}.

Regarding the age-related low vision literature, our findings underscore the need to view the complex interaction of constructs, in which visual functioning is only one, albeit an

important variable. That is, we strongly advise other researchers to analyze the psychosocial consequences of older adults' vision loss in the context of other functional losses as well as against the background of psychological mediators; outdoor-related motivation, as we have seen, influences outdoor activity. The direct negative effects of vision loss on life satisfaction reported in the low vision literature (e.g., ^{12; 17-19; 55}) might become much weaker when the direct effect of vision on outdoor activity (particularly on ADL-IADL-OUT and indirectly on LA-OUT via ADL-IADL-OUT) is also taken into consideration, as we have done in the present work. In sum, the findings of this study support the view that a "medical model" directly linking vision loss to life satisfaction should be replaced by a "biopsychosocial" model, in which mediating variables operating between both of these variables also deserve consideration. These mediating variables probably are numerous ranging from personality aspects to physical and social environmental characteristics. The good fit of the theory-driven model tested in this study with the data should thus not be understood such that other mediating variables are not important.

There are several major aspects limiting the internal and external validity of this study. First of all, the present analysis only used cross-sectional data as the basis for the detection of quasi-causal relations. Although this strategy is encountered quite frequently in the literature, it is difficult to establish causal relationships in this manner. We have tried to fulfill one major criterion of quasi-causal analyses, that is, the rigorous application of a theoretical structure developed in our HSM. The clear confirmation of the HSM by our data should be seen as initial support for the hypothesized causal relations and thus might encourage others to perform additional longitudinal work in the future. A second limitation of the present study is that it does not account for some important variables which may influence outdoor activity of older adults such as cognitive functioning and aspects of the social environment. The availability of such measures would probably have significantly enhanced variance

explanation, which was, however, already very good. With respect to cognitive functioning, one should however keep in mind that the present study was based on elders aged 55 and older (BASE on 70+); it might well be that the role of cognitive functioning is not as important in a sample with such a broad age range compared to a sample of the oldest old¹⁵. The role of social network variables for outdoor behaviors has been confirmed repeatedly (e.g.,¹) and thus deserves stronger consideration in future research of this kind. A third limitation of the study is that major variables were measured only on a subjective basis (e.g., physical mobility). However, the prominent role of physical mobility for everyday competence was not only confirmed in this study, but in other studies as well, which used objective measures such as balance and gait tests (e.g.,^{15; 24}). Fourth and finally, the interrelation between variables might be different in rural compared to urban settings; the hypothesized links were expected to be particularly strong for older adults aging living in rural regions. This differential test, however, was not possible in the present study which comprised only rural elders.

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Table 1

Sample Description

Variable: <u>M</u> (<u>SD</u>), empirical range	All (<u>n</u> =404)	East (<u>n</u> =204)	West (<u>n</u> =200)	Male (<u>n</u> =203)	Female (<u>n</u> =201)
Age	73.0 (10.2)	73.1 (10.0)	72.9 (10.4)	72.6 (9.9)	73.4 (10.5)
Years of education (3-20)	10.6 (2.5)	10.3 (2.3)	10.8 (2.7)	11.3 (2.6)	9.8 (2.2)***
Income-per- head ^a (DM 250-4500)	1595.2 (702.0)	1583.4 (584.4)	1605.9 (796.1)	1539.3 (674.2)	1654.1 (727.7)
Household composition (living alone)	38.9%	45.1%	32.5%**	20.7%	57.2%***
Satisfaction with health (0- 10) ^b	5.8 (2.7)	5.7 (2.6)	5.8 (2.8)	5.8 (2.6)	5.7 (2.8)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

^an=333 due to missing values.

^bHigher scores indicate higher satisfaction.

Table 2

Descriptive Data: Basic Vision and Health-Related Variables

Variable: <u>M</u> (<u>SD</u>), empirical range	All (<u>n</u> =404)	East (<u>n</u> =204)	West (<u>n</u> =200)	Male (<u>n</u> =203)	Female (<u>n</u> =201)
Visual acuity (0.02-1.00) ^a	0.48 (0.23)	0.44 (0.25)	0.51 (0.20)**	0.50 (0.23)	0.45 (0.23)*
Subjective visual functioning (1-5) ^a	3.5 (0.8)	3.5 (0.8)	3.5 (0.8)	3.6 (0.8)	3.4 (0.8)**
Mobility functioning (no reported impairment)	36.6%	36.3%	37.0%	37.9%	35.3%
Subjective mobility (1-5) ^a	3.3 (1.0)	3.2 (0.9)	3.3 (1.0)	3.3 (0.9)	3.2 (1.0)

Note. * p<.05; ** p<.01; *** p<.001

^aHigher scores indicate higher functioning. Visual acuity scores between 1.00 to 0.02 equal 20/20 to 20/1000 in terms of the common international nomenclature.

Table 3

Descriptive Data: Outdoor Motivation Related Variables and Outcomes

Variable: <u>M</u> (<u>SD</u>), empirical range	All (<u>n</u> =404)	East (<u>n</u> =204)	West (<u>n</u> =200)	Male (<u>n</u> =203)	Female (<u>n</u> =201)
Importance of being outdoors (0-10) ^b	6.6 (2.8)	6.1 (2.9)	7.1 (2.7)***	6.6 (2.8)	6.6 (2.8)
Mobility type (0-20) ^b	7.6 (4.3)	7.7 (4.6)	7.6 (4.0)	8.0 (4.1)	7.3 (4.5)
Activities of daily living outside of the home (ADL- IADL-OUT) ^a (0- 12)	9.1 (3.3)	9.3 (3.2)	9.0 (3.3)	9.6 (3.1)	8.7 (3.3)**
Leisure activities outside of the home (LA-OUT) ^a (0-18)	5.2 (3.1)	4.0 (2.4)	6.4 (3.2)***	5.3 (3.0)	5.2 (3.2)
Lonely dissatisfaction (PGCMS) (4-20) ^a	14.9 (2.8)	14.8 (2.9)	15.1 (2.8)	15.3 (2.8)	14.5 (2.8)**
Future perspective (1-5) ^a	3.5 (0.7)	3.3 (0.7)	3.6 (0.7)**	3.5 (0.7)	3.4 (0.7)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

^aHigher scores indicate higher functioning, better emotional adaptation and more positive future expectations.

^bHigher scores indicate higher motivation for being outdoors.

Table 4a

Zero-Order Correlations Among the Variables of the Hypothesized Structural Model

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	—												
2. Years of education	-.15	—											
3. Income	.06	.35	—										
4. Visual acuity	-.34	.21	.10	—									
5. Subjective visual functioning	-.31	.16	.01	.47	—								
6. Mobility functioning	-.20	.16	.16	.21	.29	—							
7. Subjective mobility	-.32	.20	.18	.34	.42	.64	—						
8. Importance of being outdoors	-.19	.18	.15	.29	.21	.21	.31	—					
9. Mobility type	-.17	.15	.18	.19	.22	.18	.33	.46	—				
10. ADL-IADL-OUT	-.47	.24	.16	.39	.46	.55	.71	.37	.39	—			
11. LA-OUT	-.36	.19	.13	.29	.27	.17	.40	.37	.32	.50	—		—
12. Lonely dissatisfaction	-.12	.26	.22	.21	.18	.28	.38	.31	.19	.39	.29	—	—
13. Future perspective	-.24	.25	.22	.32	.27	.37	.53	.30	.23	.49	.37	.54	—

Table 4b

Correlations Among the Variables of the Hypothesized Structural Model in the Latent Space

Variable	1	2	3	4	5	6	7	8
1. Age	—							
2. SES	-.13	—						
3. Vision Impairment	-.47	.34	—					
4. Physical mobility impairment	-.34	.35	.59	—				
5. Outdoor motivation	-.26	.39	.44	.49	—			
6. ADL-IADL-OUT	-.50	.36	.66	.82	.59	—		
7. LA-OUT	-.41	.32	.46	.45	.56	.56	—	
8. Life satisfaction	-.26	.51	.45	.68	.51	.63	.51	—

Table 5

Summary of Model Estimations

Model	χ^2	df	p	NFI	IFI	CFI	RMSEA
M1	126.52	63	.000	.992	.996	.996	.050
M2	143.55	73	.000	.991	.995	.995	.049
M3	145.78	75	.000	.991	.995	.995	.048

Note. NFI = normed fit index; IFI = incremental fit index; CFI = comparative fit index; RMSEA = root mean squared error of approximation; M1 = initial measurement model; M2 = hypothesized structural model; M3 = hypothesized structural model, but deletion of non-significant paths age on physical mobility and vision on life satisfaction

Figure Captions

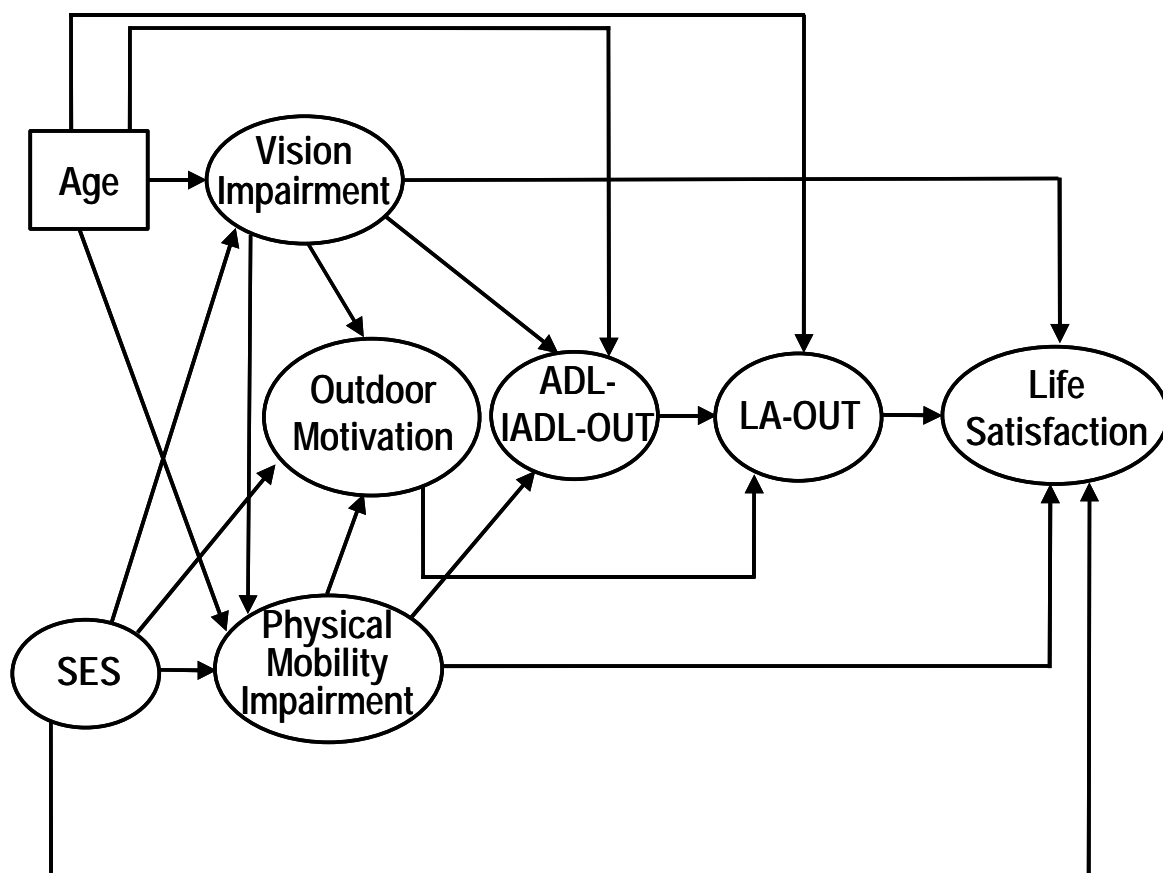
Figure 1

Hypothesized Structural Model of the Study (ADL-IADL-OUT = Activities of Daily Living exerted outside of the home; LA-OUT = Leisure activities exerted outside of the home).

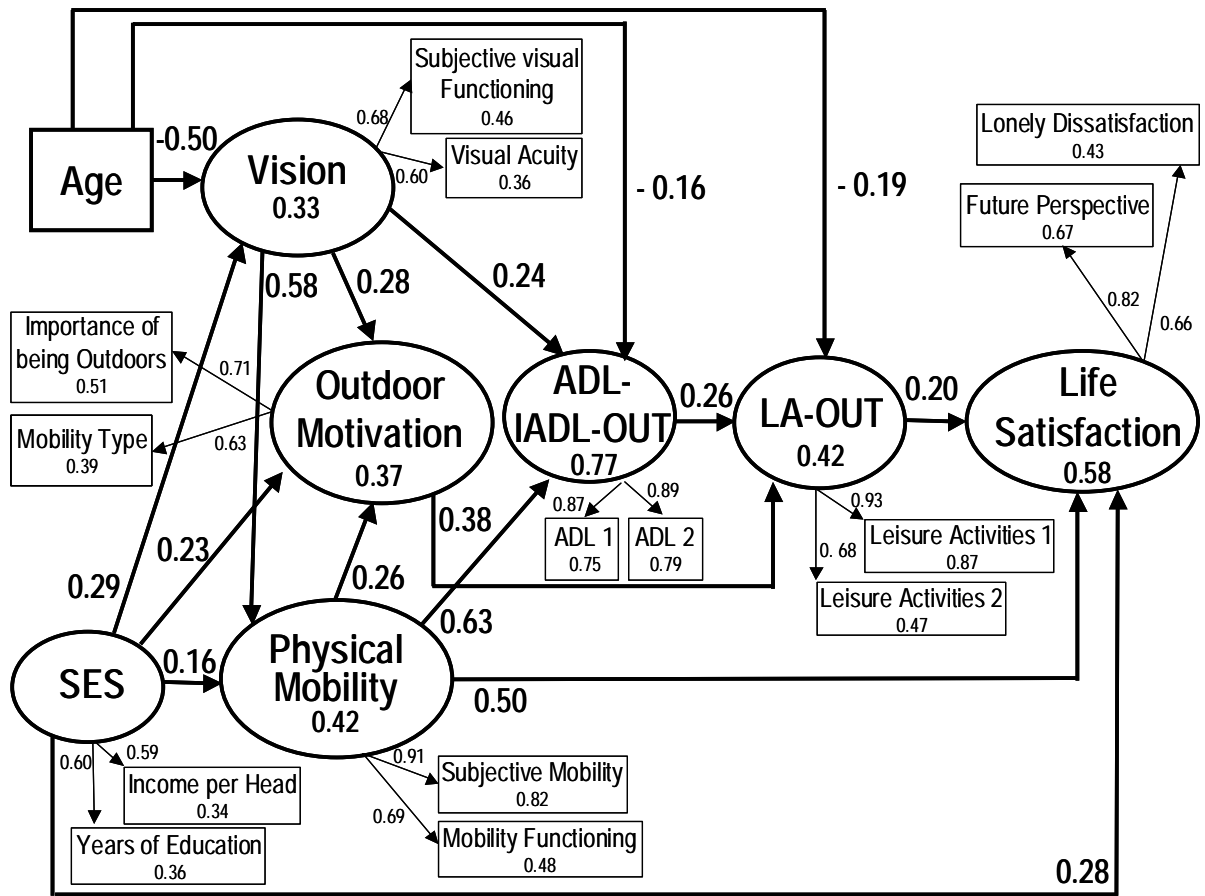
Figure 2

Results of Structural Equation Modeling. Hypothesized Structural Model Empirically Optimized; all standardized paths coefficients are significantly different from zero (ADL-IADL-OUT = Activities of Daily Living exerted outside of the home; LA-OUT = Leisure activities exerted outside of the home).

(Figure 1)



(Figure 2)



Paper 3

Heyl, V., Wahl, H.-W., & Mollenkopf, H. (in press, a). Visual capacity, out-of-home activities and emotional well-being in old age: Basic relations and contextual variation. *Social Indicators Research*.

Visual Capacity, Out-of-Home Activities and Emotional Well-being in Old Age:

Basic Relations and Contextual Variation

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Abstract

This work examined the role of visual capacity in connection with psychological, social network related, and socio-structural predictors of out-of-home everyday functioning and emotional well-being. The results are based on a sample of 1,519 community dwelling elderly (55-98 years; mean age 70.8 years), 757 of them were living in urban, and 762 were living in rural regions, half-and-half from East and West Germany. Structural equation modeling supports the hypothesis of robust relations among age, vision, intellectual functioning, out-of-home everyday functioning, and emotional well-being that are largely independent of the regional and societal macro context. In detail, vision mediated the effect of age on out-of-home activities of daily living (ADL/IADL) and leisure activities, while intellectual functioning mediated the effect of vision on out-of-home leisure activities. All effects on emotional well-being were mediated by out-of-home leisure activities. Enriching the micro level model with psycho-social variables (i.e., outdoor motivation and social resources) and an indication of the socio-economic situation (i.e., financial resources) revealed some contextual variations: At this meso level of analysis, social resources contributed less and outdoor motivation contributed more to out-of-home leisure activities in the urban than in the rural sample. Second, outdoor motivation was significantly related to social resources in the urban, but not in the rural sample. Third, financial resources contributed modestly but significantly to out-of-home leisure activities in the East German, but not in the West German urban and rural samples. It is concluded that visual capacity plays a substantial role in a robust micro level model able to predict everyday functioning and well-being. If additional resources adding to the prediction of these outcomes are also taken into consideration in a meso level analysis model, the whole variable interplay becomes more strongly affected by macro contextual variation.

This work contributes to research on the role of visual capacity and various other resources for major ageing outcomes, primarily out-of-home everyday functioning but also emotional well-being. Out-of-home activities will be focussed because they are fundamental for maintaining an independent lifestyle and, in a sense, also for social participation in societies at large. Out-of-home activities can be also regarded as a prerequisite for quality of life (e.g., Farquhar, 1995). Moreover, out-of-home activities depend highly on a functioning visual system. It is worth mentioning in this context that visual decline is a common condition in the older population. Epidemiological data show that about 20% of those 65 years and older and about 25% of those 75 years and older suffer from severe vision loss (e.g., Lighthouse Research Institute, 1995). An essential question here is to what extent and by which means the risk of losing autonomy in private and public life might be counteracted in the case of declining visual functioning. This challenge presumes however detailed and evidence-based knowledge on the network of resources important to maintain the highest possible autonomy and well-being as people age and suffer from various age-related chronic losses including vision impairment. Seen within a broadly framed perspective such as Sen's approach (e.g., Sen, 1999), the issue of how a person's capabilities or freedom to achieve appreciated states of being and doing (e.g., performing chosen out-of-home activities) might be maintained in the light of a declining capacity becomes central to the paper. More specific, we ask in this research to what extent psychological, social and economic resources are able to contribute to a better understanding of out-of-home activities and emotional well-being and what impact the remaining (or lost) visual functioning has in this complex interplay of resources.

As done in our earlier work (Wahl et al., 2002), we will distinguish between obligatory or basic out-of-home activities such as climbing stairs or doing shopping and more discretionary or optional out-of-home activities such as going to a café. This distinction refers to the concept of Activities of Daily Living (ADL/IADL) that comprises basic (ADL; e.g.,

eating) and more complex (IADL; e.g., preparing a meal) day-to-day activities necessary for maintaining a basic level of autonomy (Lawton & Brody, 1969) as opposed to the concept of leisure and lifestyle activities. A similar distinction has been made in a model of everyday competence by M. Baltes and co-workers (M. Baltes et al., 1993, 1999; Marsiske et al., 1997) by using the terms basic and expanded competencies (BaCo and ExCo). Also, this accords well with Sen's (1999) recommendation to look at capabilities in terms of basic vs. higher-order needs.

Research Background

Empirical research on visual impairment has consistently shown that low vision is significantly related to lowered ADL/IADL functioning and limited mobility (e.g., Horowitz, 1994; Marron & Bailey, 1982; Ramrattan et al., 2001; Rubin et al., 1994; Wahl et al., 1999a, b; for a recent review of this research see also Burmedi et al., 2002, a, b). Furthermore, a number of studies supports the notion that low vision is related to a reduction in leisure activities such as visiting friends or simply going out for a stroll (e.g., Heyl & Wahl, 2001, Ramrattan et al., 2001, Wahl et al. 1999a). In addition, Marsiske et al. (1997) found in one of their analyses that all of the age-related variance in BaCo and ExCo was explained by sensory variables, suggesting that visual and auditory acuity may serve as indicators of general aging phenomena (e.g., Lindenberger & P. Baltes, 1994). Finally, the results of a substantial number of studies show that low vision is significantly related to lowered well-being (e.g., Bazargan et al., 2001; Gillman et al., 1986; Wahl et al., 1999a).

It is important to note that most of this research has focused on the direct relationships between vision, everyday functioning and well-being, that is, the consideration of potentially mediating psychological, psycho-social, and socio-structural variables has mostly been neglected. However, there are at least two exceptions to this rule. First, in accordance with predictions derived from the everyday competence model by M. Baltes et al. (1999), the study by Marsiske et al. (1997) revealed that sensori-motor variables such as vision and balance

were relatively more important for the prediction of BaCo, while psychological variables such as cognitive performance and depression were more critical for the prediction of ExCo.

Moreover, a strong connection between vision and intelligence emerged, as has been found in other studies on sensory and cognitive development (Lindenberger & P. Baltes, 1994).

Second, in the context of a multi-dimensional model considering age, socioeconomic status, sensorimotor and psychological variables, Wahl et al. (2002) found that vision was directly related to out-of-home ADL/IADL, while the relationship between vision and out-of-home leisure activities was mediated by outdoor motivation, a variable newly introduced in this research. Moreover, the connection between vision and well-being turned out to be indirect, mediated by outdoor motivation, motility, and out-of-home activities. The Wahl et al. (2002) study was limited, however, because all participants lived in rural regions. In addition, important variables such as intellectual functioning and social resources were not available in the data set.

To sum up, there are three shortcomings in the existing literature that will be addressed in the present paper: (1) Work on age-related visual impairment has to consider psychological resources such as intellectual functioning that are likely mediators of the relationship between vision and outcomes such as everyday functioning. (2) Work on age-related visual impairment demands enrichment by psychological variables such as outdoor motivation as well as socio-structural variables such as financial resources in order to achieve a more comprehensive perspective on autonomy and well-being. (3) Work on age-related visual impairment has tended to neglect the large-scale socio-environmental context (e.g., urban vs. rural regions) in which important resources of everyday functioning and well-being do operate.

Research Questions, Levels of Analysis, and Hypotheses

Against what has been concluded with respect to the state of art of vision and quality of life literature concerning old age, the present study is driven by two fundamental research

questions: (1) Are there robust basic relations among age, vision, intellectual functioning, out-of-home everyday functioning, and emotional well-being that are mostly independent of large-scale environmental variations? (2) What kind of differentiation comes into play when such basic mechanisms are framed within a broader psycho-socio-economic perspective? Both questions will be investigated by drawing from a comparison of urban vs. rural regions and by including an additional differentiation in terms of two formerly different societies unified since 1990 (East and West Germany).

Corresponding to the three research shortcomings mentioned above, we have chosen three levels of analysis representing different constraints and opportunities: Level I of constraints and opportunities related to everyday functioning and well-being (micro level): At this level vision will be considered only against one additional constraint/opportunity, i.e., intellectual functioning. Level II of constraints and opportunities related to everyday functioning and well-being (meso level): At this level psycho-socio-economic resources (outdoor motivation, social and financial resources) will be additionally considered. Level III of constraints and opportunities related to everyday functioning and well-being (macro level): This level focuses on the role of different regional contexts, i.e., urban vs. rural regions, for everyday functioning and well-being of the elderly. Hence, in all of the analyses at level I and II, we will contrast participants from urban and rural regions because urban and rural regions provide different socio-structural conditions for older adults which may impact on autonomy and well-being (e.g., Golant, 2004, for a recent review). Additionally, a distinction will be made by contrasting participants from East and West Germany. Because of different traditions and living conditions that were operative for decades in East and West Germany and partially still are (Mollenkopf, Ruoppila et al., in press), from a large-scale socio-environmental perspective, constraints and opportunities related to societal affiliation should be also important for everyday functioning and well-being.

The following hypotheses will be investigated by combining research questions and levels of analysis: In our first hypothesis we refer to basic mechanisms at the micro level against the background of the macro level (Levels I and III): (a) Based on the consistent finding of a strong connection between age, vision, and intellectual functioning in the existing literature, basic and similar links are assumed between age, vision, intellectual functioning, out-of-home everyday functioning, and well-being in both regions as well as East and West Germany. (b) In detail, it is expected that vision mediates the effect of age on out-of-home ADL/IADL and leisure activities, that (c) intellectual functioning mediates the effect of vision on out-of-home leisure activities, and that (d) all effects on emotional well-being are mediated by out-of-home leisure activities.

In our second hypothesis we refer to contextual variations at the meso level against the background of the macro level (Levels II and III): (a) Since psychological variables have turned out to be more important for leisure activities than for ADL/IADL (Marsiske et al., 1997; Wahl et al., 2002), it is expected that psycho-socio-economic variables such as outdoor motivation and social and financial resources impact on out-of-home leisure activities, while out-of-home ADL/IADL should depend largely on vision. (b) As in our earlier work (Wahl et al., 2002), it is assumed that financial resources contribute to vision and outdoor motivation. (c) Moreover, it is expected that outdoor motivation is related to social resources. (d) It is also expected that psycho-socio-economic resources impact differently on out-of-home leisure activities in urban vs. rural contexts. (e) It will be explored whether further differentiation by societal affiliation (East vs. West Germany) reveals additional effects. (f) Also, while it is assumed that the most basic relations between age, vision, and intellectual functioning as shown in Figure 1 remain unchanged, it will be explored whether the other connections from the micro level model (particularly the connections between out-of-home ADL/IADL and out-of-home leisure activities and between intellectual functioning and out-of-home leisure

activities) are altered by the inclusion of psycho-socio-economic resources at the meso level of analysis.

Method

Sample

This study is based on the German sub-sample (n=1,519) of the project MOBILATE (Mollenkopf, Marcellini et al., in press) that included a total of 3,950 community dwelling individuals, disproportionately stratified by age (55-74 and 75+ years) and gender, and additionally differentiated according to region (urban and rural) and country (Finland, East Germany, West Germany, Hungary, Italy, and the Netherlands). Older individuals and men were over-sampled in order to achieve comparable data strength in younger and older age groups as well as in men and women. The German sub-samples in the urban areas of Chemnitz (East Germany, n=389) and Mannheim (West Germany, n=368) were drawn from the population registers of the Municipality Registration Offices. Subjects in the rural regions were identified in a random route procedure in villages with less than 5,000 inhabitants. In the East German rural region (district of Jerichow), interviews were conducted in 58 different villages; in the West German rural region (district of Vogelsberg), individuals from 39 different villages were interviewed. Data-collection was conducted by a commercial research institute (USUMA, Berlin) after their interviewers had received an intensive training in data-collection skills provided by the MOBILATE research team. From the contacted eligible individuals (n=2,648), about 57% were actually interviewed. Since collecting data from those refusing to participate is prohibited by the German law, no hard data on selective sampling are available. The main subjectively given reasons for not participating in the study were (a) refusal of the interview, (b) problems in arranging an interview due to time constraints, and (c) problems in reaching the participants. Only about 4.4% of those living in rural regions and about 5.9% of those living in urban regions refused to participate because of health problems. This is a very low rate in surveys of older adults. Therefore, there is some reason to believe

that the sample comprises also individuals with health problems, i.e., it should not be strongly biased towards very healthy respondents. Table 1 provides a detailed sample description in terms of basic demographic variables.

- insert Table 1 about here -

A series of analyses of variance were run, contrasting participants from East German urban, East German rural, West German urban and West German rural regions. Years of education were significantly different between groups. Specifically, participants from urban regions were generally more educated than their counterparts. There were also significant differences in income between participants from urban and rural regions and this applied to East as well as West Germany. The highest income-per-head was reported in the West German urban region and differed significantly from that in the East German urban region. There were no significant differences between the rural regions in East and West Germany. Regarding marital status, the chi-square statistic indicates different frequency distributions among the groups. Most notably, compared to the other regions, in the West German urban region less participants were married, while more participants were widowed.

Measures

Data was collected by employing a comprehensive survey questionnaire consisting of objective screening tools, self-rating scales, standardized measures, and a diary measure to document all trips that were made during two days (Mollenkopf, Ruoppila et al., in press). In the following, only those measures relevant for the present study are described in further detail.

Vision. Two indicators of visual functioning were assessed. Visual acuity was screened by using charts with “Pflüger-Haken” (E-shaped symbols) of various size (Sachsenweger, 1987; see also Reim, 1989) located at a standard distance of 1 m. The subject’s task was to identify the open side of the E-shaped symbol. Both eyes were examined simultaneously under optimal light conditions, using the best correction available. This

measure provides a quick screening of visual acuity ranging from 1.0 indicating normal (20/20) vision to 0.02 (20/1000) or less (functional blindness according to criteria of the German Ophthalmological Society). In our other studies (e.g., Wahl, 2004), this screening was highly correlated with other standard measures of visual acuity such as standardized letter charts used in clinical settings (about $r = .70$). In addition to objective visual acuity, subjective visual functioning was assessed by a self-evaluation rating based on a 5-point Likert-type scale ranging from “excellent” to “very poor”.

Intellectual Functioning. Intellectual functioning was assessed by the Digit-Symbol-Substitution Test (Oswald & Fleischmann, 1995), which is generally regarded as a quite robust measure of speed of information processing. In this test, the subject’s task is to complete a row of numbers with symbols that have been assigned to the respective numbers in an illustrative instruction. Time is constrained to 90 seconds. The test score is the number of correctly entered symbols (maximum 67).

Outdoor Motivation. In our previous study, the motivation to go outside (indicated by the importance of being out-of-home and a self-assessment in terms of being an indoor/outdoor type of person) turned out to be an important predictor of out-of-home leisure activities (Wahl et al., 2002). Importance of being out-of-home was measured by a self-evaluation rating based on an 11-point Likert-type scale ranging from “not important at all” to “very important”. Assessment of indoor/outdoor type was based on the question: “What type of person are you? Are you a person who prefers to be at home or a person who prefers to be on the go?”. Participants had to evaluate themselves on an 11-point Likert-type scale ranging from “If I had my choice, I’d always stay at home” to “If I had my choice, I’d always be on the go”.

Social Resources. Three measures served as indicators of social resources. First, variety of out-of-home social network was assessed by asking about persons who are particularly important for emotional and personal reasons and who do not live in the

respondent's household. After recording the two most important persons separately and in further detail, respondents were shown a list mentioning for example good friend, brother, sister and other possibly important persons and were asked which persons out of this list are important to them. The number of important persons was summed up. Second, face-to-face contact frequency with the two most important persons was assessed separately for each important person. The answer possibilities were 1 = "daily", 2 = "at least once a week", 3 = "once to three times a month" and 4 = "less than once a month". Total face-to-face contact frequency with most important person(s) was aggregated by assigning values from 14 (respondent has two most important persons and daily face-to-face contact with both persons) to 0 (respondent has no important person at all) to all of the possible combinations resulting from the number of most important persons (0, 1 or 2) and face-to-face contact frequency (1-4). Third, in an analogous manner, total telephone contact frequency with most important person(s) was assessed from 0 to 14.

Financial resources. Financial resources were assessed in terms of income-per-head. The respondents were asked to indicate their household net income category. By dividing the centre of this non-metric information by the number of household members, a pseudo-metric scale was generated.

Out-of-home ADL/IADL. Participants were asked to rate their ability to perform 5 ADLs (bending down, climbing stairs, going outdoors, carrying heavy bags or luggage, walking at least 2 km) and 1 IADL (shopping). The answer categories were 0 = "unable to perform", 1 = "able to perform with difficulty", and 2 = "able to perform without difficulty". The internal consistency (Cronbach's alpha) of this scale amounted to .93 in this study. As done in the work of Marsiske et al. (1997) and in our previous work (Wahl et al., 2002), items were ranked by difficulty and were then divided into two odd-even split halves (ADL/IADL 1 and ADL/IADL 2). This was done to obtain two equivalent indicators for the respective latent construct in the structural equation models reported later.

Out-of-home Leisure Activities. Participants were asked whether they take part in any of 18 leisure activities that usually are pursued outside the home (e.g., going to a café, restaurant or bar, dancing, bowling). A “Yes/No” format was used to indicate participation in an activity, resulting in a sum score ranging from 0-18. The internal consistency (Cronbach’s alpha) of this scale amounted to .68 in this study. In order to obtain two equivalent indicators for out-of-home leisure activities at the latent level, items were ranked by difficulty and were then divided into two odd-even split halves (leisure 1 and leisure 2).

Emotional Well-being. Emotional well-being was assessed by the positive affect schedule from the Positive Affect Negative Affect Schedules (PANAS; Watson et al., 1988). The positive affect schedule consists of 10 positive emotion adjectives (e.g., interested, active, inspired). Participants were asked to indicate on a 5-point scale, ranging from 1 = “very often” to 5 = “not at all”, how frequently they had experienced each emotion during the past year. The internal consistency (Cronbach’s alpha) of this scale amounted to .91 in this study. For the structural equation analyses reported later, items were ranked by difficulty. Afterwards, they were divided into two odd-even split halves (positive affect 1 and positive affect 2).

Statistical Analyses

To test our hypotheses, we used structural equation modelling techniques. Model fit was assessed by the following statistics: χ^2 value with its associated degrees of freedom and probability of error, root mean squared error of approximation (RMSEA), Tucker-Lewis index (TLI), and comparative fit index (CFI). However, since χ^2 testing of model fit might be too sensitive (i.e., rejection of models that actually fit well) when the sample size is large (as in our study), fit evaluation was primarily based on RMSEA, TLI, and CFI (Browne & Cudeck, 1993; Hoyle & Panter, 1995). As a general rule, for a model to be evaluated as having a good fit, RMSEA should be $\leq .05$, and TLI and CFI should be at least .95. A strategy of nested model comparisons was applied to choose among differentially restricted models. In

pairwise comparisons the more restricted (i.e., the more parsimonious) model was accepted when the model fit was not substantially reduced. Decisions were not based on the classical χ^2 difference test (e.g., Bollen, 1989), since it is associated with the same problems as the χ^2 testing of model fit (i.e., rejection of restrictions that virtually do not reduce model fit substantially). Rather, we accepted the more restricted model when the differences between the respective TLI, CFI and RMSEA values of the compared models were below .01 and the RMSEA 90% confidence intervals of the models did overlap (Schilling, 2004).

As rather common in empirical research, the income-per-head variable contained a substantial amount of missing data (15.3%), resulting in N=1287 (see again Table 1). Therefore, we used full information maximum likelihood estimation available in the AMOS 4 statistical program package (FIML; Arbuckle, 1996; Arbuckle & Wothke, 1999) which permits observations with partially missing data to remain in the data set.

Results

Regional and Societal Differences at the Descriptive Level

Prior to the actual hypotheses testing, we examined mean level differences between the four subgroups that result from the differentiation by region and societal affiliation in all of the variables that will be used as indicators in the latent variable analyses. Table 2 shows the results of the analyses of variance.

- insert Table 2 about here -

There were no significant differences between the subgroups regarding visual acuity, subjective visual functioning, and out-of-home ADL/IADL. Regarding intellectual functioning, participants from the West German rural region scored significantly lower in the Digit-Symbol-Substitution Test than all of the other subgroups. This result corresponds to the fact that these individuals were also the least educated in terms of years of education (see again Table 1). Outdoor motivation in terms of importance of being out-of-home and indoor/outdoor type was higher in the East than in the West German subgroups and highest

among participants from the East German rural region. Individuals from the West German urban region reported the slightest variety of out-of-home social network, but also the highest telephone contact frequency with most important person(s). Regarding face-to-face contact frequency with most important person(s), the rural subgroups had significantly more face-to-face contact than the urban subgroups. This might indicate that in rural regions visiting or meeting social partners is easier than in urban regions, presumably because of closer living distances. The West German subgroups were significantly more active in terms of out-of-home leisure activities than the East German subgroups, presumably because leisure activities are still more common and/or easier to afford in West Germany. Finally, participants from the East German urban region reported a significantly higher emotional well-being in terms of positive affect than all of the other subgroups, while participants from the West German rural region reported the least positive affect.

Model-testing Results

Measurement Model

The correlation matrices of all observed indicators used in the models are provided in Table 3a and 3b. Generally, coefficients of .10 and above were statistically significant at the .05 level.

- insert Table 3a, 3b about here -

To test measurement model invariance across subgroups, an initial measurement model comprising the constructs of vision, outdoor motivation, social resources, out-of-home ADL/IADL, out-of-home leisure activities, and emotional well-being, and the observed variables age, financial resources, and intellectual functioning was simultaneously estimated for all of the subgroups (East German urban and rural regions, West German urban and rural regions) in a four-group model. This model specified unconstrained correlations among all of the latent constructs, age, financial resources, and intellectual functioning, but the measurement residuals and the unstandardized measurement weights (factor loadings) were

required to be equal across subgroups. As expected, the χ^2 -statistic was significantly above zero ($\chi^2=885.70$, $df=344$, $p<.05$). However, this model fit well in terms of the other fit indices described in the method section (RMSEA=.032, TLI=.984, CFI=.990). When all of the estimated parameters were allowed to vary freely across groups, the model fit changed significantly in terms of χ^2 difference testing ($\chi^2=599.30$, $df=285$, $p<.05$), but not in terms of the other fit indices (RMSEA=.027, TLI=.989, CFI=.994). Moreover, the RMSEA 90% confidence intervals of the models did overlap. Therefore, the more restricted initial measurement model was accepted. This model indicates invariant measurement models across groups. Table 4 provides the standardized factor loadings of the measurement models for all of the subgroups.

- insert Table 4 about here -

Micro Level Analyses as Seen Against the Macro Level

In the next step, micro level models were specified according to the first hypothesis. These models were simultaneously estimated for all of the subgroups (East German urban and rural regions, West German urban and rural regions) in four-group models. In model MICRO 1 all of the estimated parameters were allowed to vary freely across subgroups. Although the χ^2 -statistic was significantly above zero ($\chi^2=348.41$, $df=124$, $p<.05$), the model fit well in terms of RMSEA (.035), TLI (.990), and CFI (.994). To test the assumption of basic and similar links between age, vision, intellectual functioning, out-of-home everyday functioning, and emotional well-being in both regions and societies, in model MICRO 2 all estimated parameters were constrained to equality across subgroups. Model MICRO 2 differed significantly from model MICRO 1 in terms of χ^2 ($\chi^2=633.04$, $df=196$, $p<.05$), but not in terms of the other, more relevant fit indices (RMSEA=.038, TLI=.987, CFI=.989). Moreover, the RMSEA 90% confidence intervals of the models did overlap. Therefore, the more restricted model MICRO 2 was accepted (see Figure 1). This four-group model indicates equal measurement and structural models across subgroups.

- insert Figure 1 about here -

Meso Level Analyses as Seen Against the Macro Level

Meso level models were specified according to our second hypothesis. In the first step, these models were simultaneously estimated for the urban and rural groups in two-group models. In model MESO 1 all of the estimated parameters were allowed to vary freely across groups. This model fit well in terms of RMSEA, TLI, and CFI (see Table 5).

- insert Table 5 about here -

Subsequent models deleted paths on the basis of inspection of path significance. As can be seen in Table 5, the most restricted model MESO 4 did not differ significantly from model MESO 1, neither in terms of χ^2 difference, nor in terms of the other fit indices. Therefore, model MESO 4 was accepted as the final two-group model at the meso level of analysis. Model MESO 4 indicates that there is no significant association between financial resources and outdoor motivation in both groups. Further, it indicates a very modest but significant negative correlation between age and financial resources in the rural but not in the urban group, and a significant link between outdoor motivation and social resources in the urban but not in the rural group. Finally, it shows that social resources contribute relatively less and outdoor motivation contributes relatively more to out-of-home leisure activities in the urban than in the rural sample. Model MESO 4 is illustrated in Figure 2.

- insert Figure 2 about here -

In the second step, four-group models differentiating East German urban and rural and West German urban and rural subgroups were specified according to the second hypothesis. Again, the first model allowed for free variation of the estimated parameters across groups and subsequent models deleted paths on the basis of inspection of path significance. The finally accepted model (shown in Figure 3a, 3b) had a quite good model fit in terms of the crucial fit indices: $\chi^2 = 933.14$, $df = 385$, $p < .05$, $RMSEA = .031$, $TLI = .986$, $CFI = .990$. Compared to the four-group model at the micro level of analysis, the explained variance of

out-of-home leisure activities (i.e., the construct that is directly affected by the inclusion of the psycho-socio-economic variables) increased from .52 to values from .63 up to .81 for the different subgroups. The final four-group model generally confirmed the results from the two-group model, but also revealed some further effects (see Figure 3a, 3b). First, it became apparent that age and financial resources were negatively correlated in the West German rural subgroup, but positively in the East German urban sample, and completely uncorrelated in both of the other groups. These differential relations have been already observed at the bivariate level (see again Table 3a, 3b). Second, differential relations between financial resources and out-of-home leisure activities emerged. While financial resources contributed modestly but significantly to out-of-home leisure activities in the East German subgroups, no significant associations could be observed in the West German subgroups. Third, compared to model MICRO 2 (see again Figure 1), the consideration of the psycho-socio-economic variables brought about a weakening of the connection between out-of-home ADL/IADL and out-of-home leisure activities.

- insert Figure 3a, 3b about here -

Discussion

This work was driven by two fundamental research questions and respective hypotheses referring to basic relations and contextual variation with regard to visual capacity, psychological, social network related, and economical resources, as well as major aging outcomes such as out-of-home everyday functioning and emotional well-being. Data strongly support our first hypothesis in which we expected a robust relation between age, vision, intellectual functioning, out-of-home everyday functioning, and emotional well-being (micro level analysis) that should be largely unaffected by contextual variation at the macro level. Contextual variation was operationalized by taking advantage of the East and West German subsamples in the study, with additional urban and rural subgroups respectively. In detail, vision mediated the effect of age on out-of-home ADL/IADL and leisure activities, while

intellectual functioning mediated the effect of vision on out-of-home leisure activities. All effects on emotional well-being were mediated by out-of-home leisure activities. Most important with regard to this robust dynamic identified in our data is that the effect of chronological age on everyday functioning is completely mediated by vision and cognition. However, it also seems to be the case that vision, our main target variable on the side of resources, does only indirectly relate to out-of-home leisure and well-being, because no direct path was necessary in order to achieve a good model fit. This set of findings replicates – based on a broad age range of a diverse sample of community dwelling elders – what already has been reported in similarly framed earlier work (Marsiske et al., 1997). It extends foregoing research in showing the independence of what we described as a robust correlative pattern of predictors related to out-of-home activities and well-being from external influences at the macro level, although differences between subgroups did exist at the mean level in some of the variables.

However, as expected in our second hypothesis, framing these basic mechanisms within a broader perspective by considering additional variables of potential importance for out-of-home activities and well-being such as outdoor motivation (meso level analysis), social resources, and financial situation revealed substantial variation regarding the interplay of resources according to differences at the macro level. Social resources turned out to contribute less and outdoor motivation turned out to contribute more to out-of-home leisure activities in the urban than in the rural sample. This findings seem to echo classic urban-rural cultural differences, first, in that social resources and social control are expected to be stronger in the rural context, and second, in that the more numerous activity offers for older adults in urban compared to rural settings have to fit subjective needs and motivations (Golant, 2004). However, further qualification is in place: As was also found, outdoor motivation was significantly associated with social resources in the urban, but not in the rural sample. Since we have assessed social resources in terms of out-of-home social network and contact

frequency, this finding might be related to the greater geographical distances to most important persons in the urban regions under investigation (Baas et al., in press; Mollenkopf et al., 2004). That is, in the urban regions one might have to be motivated to go out to maintain social resources, since these resources were generally farther away than in the rural areas. However, since the direction of the path is not meaningful in this cross-sectional analysis, it might also be that in the urban regions social resources enhanced outdoor motivation because social contacts with others living farther away might be an important reason to go out.

Based on the significant association between outdoor motivation and social resources, social resources were also indirectly connected to visual capacity in the urban group. There was no link between vision and social resources in the rural group. That is, a reduced outdoor motivation (that was related to reduced visual capacity) was not connected to social resources in rural regions, but was associated with reduced social resources in urban regions. Social resources, in turn, were less powerful in predicting out-of-home leisure activities in the urban compared to the rural groups, as already mentioned above. Hence, it seems that social resources are most effective in enhancing out-of-home leisure activities in environmental contexts where they are unrelated to visual capacity. Generally, since vision loss leads to impairments in person-environment interaction primarily with respect to the spatial-physical and not the social environment (e.g., Burmedi et al., 2002a,b), the social network might be an important resource especially for visually impaired individuals – provided that this resource is easily accessible in terms of spatial distances (as in rural regions).

However, in this context it is important to note that, since we have analyzed cross-sectional data, caution is advised with respect to causal connections between, for example, outdoor motivation and social resources. On the basis of the present study, it is an open question whether a reduced outdoor motivation reduces social resources or whether reduced social resources reduce outdoor motivation. Though we have decided to model the path from

outdoor motivation to social resources, it has to be pointed out that none of the paths in the model prove causal relations (except for some face validity causal relations, e.g., chronological age might influence vision, but vision would not influence chronological age). In some contrast to the results of our previous work (Wahl et al., 2002), no relationship could be found between our socio-economic indication (i.e., financial situation) and outdoor motivation. However, in our previous work we had employed income-per-head and years of education to assess socioeconomic status (that turned out to be related to outdoor motivation), while this study has focussed only on the income-per-head variable. The major reason for this was to avoid confounding between years of education and the measure of intellectual functioning, a classic in the psychometric intelligence literature (e.g., Schaie, 1996). It could well be that it is rather the educational than the financial component of socioeconomic status that is related to outdoor motivation. But financial resources were not simply unimportant. Specifically important with respect to the outcomes considered in this study, financial resources contributed modestly but significantly to out-of-home leisure activities in the East German, but not in the West German urban and rural samples. That is, while in West Germany out-of-home leisure activities seem to be within everyone's means (since they are independent from financial resources), in East Germany they tend to be left up to those with a relatively higher income.

Going further, the weakened connection between out-of-home ADL/IADL and out-of-home leisure activities in the meso level model compared to the micro level model indicates that impairments in basic out-of-home competencies do not lead to reductions in out-of-home leisure activities to an extent that would be inferred from the micro level model. Rather, psychological (i.e., outdoor motivation), social, and financial resources intervene substantially and reduce the (previously overestimated) effect from out-of-home ADL/IADL on out-of-home leisure activities. However, the other basic relations modeled at the micro level are scarcely affected by inclusion of the meso level variables. Particularly the link between

intellectual functioning and out-of-home leisure activities remains at its medium size, varying between about .20 and about .30 in the different subgroups. This connection appears to be accurately estimated and therefore will be hardly altered by inclusion of other important variables.

Finally, as in our earlier study (see Wahl et al., 2002) out-of-home leisure activities again emerged as a strong predictor of subjective well-being that mediates all of the other potential effects in the model. It should be emphasized here that the present work has focussed on emotional well-being that primarily comprises the affective component of well-being, while the more cognitively framed satisfaction component was not considered (Diener, 1994). Since the present study was planned predominantly against a psychological research background, employing a more psychological (affective) measure of well-being appears to be justified. It remains thus to be seen whether our findings in terms of robust basic relations and contextual variation also apply to a more cognitively oriented well-being measure.

We started this work with the fundamental question how a person's capability or effective freedom to achieve various appreciated states of being and doing (Sen, 1999; e.g., performing chosen out-of-home activities) might be maintained in the light of a declining capacity such as age-related visual decline. Transposing the findings of our study into such a more broadly framed avenue and thus generalizing from the level of detailed and specific relations to societal ageing at large, the results of this study show that vision per se is an important resource for major ageing outcomes such as out-of-home everyday functioning and emotional well-being (micro level of analysis). However, results do also support the notion that the negative effects of lowered vision can be counteracted by effective psycho-socio-economic resources (meso level of analysis). Moreover, they show that the effectiveness of these resources partially depends on the macro context and thus also on societal planning processes and policy consideration and impact. Hence, our distinction between micro, meso, and macro level of analysis turned out to be very useful since it revealed a number of

important differentiations. In different regional and societal contexts different resources are able to enhance the older individual's capability and visual capacity plays a considerable though not decisive role within his/her network of resources.

The major limitation of the current work in theoretical as well as practical terms is that it relies on cross-sectional data. Therefore, drawing conclusions on causal relations on the basis of the estimated models is not justified, although some causal interpretations (e.g., regarding the relationship between vision and out-of-home ADL/IADL) seem to be reasonable. Hence, the frequently given suggestion in the empirical literature to proceed with longitudinal data is clearly also a must in this area of inquiry.

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Table 1: Sample Description

Variable: M (SD)	East Germany		West Germany	
	Urban Region (n=389)	Rural Region (n=379)	Urban Region (n=368)	Rural Region (n=383)
Age	70.5 (9.6)	70.6 (8.4)	71.2 (9.0)	71.0 (8.8)
Years of education	12.5 _A (2.9)	10.7 _B (2.6)	11.6 _C (2.7)	9.9 _D (2.5)
Income-per-head ^a	932.6 _A (253.8)	725.2 _B (216.5)	1006.3 _C (455.9)	769.1 _B (307.2)
Marital Status				
married	64.3%	65.4%	52.7%	60.1%
widowed	27.5%	28.0%	37.0%	35.0%
divorced	3.6%	4.2%	5.2%	2.4%
never married	4.6%	2.4%	5.2%	2.6%

Note.

Different subscripts indicate different means at the .05 level. ^aTotal of N=1287 due to missing values; 100 DM equal approximately \$ 50.

Table 2: Descriptive Results

Variable: M (SD)	East Germany		West Germany	
	Urban region (n=389)	Rural region (n=379)	Urban region (n=368)	Rural region (n=383)
Visual acuity	0.46 (0.27)	0.50 (0.25)	0.46 (0.27)	0.49 (0.23)
Subjective visual functioning	3.6 (0.7)	3.6 (0.8)	3.6 (0.8)	3.5 (0.8)
Intellectual functioning	32.3 _A (14.9)	32.5 _A (14.6)	32.4 _A (15.6)	27.5 _B (12.6)
Importance of being out-of-home	7.2 _A (2.5)	8.0 _B (2.3)	6.6 _C (2.7)	7.3 _A (2.7)
Indoor/Outdoor type	4.9 _{AB} (2.2)	5.3 _A (2.6)	4.6 _{BC} (2.2)	4.1 _C (2.5)
Social network	3.2 _{AB} (2.8)	3.4 _A (2.7)	2.7 _B (2.6)	3.3 _A (2.9)
Contact frequency				
- telephone	5.8 _A (3.9)	5.4 _{AB} (3.8)	6.2 _A (3.9)	4.8 _B (3.7)
- face-to-face	5.8 _A (4.0)	7.1 _B (4.5)	5.8 _A (4.0)	7.5 _B (4.9)
Out-of-home ADL/IADL	9.0 (3.6)	9.4 (3.2)	8.9 (3.6)	8.9 (3.3)
Out-of-home leisure activities	3.8 _{AC} (2.6)	3.5 _C (2.2)	4.3 _{AB} (3.0)	4.7 _B (2.7)

Emotional well-being	3.4 _A	3.1 _B	3.2 _B	2.9 _C
	(0.6)	(0.7)	(0.7)	(0.9)

Note.

Different subscripts indicate different means at the .05 level. Higher scores indicate a higher characteristic value and, in the case of indoor/outdoor type, a stronger tendency to be on the go.

Table 3a: Correlations among indicators for East German urban and rural groups

Indicator	(SD _{eu} /SD _{er})	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	(9.59/8.39)	—	.03	-.35	-.26	-.42	-.01	-.07	-.11	-.12	-.05	-.40	-.45	-.25	-.35	-.23	-.21
2. Income-per-head	(253.8/216.5)	.17	—	.18	.09	.07	.02	.06	.18	.13	.20	.09	.13	.16	.09	.21	.19
3. Visual acuity	(0.27/0.25)	-.53	-.19	—	.40	.24	.23	.17	.10	.06	.09	.40	.43	.36	.42	.26	.27
4. Subjective visual functioning	(0.70/0.84)	-.23	.02	.26	—	.22	.22	.13	.01	.03	.01	.38	.42	.24	.24	.24	.22
5. Intellectual functioning	(14.86/14.59)	-.27	.17	.17	.25	—	.06	-.00	.01	.04	.02	.28	.28	.31	.36	.31	.34
6. Importance of being out-of-home	(2.53/2.25)	-.36	-.06	.41	.19	.18	—	.44	-.11	-.03	-.05	.31	.28	.27	.22	.16	.15
7. Indoor/Outdoor type	(2.23/2.60)	-.25	.02	.09	.13	.15	.31	—	.07	.10	.14	.32	.31	.20	.21	.14	.05
8. Social network	(2.75/2.72)	-.10	.08	.34	.17	.13	.15	.08	—	.50	.51	.08	.13	.20	.18	.16	.12
9. Contact frequency telephone	(3.95/3.85)	-.10	.01	.24	.13	.19	.23	.06	.60	—	.40	.15	.12	.19	.09	.19	.15
10. Contact frequency face-to-face	(4.04/4.47)	.09	.06	.05	.11	.03	.05	.03	.42	.50	—	.04	.03	.06	.06	.10	.06
11. ADL/IADL 1	(1.82/1.58)	-.52	-.06	.36	.35	.26	.43	.18	.08	.18	.01	—	.88	.40	.43	.36	.26
12. ADL/IADL 2	(1.86/1.76)	-.58	-.08	.40	.35	.32	.46	.25	.07	.16	-.03	.91	—	.40	.46	.40	.27
13. Leisure 1	(1.34/1.25)	-.34	.07	.30	.29	.38	.41	.22	.11	.16	.06	.51	.56	—	.51	.45	.41
14. Leisure 2	(1.58/1.28)	-.41	.02	.39	.22	.35	.44	.21	.11	.16	.03	.49	.54	.64	—	.31	.32
15. Positive affect 1	(0.69/0.73)	-.45	.05	.33	.32	.36	.46	.30	.29	.32	.07	.51	.54	.44	.41	—	.76
16. Positive affect 2	(0.64/0.70)	-.40	.07	.29	.31	.37	.42	.29	.25	.30	.12	.48	.51	.45	.44	.82	—

Note.

SD_{eu} = standard deviation for the East German urban group; SD_{er} = standard deviation for the East German rural group; values for the East German urban group are below the diagonal; values for the East German rural group are above the diagonal.

Table 3b: Correlations among indicators for West German urban and rural groups

Indicator	(SD _{wu} /SD _{wr})	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	(9.03/8.85)	—	-.15	-.39	-.32	-.34	-.13	-.22	-.10	-.07	.03	-.45	-.47	-.23	-.41	-.30	-.27
2. Income-per-head	(455.9/307.2)	-.03	—	.16	.26	.24	.21	.10	-.03	.08	-.08	.14	.12	.07	.27	.04	.03
3. Visual acuity	(0.27/0.23)	-.37	.22	—	.53	.11	.18	.23	.01	.18	-.02	.49	.43	.23	.32	.18	.11
4. Subjective visual functioning	(0.79/0.85)	-.27	.12	.34	—	.38	.22	.28	.11	.16	.02	.56	.53	.36	.41	.39	.37
5. Intellectual functioning	(15.64/12.62)	-.38	-.07	.14	.20	—	.20	.15	-.03	-.02	-.14	.35	.40	.23	.39	.35	.35
6. Importance of being out	(2.72/2.68)	-.29	.16	.35	.25	.26	—	.27	-.01	.11	.11	.29	.31	.13	.31	.11	.17
7. Indoor/Outdoor type	(2.18/2.46)	-.26	-.01	.14	.12	.17	.51	—	.00	.07	.05	.32	.31	.15	.24	.26	.24
8. Social network	(2.57/2.87)	-.07	-.05	.10	.11	.12	.22	.12	—	.49	.63	.02	.07	.31	.15	.37	.30
9. Contact frequency telephone	(3.88/3.75)	-.02	.12	.09	-.03	.02	.10	.06	.52	—	.47	.12	.11	.23	.17	.25	.23
10. Contact frequency face-to-face	(3.98/4.92)	.07	-.08	-.02	.02	.04	.09	.05	.50	.59	—	.01	.03	.17	.05	.22	.19
11. ADL/IADL 1	(1.80/1.69)	-.48	.13	.38	.39	.35	.50	.40	.09	-.00	-.08	—	.88	.34	.47	.33	.28
12. ADL/IADL 2	(1.86/1.72)	-.48	.11	.39	.40	.33	.47	.40	.08	-.01	-.07	.91	—	.38	.48	.39	.35
13. Leisure 1	(1.56/1.62)	-.26	.07	.21	.23	.31	.41	.28	.26	.16	.17	.43	.40	—	.49	.52	.47
14. Leisure 2	(1.70/1.50)	-.37	.12	.30	.28	.38	.51	.40	.27	.16	.10	.50	.46	.65	—	.43	.40
15. Positive affect 1	(0.76/0.88)	-.27	.16	.32	.33	.32	.50	.36	.27	.19	.13	.53	.47	.45	.57	—	.89
16. Positive affect 2	(0.74/0.91)	-.24	.10	.28	.26	.28	.41	.36	.24	.15	.11	.45	.42	.38	.50	.84	—

Note.

SD_{wu} = standard deviation for the West German urban group; SD_{wr} = standard deviation for the West German rural group; values for the West

German urban group are below the diagonal; values for the West German rural group are above the diagonal.

Table 4: Standardized factor loadings of the measurement models for all subgroups

	East Germany		West Germany	
	Urban (n=38 9)	Rural (n=37 9)	Urban (n=36 8)	Rural (n=38 3)
Vision → Visual acuity	.45	.58	.56	.62
Vision → Subjective visual functioning	.48	.61	.59	.65
Outdoor motivation → Importance of being out	.72	.71	.78	.75
Outdoor motivation → Indoor/Outdoor type	.48	.47	.55	.52
Social resources → Social network	.78	.78	.77	.81
Social resources → Contact freq. telephone	.68	.67	.66	.71
Social resources → Contact freq. face-to-face	.67	.66	.65	.70
ADL/IADL_OUT → ADL/IADL 1	.94	.93	.94	.93
ADL/IADL_OUT → ADL/IADL 2	.97	.96	.97	.96
LA_OUT → Leisure 1	.73	.63	.78	.73
LA_OUT → Leisure 2	.80	.70	.83	.80
Emotional well-being → Positive affect 1	.89	.89	.90	.93
Emotional well-being → Positive affect 2	.79	.80	.81	.86

Table 5: Fit indices for the two-group models at the meso level of analysis

Model	χ^2	df	TLI	CFI	RMSEA
MESO 1: Hypothesized structural model	608.08*	186	.989	.992	.039
MESO 2: Drop correlation between age and income in the urban group	609.39*	187	.989	.992	.039
MESO 3: Drop path from income to outdoor motivation in both groups	610.03*	189	.989	.992	.038
MESO 4: Drop path from outdoor motivation to social resources in the rural group	613.80*	190	.989	.992	.038

Note.

* $p < .05$; df = degrees of freedom; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root mean squared error of approximation. The hypothesized structural model is described in the text. The models do not differ from each other in terms of χ^2 -difference test.

Figures

Figure 1:

Empirical four-group model at the micro level of analysis (model MICRO 2) for East and West German urban and rural subgroups (restricted to absolute identity across subgroups)

Figure 2:

Empirical two-group model at the meso level of analysis (model MESO 4) for urban and rural groups

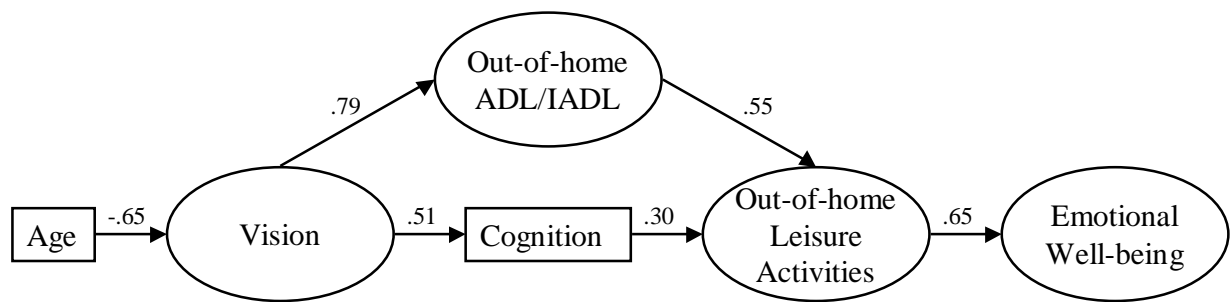
Figure 3a:

Empirical four-group model at the meso level of analysis part 1 (for East German urban and rural subgroups)

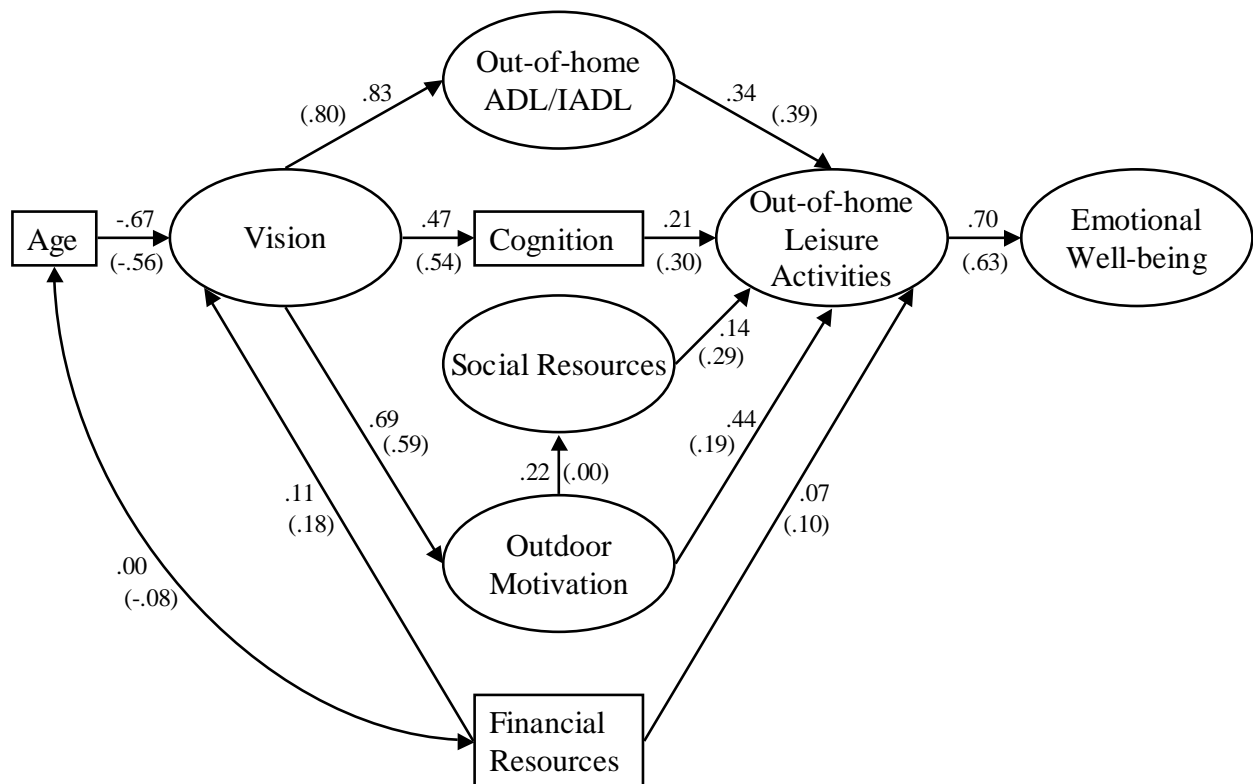
Figure 3b:

Empirical four-group model at the meso level of analysis part 2 (for West German urban and rural subgroups)

(Figure 1)

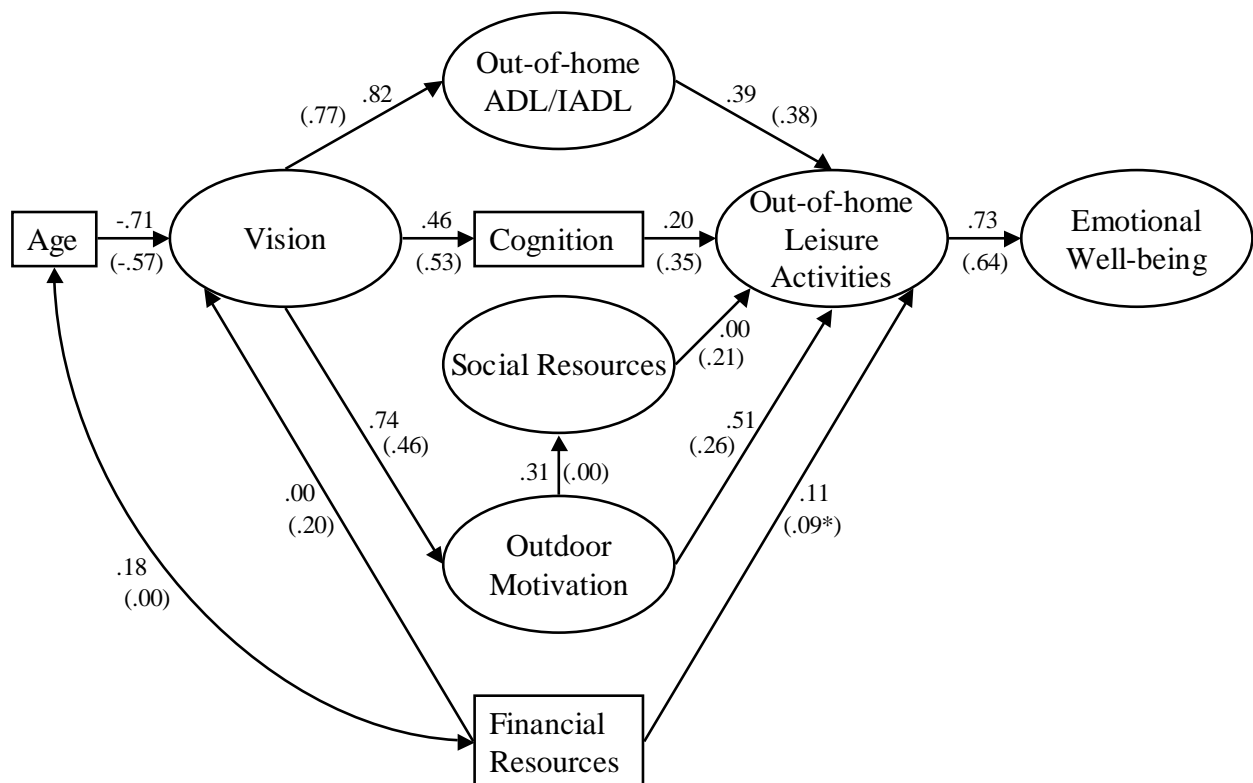


(Figure 2)



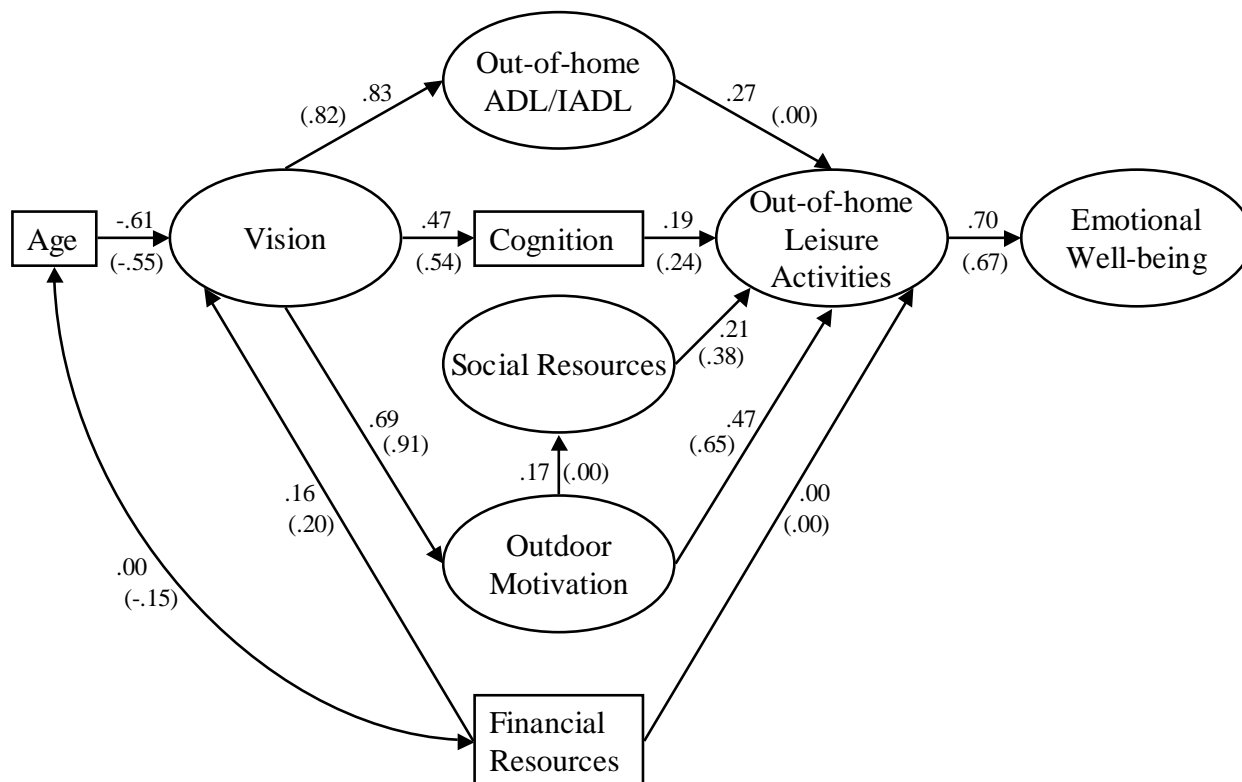
Note. Numbers in brackets refer to the rural group. For all paths and correlations that are greater zero $p < .05$.

(Figure 3a)



Note. Numbers in brackets refer to the East German rural subgroup. $*p < .10$; for all other paths and correlations that are greater zero $p < .05$.

(Figure 3b)



Note. Numbers in brackets refer to the West German rural subgroup. For all paths and correlations that are greater zero $p < .05$.

Paper 4

Heyl, V., Wahl, H.-W., & Mollenkopf, H. (in press, b). Vision, out-of-home activities and emotional well-being in old age: Do macro-contexts make a difference? *International Congress Series*.

Vision, Out-of-home Activities, and Emotional Well-being in Old Age: Do Macro-Contexts Make a Difference?

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Abstract.

Purpose: This study examined the role of vision in connection with psychological, social network related, and socio-structural predictors of out-of-home everyday functioning and emotional well-being.

Method: The sample consisted of 1,519 community dwelling elderly (55-98 years) from Germany, and comparative samples from Finland (n=610) and Italy (n=600). Half of the participants resided in urban areas, while the other half resided in rural regions.

Results: Structural equation modeling supports the hypothesis of robust relations among age, vision, intellectual functioning, out-of-home everyday functioning, and emotional well-being that are comparable across countries. In detail, vision mediated the effect of age on out-of-home activities of daily living, while intellectual functioning mediated the effect of vision on out-of-home leisure activities. All effects on emotional well-being were mediated by out-of-home leisure activities. Enriching this basic model with additional variables (i.e., outdoor motivation, social and financial resources) revealed some contextual variations in Germany: First, social resources contributed more to out-of-home leisure activities in the rural than in the urban samples. Second, outdoor motivation was significantly related to social resources in the urban, but not in the rural samples. Third, financial resources contributed modestly but significantly to out-of-home leisure activities in East Germany, but not in West Germany.

Conclusion: It is concluded that in different macro contexts different contextual resources are able to enhance everyday functioning of older individuals and that vision plays an important though not all-dominant role within this network of resources.

Keywords: visual functioning; out-of-home activity; subjective well-being; aging

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1. Research Background and Research Questions

In this work we have examined the role of vision in the context of psychological, social network related and economic predictors of everyday competence and well-being of older adults. The focus was on out-of-home activities, because they are fundamental for maintaining an independent lifestyle and well-being and because they highly depend on a functioning visual system.

As done in our earlier work [1], we have distinguished between obligatory or basic out-of-home activities such as climbing stairs or doing shopping and more discretionary or optional out-of-home activities such as going to a café. This distinction refers to the concept of Activities of Daily Living (ADL/IADL) [2] as opposed to the concept of leisure activities. A similar distinction has been made by Margret Baltes and co-workers [3, 4] by using the terms basic and expanded competencies.

We know from the existing literature that vision is strongly connected to behavioural competencies such as ADL/IADL functioning and mobility [5, 6, 7] as well as to emotional adaptation [8, 7, 9, 10]. Further, we know that some of these links are mediated by variables such as cognitive functioning [4] or motivation [1]. However, analyses that consider the effects of vision in the context of potentially mediating variables are rare. Moreover, there is a general tendency in the existing research to neglect the large-scale or macro environmental context (e.g., different countries, urban vs. rural regions), though it has been repeatedly pointed to its likely importance. Therefore, it was the aim of this study to consider and extend existing knowledge about vision and mediating variables as well as to consider the large-scale environmental context in which important predictors of everyday functioning and well-being do operate. In detail, this research was driven by two fundamental questions:

1. Are there basic relations between age, vision, cognitive functioning, out-of-home everyday functioning, and emotional well-being that are comparable across different countries (i.e., East and West Germany, Finland, Italy)?
2. What kind of differentiation does emerge when these basic relations are framed within a more comprehensive model considering additional predictors that is applied to different (i.e., urban and rural) environments within Germany?

2. Method

This study is based on samples of community dwelling elderly aged 55 to 98 years from East Germany (n = 768), West Germany (n = 751), Finland (n = 610) and Italy (n = 600) that participated in the project MOBILATE [11]. Half of the participants resided in urban areas, while the other half resided in rural regions. Older individuals and men were oversampled in order to achieve comparable data strength in younger and older age groups as well as in men and women.

Data was collected by employing a comprehensive survey questionnaire consisting of objective screening tools, self-rating scales, standardized measures, and a diary measure to document all trips that were made during two days [12]. The measures relevant to the present study and the constructs they indicate are listed in Table 1.

Table 1
Measures used in the present study.

Construct	Measure
Vision	Visual Acuity Screening [13] Subjective visual functioning (1-item measure)
Intellectual functioning	Digit-Symbol-Substitution Test [14]
Outdoor motivation	Importance of being out-of-home (1-item measure) Indoor/outdoor type (1-item measure)
Social resources	Out-of-home social network Face-to-face contact frequency with the two most important persons Telephone contact frequency with the two most important persons
Financial resources	Income-per-head
Out-of-home ADL/IADL	Ability to perform 5 ADL (e.g., climbing stairs) and 1 IADL (shopping)
Out-of-home leisure activities	Participation in 18 out-of-home leisure activities (e.g., going to a café)
Emotional well-being	Positive affect schedule from the PANAS [15]

3. Results and Discussion

The results support the assumption of basic relations that are comparable across countries (see Fig. 1). In detail, vision mediated the effect of age on out-of-home everyday functioning, while cognition mediated the effect of vision on out-of-home leisure activities. All effects on emotional well-being were mediated by out-of-home leisure activities. This set of findings replicates results from similarly framed earlier work [4]. It extends foregoing research in showing that these results are independent from external influences at the macro level.

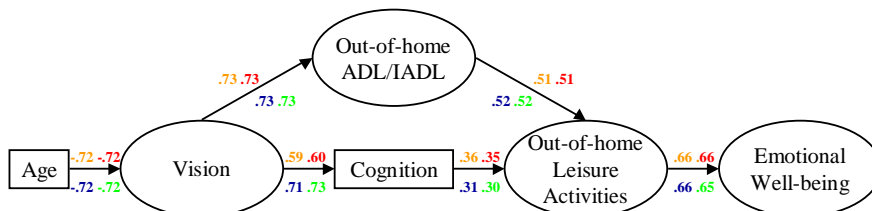


Fig. 1. Basic model for East Germany, West Germany, Finland, and Italy.
Note. For all standardized paths coefficients $p < .05$. Model fit statistics: $\chi^2 = 697.20$; $df = 157$; $p < .05$; RMSEA = .036; TLI = .989; CFI = .993.

As expected, framing the basic relations within a more comprehensive model revealed some macro contextual differences between East and West German urban and rural subgroups (see Fig. 2): First, social resources turned out to contribute more to out-of-home leisure activities in the rural than in the urban samples. This is in accordance with urban-rural cultural differences in that social resources and social control are expected to be stronger in the rural context [16].

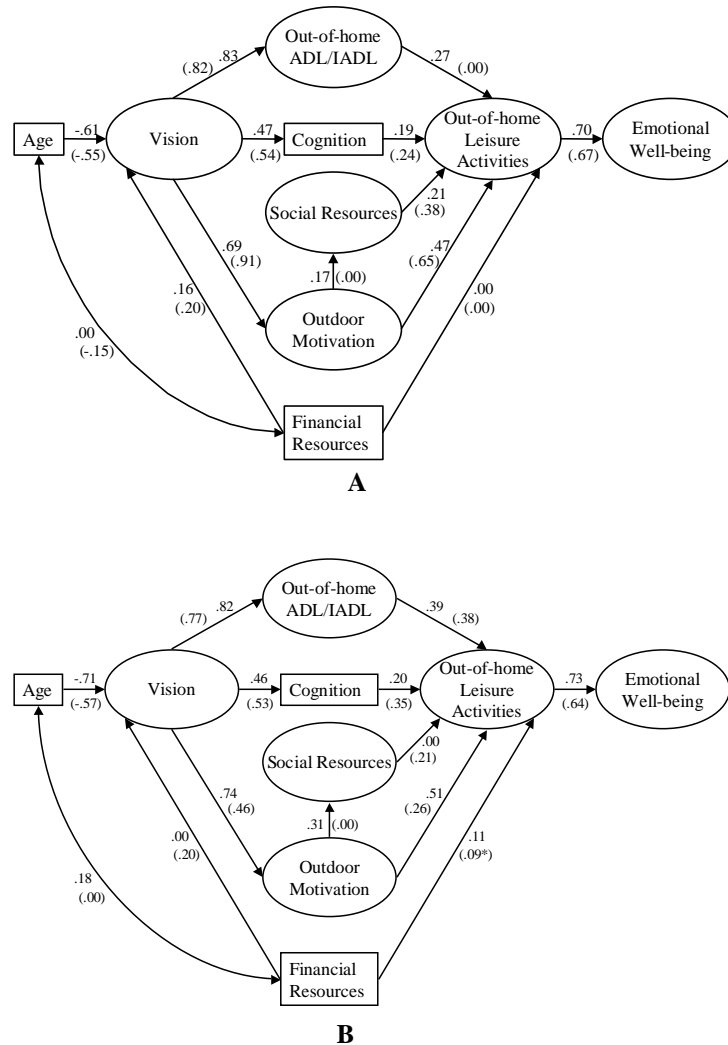


Fig. 2. Comprehensive model for West Germany (A) and East Germany (B) urban and rural subgroups. Note: Numbers in brackets refer to the rural subgroups. For all standardized paths coefficients and correlations that are greater than zero $p < .05$. Model fit statistics: $\chi^2 = 933.14$; $df = 385$; $p < .05$; RMSEA = .031; TLI = .986; CFI = .990.

Second, outdoor motivation was significantly related to social resources in the urban, but not in the rural samples. Since we have assessed social resources in terms of out-of-home social network, this finding might be related to the greater geographical distances to most important persons in the urban regions under investigation [17]. That is, in urban regions one might have to be motivated to go out to maintain social resources, since these resources are generally farther away than in rural areas. However, since the direction of the path is not meaningful in this cross-sectional analysis, it might also be

that in the urban regions social resources enhanced outdoor motivation because social contacts with others living farther away might be an important reason to go out.

Third, financial resources contributed modestly but significantly to out-of-home leisure activities in East Germany, but not in West Germany. That is, while in West Germany out-of-home leisure activities seem to be within everyone's means (since they are independent from financial resources), in East Germany they tend to be left up to those with a relatively higher income.

Last but not least, it seems that social resources are most effective in enhancing out-of-home leisure activities in environmental contexts where they are unrelated to visual capacity. As can be seen in Figure 2, there was no link between social resources and vision in the rural samples where social resources contributed more to out-of-home leisure activities than in the urban samples where social resources were indirectly related to vision via outdoor motivation. That is, the effectiveness of resources such as social networks partially depends on the macro context.

To sum up, the results of this study show that vision per se is an important resource for major ageing outcomes such as out-of-home everyday functioning and emotional well-being. However, the results do also support the notion that the negative effects of lowered vision can be counteracted by effective psycho-socio-economic resources. Moreover, they show that the effectiveness of these resources partially depends on the macro context and thus also on societal planning processes and policy consideration and impact. It is concluded that in different macro contexts different resources are able to enhance everyday functioning of older individuals and visual capacity plays a considerable though not all-dominant role within this network of resources.

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Paper 5

Heyl, V., Wahl, H.-W., & Mollenkopf, H. (submitted). Affect regulation by tenacious goal pursuit and flexible goal adjustment under developmental constraints: The case of normal age-related visual decline. Submitted to *Psychology and Aging*.

Affect Regulation by Tenacious Goal Pursuit and Flexible Goal Adjustment
Under Developmental Constraints: The Case of Normal Age-Related Visual Decline

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Abstract

This study investigated the relationships between Tenacious Goal Pursuit (TGP) and Flexible Goal Adjustment (FGA), two fundamental modes of self-regulation suggested by Brandstädter and colleagues, and positive and negative affect (PA, NA). This was done in general terms and by considering the developmental constraint of normal age-related visual decline. Data stem from 751 community-dwelling elders (55-98 years, 372 women, 379 men). Results support the hypothesis of affect-specific associations of TGP and FGA. Dysfunctional side effects of TGP and FGA in case of over- and underestimation of one's objective vision were observed in terms of PA. The simultaneous consideration of both TGP and FGA revealed synergistic effects with respect to PA, while hints for a regulatory dilemma were found regarding NA.

Since its inception by Brandtstädter and Renner (1990), the dual-process model of self-regulation has gained wide acknowledgement in the international aging literature as a means to better understand adaptation processes as people age (e.g., Abraham & Hansson, 1996; Boerner, 2004; Hooker & McAdams, 2003; Poulin, Haase, & Heckhausen, 2005; Schmitz, Saile, & Nilges, 1996). Regarding the basic architecture of the model until its more recent treatment by Brandtstädter and colleagues (e.g., Brandtstädter & Rothermund, 2002, 2003), two fundamental modes of dealing with perceived or anticipated discrepancies between actual and desired situations or developmental outcomes are distinguished: The assimilative mode refers to strategies of adjusting situations to personal goals, while the accommodative mode refers to mechanisms of adjusting personal goals to situational constraints and changes in action resources (Brandtstädter & Renner, 1990; Brandtstädter & Greve, 1994). In the assimilative mode, the individual actively tries to achieve a goal (e.g., by intentionally modifying life circumstances or one's own behavior), whereas in the accommodative mode, the individual withdraws from goals that resist goal-directed activities (e.g., by downgrading blocked goals, finding benefit in adversity, and channeling of resources toward alternative, feasible goals). Assimilative efforts appear adaptive as long as there is a realistic chance of attaining a goal. To the same degree, accommodative processes generally appear maladaptive, since they tend to inhibit instrumental, active problem-solving efforts. When goal pursuit exceeds resources or aversive circumstances seem irreversible, however, switching from assimilative to accommodative modes helps to overcome feelings of helplessness and depression and to regain a global sense of control and efficacy. In terms of measurement, Brandtstädter and Renner (1990) have designed the Tenacious Goal Pursuit (TGP) scale and the Flexible Goal Adjustment (FGA) scale in order to assess dispositional differences in assimilative tenacity and accommodative flexibility.

Most relevant for addressing the dynamic between TGP and FGA, the process of aging involves changes in many domains of life and functioning, and the balance of developmental

gains and losses tends to be less positive compared to earlier stages of life (Heckhausen, Dixon, & Baltes, 1989). Due to role losses, physical impairments, and concomitant functional declines, it is a rather common challenge of growing older that personally important goals deserve adjustment or have to be completely abandoned for the sake of others. Therefore, accommodative processes should gain particular importance in later life (e.g., Brandtstädter, Wentura & Greve, 1993). In line with these theoretical expectations, several studies have found positive relationships between age and FGA as well as negative relationships between age and TGP (e.g., Brandtstädter & Renner, 1990; Brandtstädter, Wentura, & Greve, 1993; Brandtstädter & Greve, 1994). Moreover, both measures were positively related to indicators of subjective well-being, such as general life satisfaction, and negatively related to depression.

Previous research, however, so far has not provided any in-depth treatment of the question of how assimilative tenacity and accommodative flexibility exert their effects on affective well-being (AWB). As Myers and Diener (1995) have argued, “positive well-being is not just the absence of negative emotions”, rather, AWB includes both the “presence of positive affect” and the “absence of negative affect” (p.11). Thus, the key research question of the present work is whether processes pertaining to assimilative persistence and accommodative flexibility, respectively, are able to enhance AWB by promoting the presence of PA and preventing from NA.

Our main argument is that, due to their different foci, assimilative tenacity and accommodative flexibility affect AWB in different ways. By definition, assimilative tenacity focuses on pursuing goals and modifying the environment, while accommodative flexibility focuses on adjusting goals and modifying oneself. According to the dual-channel hypothesis (e.g., Lawton, Winter, Kleban, & Ruckdeschel, 1999), engagement with the environment is apt to enhance PA but not to influence NA, while intrapersonal conditions are apt to contribute to NA but not to influence PA. Moreover, it seems reasonable to conceive

assimilative processes primarily as approach strategies (approaching desired outcomes), and accommodative processes primarily as withdrawal strategies (withdrawal from desired outcomes that have turned out to be unattainable). From a motivational perspective, approach behaviors are mediated by the behavioral activation system (e.g., Fowles, 1987; also other terms are used, see Watson, Wiese, Vaidya, & Tellegen, 1999), while withdrawal or avoidance behaviors are mediated by the behavioral inhibition system (e.g., Fowles, 1987). There is accumulating evidence that the approach system is related to PA, while the withdrawal system is related to NA (for an overview see Watson et al., 1999). According to Regulatory Focus Theory (Higgins, 1997, 1998), approach strategies aim at realizing positive outcomes (i.e., promotion focus), while avoidance strategies aim at preventing negative outcomes (i.e., prevention focus). This suggests that assimilative approach processes nurture AWB primarily by promoting PA, and accommodative withdrawal processes nurture AWB primarily by preventing from NA. Accordingly, in our first hypothesis we assume that TGP should be positively related to PA, while FGA should be negatively related to NA. However, we are not maintaining that this is an all or nothing matter. Since FGA also comprises approach-related components, e.g., the channeling of resources to feasible goals that constitute the basis for further assimilative efforts, FGA might be able to promote PA. Thus, a noteworthy correlation between FGA and PA might be observed as well (cf. Tesch-Römer, 2005), but it should be significantly lower than the one between TGP and PA proposed in hypothesis 1.

To further investigate the potential NA preventing effect of accommodative flexibility and PA enhancing effect of assimilative tenacity, we consider in this work a rather common stressor in later life, i.e., age-related visual decline. Epidemiological data show that about 20% of those 65 years and older and about 25% of those 75 years and older suffer from severe vision loss (e.g., Lighthouse Research Institute, 1995). A comprehensive review of over 300 studies on the psychosocial impact of age-related vision impairment was able to identify a

substantial number of studies reporting a heightened depression rate and lowered well-being among visually impaired elders (Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002). The main explanation for this finding is that visual impairment undermines goals in life that are substantial for late-life development (such as keeping one's autonomy in activities of daily living) and therefore poses a major threat to the aging self (Wahl & Oswald, 2000). However, the development-constraining potential is not restricted to severe vision loss. For example, in two recent studies vision played a considerable role in the prediction of out-of-home everyday functioning, emotional well-being, and life satisfaction among normally aging adults, even after controlling for cognitive functioning, social, and financial resources (Heyl, Wahl, & Mollenkopf, in press; Wahl, Heyl, & Schilling, 2002). Likewise, in a large sample of community-dwelling elders, increasing levels of subjective vision impairment significantly increased the risk of experiencing physical disability and loneliness (Wallhagen, Strawbridge, Shema, Kurata, & Kaplan, 2001). Thus, also normal age-related visual decline is able to negatively impact on major aging outcomes and can be seen as a rather frequent development constraining chronic loss situation in old age.

Going further, vision loss also provides an interesting paradigm to consider the importance of objective and subjective functioning. This is informed on the more general level by the now classic finding of the well-being and depression literature that perceiving one's functioning somewhat more positively than it actually is nurtures adaptivity and the maintenance of mental health (Colvin & Block, 1994; Taylor & Brown, 1988). Moreover, there is evidence that subjective domain evaluations (such as subjective health, subjective vision, satisfaction with finances) have direct effects on subjective well-being, while effects of objective life conditions (such as objective health, objective vision, financial situation) are only indirect (Smith, Fleeson, Geiselman, Settersten, & Kunzmann, 1999). Vision-related research has also shown that it is the subjective evaluation, rather than the objective severity, that is crucial for well-being and a risk factor for depression (e.g., Horowitz, Reinhardt, &

Kennedy, 2005; Rovner & Casten, 2002; Wahl, 1997). Thus, we assume that the study of TGP and FGA is particularly promising when subjective vision impairment in relation to objective vision impairment is taken into account.

It is also important to note that flexibility, and to a lesser extent tenacity, if considered separately, have been found to mitigate the negative effects of stressors such as perceived distance from developmental goals, physical impairments, or chronic pain (e.g., Brandtstädter & Renner, 1990; Schmitz, Saile, & Nilges, 1996; Brandtstädter, 1999; Bak & Brandtstädter, 1998). Translating these findings to the situation of vision loss and AWB, we assume in the first part of our second hypothesis that an increase in NA due to subjective vision impairment is less pronounced in individuals scoring high in FGA. Flexible individuals are ready to parry the confrontation with goals that are perceived as being blocked by visual impairment, i.e., they are ready to withdraw from these goals and seek alternative, more promising ones, thereby avoiding NA coming from experiences of failure or from bemoaning the loss of goals. When goals are subjectively perceived as, but actually are not blocked by objective visual impairment (i.e., when one's capacity to reach given goals is underestimated), individuals should not profit any longer from being high in FGA, coined as a dysfunctional side effect of accommodative processes (Brandtstädter & Rothermund, 2002, p. 128). Thus, in the second part of hypothesis 2 we assume that the moderating effect of FGA with respect to the relation between NA and subjective vision is further qualified by the consideration of objective vision impairment.

Regarding PA and its postulated enhancement by TGP (cf. hypothesis 1), we assume that the reduction of PA due to subjective vision impairment should be less pronounced in individuals scoring high in TGP, i.e., in individuals who tend to keep on pursuing their goals even in the face of difficulties, thereby maximizing their opportunities for positive experiences as far as possible. Thus, in the first part of our third hypothesis we expect assimilative tenacity to moderate, i.e., to attenuate, the assumed negative relationship between

subjective vision impairment and PA. Things might be different again, when objective vision impairment is additionally taken into account. When objective vision impairment undermines important goals such as maintaining out-of-home activities significantly, individuals overestimating their subjective visual functioning and scoring high in TGP should have more problems to let these goals go and to discover new sources of PA (dysfunctional side effect of assimilative processes; cf. Brandtstädter & Rothermund, 2002, p. 128). Thus, in the second part of hypothesis 3 we assume that assimilative tenacity should be less advantageous, if not disadvantageous, for individuals with a high level of objective and a low level of subjective vision impairment, i.e., that the moderating effect of TGP as postulated in the first part of hypothesis 3 is further qualified by objective vision impairment.

The preceding considerations were limited, however, because assimilative tenacity and accommodative flexibility were considered only in a separate manner. Thus, what might be expected regarding the relations between PA and NA, respectively, and vision when both dispositions, i.e., TGP and FGA, are simultaneously taken into account? The literature points to a possible regulatory dilemma between TGP and FGA in situations in which both adaptive tendencies are no longer inhibited by each other, but activated simultaneously (Bak & Brandtstädter, 1998; Brandtstädter & Rothermund, 2002). Such simultaneous activations, bringing about a conflict between holding on and letting go, should occur most likely, when assimilative efforts to attain a personally very important goal approach the limits of available action resources and, most notably, when both dispositions are strongly pronounced. As a consequence we assume in our fourth hypothesis that the postulated moderating effect of FGA on the relationship between NA and subjective vision impairment (cf. first part of hypothesis 2) is weaker in individuals high in TGP compared to individuals low in TGP. In other words, it is assumed that NA due to subjective vision loss is best counteracted by FGA when TGP is low, because a regulatory dilemma causing additional stress and NA appears less likely in individuals with a low disposition to pursue their goals tenaciously.

Regarding PA, things might be different again. Research indicates strong environmental effects for PA (Baker, Cesa, Gatz, & Mellins, 1992), suggesting that PA is not simply at hand at differential levels, but emerges from situations that may be actively approached. We assume that individuals scoring high in TGP and FGA are generally best prepared to maximize their possibilities to experience PA: While TGP should enhance PA directly (cf. hypothesis 1), besides its postulated NA-preventing effect, FGA is supposed to establish new, feasible domains for assimilative activities (that will enhance PA in turn). Accordingly, we assume in our fifth hypothesis that the postulated moderating effect of TGP on the relationship between PA and subjective vision impairment (cf. first part of hypothesis 3) is stronger in individuals high in FGA compared to individuals low in FGA. Taken as a whole, we assume that the conflicting aspects of TGP and FGA are reflected in their combined effects on NA, while their mutually assistive or synergistic aspects should be reflected in their combined effects on PA.

Method

Sample

Data stem from 751 community-dwelling German older adults (55-98 years; mean age 71 years) and were collected as part of a larger European study (MOBILATE; Mollenkopf, Marcellini et al., in press). The original purpose of the study was an interdisciplinary analysis of out-of-home mobility of older adults and contained a wide range of psychological measures also relevant to the present paper. The sample was disproportionately stratified by age (55-74 and 75+ years) and gender, and additionally differentiated according to urban and rural region. Older individuals and men were over-sampled in order to achieve comparable data strength in younger and older age groups as well as in men and women. The urban subjects were drawn from the population registers of the Municipality Registration Office in Mannheim. Subjects from the rural region were identified in a random route procedure in villages with less than 5,000 inhabitants. Individuals from 39 different villages in the district

of Vogelsberg were interviewed. Data-collection was conducted by a commercial research institute (USUMA, Berlin) after their interviewers had received an intensive training in data-collection skills provided by the MOBILATE research team.

From the contacted eligible individuals, about 57% were actually interviewed. Since collecting data from those refusing to participate is prohibited by German law, no hard data on selective sampling are available. The main subjectively given reasons for not participating in the study were (a) refusal of the interview, (b) problems in arranging an interview due to time constraints, and (c) problems in reaching the participants. Only about 4.4% of those living in rural regions and about 5.9% of those living in urban regions refused to participate because of health problems. Therefore, there are some reasons to assume that the sample is comprised of individuals with health problems, and it can not be expected to be strongly biased towards very healthy respondents.

Measures

Self-Regulation Variables. The Tenacious Goal Pursuit (TGP) and Flexible Goal Adjustment (FGA) scales were used to assess dispositional differences in assimilative and accommodative tendencies (Brandtstädter & Renner, 1990). Both scales consist of 15 direct- and reversed-keyed items (e.g., “Even when things seem hopeless, I keep on fighting to reach my goals” for assimilative tenacity and “I adapt quite easily to changes in plans or circumstances” for accommodative flexibility). Items are rated on a 5-point Likert-type scale ranging from “strongly disagree” to “strongly agree”. Scores showed satisfactory internal consistency. Alpha coefficients were .80 for the TGP scale and .73 for the FGA scale.

Affective Well-Being. AWB was assessed by a German translation of the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988; see also Kunzmann, Little, & Smith, 2000). The PANAS consists of 10 high-activation positive (e.g., interested, active, inspired) and 10 high-activation negative (e.g., hostile, distressed, afraid) emotion adjectives. Participants were asked to indicate on a 5-point scale, ranging from “very often” to

“not at all”, how frequently they had experienced each emotion during the last year. The internal consistency (Cronbach’s alpha) of the PANAS amounted to .92 for PA and .87 for NA in this study.

Subjective Vision. Subjective visual functioning was assessed by a 1-item self-evaluation rating based on a 5-point Likert-type scale ranging from “excellent” to “very poor”. Although one-item measures have their limitations, they have been successfully used in the literature dealing with the role of chronic functional loss and its impact on well-being (Smith et al., 1999).

Objective Vision. Visual acuity was screened by using charts with “Pflüger-Haken” (E-shaped symbols) of various size (Sachsenweger, 1987; see also Reim, 1989) located at a standard distance of 1 m. The subject’s task was to identify the open side of the E-shaped symbol. Both eyes were examined simultaneously under optimal light conditions using the best correction available. This measure provides a quick screening of visual acuity ranging from 1.0 indicating normal (20/20) vision to 0.02 (20/1000) or less (functional blindness according to criteria of the German Ophthalmological Society). In earlier studies (e.g., Wahl, 2004), this screening was highly correlated with other standard measures of visual acuity such as standardized letter charts used in clinical settings ($r = .70$).

Control Variables. We also gathered background information on age, gender, years of education, and size of social network. Since age, gender, and years of education were shown to be related to TGP and FGA (e.g., Abraham & Hansson, 1996; Brandtstädter & Renner, 1990) as well as to AWB (see Diener, Suh, Lucas, & Smith, 1999), it seems reasonable to control for them in the statistical analyses. Social network was assessed by asking about persons who are particularly important for emotional and personal reasons. The rationale to control for social network is that it was related to AWB in a number of studies (e.g., Finch, 1998; McCaskill & Lakey, 2000; Heyl, Wahl, & Mollenkopf, in press).

Statistical Analyses

Data were analyzed by moderated regression analyses (Aiken & West, 1991). To represent interaction terms (e.g., the interaction between FGA = X1 and subjective vision = X2), the variables were first multiplied (X1*X2). Subsequently, the product term (X1X2) was regressed on its constituents (X1, X2) to find the residual of the interaction term (R_X1X2) as orthogonalized variable (partial orthogonalization; Burrill, 1997). This was done to avoid multicollinearity between the product terms and its constituents.

In each analysis the predictors were entered in the same hierarchical order: control variables (i.e., age, gender, years of education, social network), vision-related variables, self-regulation variables, then two-way interactions, three-way interactions only after the two-way interactions, and, in the final analysis for reasons of completeness, the four-way interaction last. Main effects (i.e., control variables, vision, self-regulation variables) were entered first to secure that their effects are removed before entering the product terms (even though the product terms were orthogonalized). A product term was regarded as statistically significant when its β -weight was significant and when it contributed significantly to cumulative R^2 .

Results

Results at the Bivariate Level

The bivariate correlations of all variables included in the subsequent moderated regression analyses as well as their means and standard deviations are displayed in Table 1. First of all, Table 1 shows that TGP was negatively related to age, as could be expected from the literature (e.g., Brandstädter & Renner, 1990). However, no statistically significant link between FGA and age could be observed. Yet, the non-significant correlation coefficient was in the right (positive) direction. TGP and FGA were inversely related, indicating that being high in TGP and FGA simultaneously was not a common constellation in the present sample. PA was negatively related to age, while there was no link between NA and age. Moreover, there was no significant relationship between PA and NA (similar results have been reported in the literature, e.g., Kunzmann, Little, & Smith, 2000). The relations that were found

between AWB and subjective and objective vision, respectively, are in accordance with the literature as well. However, the link between subjective vision and NA did not reach significance.

Most important, Table 1 provides support for our first hypothesis of affect-specific links between TGP and FGA, respectively, and AWB: As has been expected, TGP was positively related to PA, and FGA was negatively related to NA. In line with the dual-channel hypothesis (Lawton et al., 1999), no significant relationship between FGA and PA or between TGP and NA could be observed at the level of zero-order correlations.

Results at the Multivariate Level

To test both parts of hypothesis 2, a moderated regression of NA on subjective and objective vision, FGA, all of the two-way interactions as well as on the three-way interaction between FGA and subjective and objective vision was conducted (controlling for age, gender, education, and social network). Besides significant main effects of gender (women reported more negative affect), objective vision, and FGA, a significant two-way interaction effect emerged (FGA x subjective vision: $t(674) = 5.66, p < .001$). As can be seen in Figure 1, FGA moderated the relationship between subjective vision and NA. Lower scores in subjective vision were associated with higher scores in NA, but only when FGA was low. When FGA was high, lower scores in subjective vision were associated with lower NA. This result supports the first part of our second hypothesis. Moreover, it explains why no significant link between subjective vision and NA has been observed at the bivariate level: Without considering FGA, NA cannot be predicted from subjective vision, because the opposite-directional effects resulting from low vs. high FGA are neutralized. Since the three-way interaction was not significant, no support was found for the second part of hypothesis 2.

To test both parts of hypothesis 3, a moderated regression of PA on subjective and objective vision, TGP, all of the two-way interactions as well as on the three-way interaction between TGP and subjective and objective vision was conducted (again controlling for age,

gender, education, and social network). Besides significant main effects of age, education, social network, subjective vision, and TGP, a significant two-way interaction effect emerged (TGP x subjective vision: $t(672) = -2.14, p < .05$). Moreover, the three-way interaction between TGP and subjective and objective vision turned out to be significant ($t(672) = 2.34, p < .05$). The two-way interaction indicates that the relationship between subjective vision and PA was mitigated by TGP, as has been expected in the first part of our third hypothesis, but the three-way interaction revealed that this was true only for those with low objective vision (Figure 2). Under the condition of high objective vision, there were only main effects of TGP and subjective vision, respectively, on PA. Under the condition of low objective vision, however, PA could not be predicted from subjective vision anymore for individuals high in TGP. On the one hand, the PA of individuals with low subjective and objective vision was significantly higher when TGP was high than when TGP was low. On the other hand, however, the PA of those overestimating their vision (i.e., individuals with high subjective, but low objective vision) was not different between those high vs. low in TGP. Thus, as has been expected in the second part of our third hypothesis, for individuals who overestimate their objective visual capacity, TGP seems to be no longer advantageous.

To test hypothesis 4 and hypothesis 5, separate moderated regressions of NA and PA, respectively, on subjective and objective vision, both FGA and TGP, all of the two-way and three-way interactions as well as on the four-way interaction between FGA, TGP, and subjective and objective vision was conducted (again controlling for age, gender, education, and social network). The results are displayed in Table 2.

Regarding NA, besides significant main effects of objective vision and FGA, the significant FGA x subjective vision interaction effect described above appeared again. Moreover, significant interaction effects of FGA x TGP and FGA x objective vision emerged. None of the higher order interactions was significant. Since in our fourth hypothesis a significant three-way interaction of FGA x TGP x subjective vision has been expected, the

results do not provide evidence for a regulatory dilemma between TGP and FGA with respect to the regulation of age-related visual decline. However, independent of age-related visual decline, the significant two-way interaction of FGA x TGP provides some support for a regulatory dilemma as expected in hypothesis 4. As can be seen in Figure 3, the inverse relationship between FGA and NA was weaker for those high in TGP compared to those low in TGP. That is, the beneficial (i.e., decreasing) effect of FGA on NA was less pronounced for those high in TGP, indicating antagonistic tendencies between both modes. Finally, as can be seen in Table 2, the direction of the standardized β -weight of the FGA x objective vision interaction was oppositional to that of the FGA x subjective vision interaction. Accordingly, an inspection of the conditional regression plots (not shown) revealed that high FGA strengthened, not weakened, the inverse relationship between objective visual acuity and NA compared to low FGA. That is, under the condition of high FGA, individuals with low objective vision had a higher probability of experiencing NA than individuals low in FGA. However, the level of NA was still lower for high FGA individuals than for low FGA individuals, though not statistically significant for those with low visual acuity.

Regarding PA, besides significant main effects of age, education, social network, subjective vision, and TGP, the significant TGP x subjective vision x objective vision interaction effect described above appeared again (cf. Table 2). However, the significant TGP x subjective vision interaction effect from the previous analysis considering TGP separately had disappeared. Moreover, a significant interaction effect of FGA x TGP x subjective vision emerged. As can be seen in Figure 4, under the condition of low FGA, there were only main effects of TGP and subjective vision, respectively, on PA. Under the condition of high FGA, however, PA could not be predicted from subjective vision anymore for those high in TGP. Thus, high TGP seems to be not able to moderate the relationship between subjective vision and PA until FGA is high, too. That is, a synergistic interaction of TGP and FGA seems to be

crucial for individuals with low subjective vision to maintain a high level of PA. This result supports our fifth hypothesis.

Discussion

The purpose of this study was to examine the relationship between assimilative tenacity and accommodative flexibility, and AWB in general terms as well as under the developmental constraint of normal age-related visual decline. We have argued that assimilative and accommodative tendencies, respectively, should primarily affect different aspects of AWB, i.e. the presence of PA vs. the absence of NA. Moreover, we assumed that dysfunctional side effects of assimilative and accommodative tendencies should emerge when individuals overestimate and underestimate, respectively, their objective visual functioning. Finally, we expected antagonistic and synergistic interaction effects of assimilative and accommodative tendencies to appear when AWB is regressed on both TGP and FGA simultaneously.

First, our findings support the notion of domain-specific links between TGP and FGA, respectively, and AWB, as has been expected in our first hypothesis. While higher TGP was significantly related to higher PA, higher FGA was significantly related to lower NA. This result provides additional support for the dual-channel hypothesis suggesting a dual-antecedent pattern for PA and NA (Lawton et al., 1999). It is also in line with empirical literature showing that PA and NA are predicted by different variables such as different personality traits (PA by extraversion and NA by neuroticism; Costa & McCrae, 1980) or different facets of social relationships (PA by social support and NA by social undermining; Finch, 1998). Moreover, given that subjective well-being is enhanced by both the presence of positive affect and positive evaluations as well as the absence of negative affect and negative evaluations, the result of affect-specific links suggests that the same-directional correlations between TGP and FGA, respectively, and subjective well-being reported in the literature might have arisen differently: on the one hand through the promotion of positive aspects by TGP, and on the other hand, through the protection from negative aspects by FGA. No link

has been found between FGA and PA at the level of zero-order correlations. However, analyses at the level of moderated regressions revealed conditional positive effects of FGA on PA. The significant FGA x TGP x subjective vision interaction (see again Figure 4) indicates that though high TGP is able to elevate PA even when FGA is low (main effect of TGP), its moderating effect emerges not until FGA is high, too. Thus, under the condition of high TGP, FGA also has a beneficial effect on PA, even though its primary impact appears to consist in the prevention from NA.

Second, our findings provide support for the assumption that the relationship between subjective vision and NA is moderated by FGA (first part of hypothesis 2, see again Figure 1), while the relationship between subjective vision and PA is moderated by TGP (first part of hypothesis 3). This is in accordance with similar moderator effects reported in the literature, for example, with respect to negative effects of perceived distance from developmental goals on life satisfaction (Bak & Brandtstädter, 1998). The latter effect, however, is moderated again by two independent modifiers (objective vision and FGA, see again Figures 2 and 4). The finding that high FGA aggravated instead of mitigated the inverse relationship between objective vision and NA seems to indicate that there is a limit to the resilience of older adults. However, NA of low acuity/high FGA individuals was still on a lower level than that of low acuity/low FGA individuals.

Third, with respect to NA, no evidence has been found for a dysfunctional side effect of accommodative tendencies for those underestimating their objective visual capacity. That is, contrary to the second part of hypothesis 2, as far as the absence of NA is concerned, individuals seem to benefit from being high in FGA even when they underestimate their visual capacity. However, with respect to the presence of PA the combination of being high in FGA and underestimating one's objective visual capacity tends to result in a dysfunctional side effect. As can be seen in Table 2, the interaction of FGA x subjective x objective vision has a significant β -weight, but does not contribute significantly to cumulative R^2 . An

inspection of the conditional regression plots (not shown) revealed that under the condition of high objective vision, high scores in FGA aggravate the relationship between subjective vision and PA (that is, lower scores in subjective vision are more strongly associated with lower PA). These results indicate that dysfunctional side effects of accommodative tendencies tend to affect the presence of PA, but not the absence of NA. Moreover, our findings partly support the notion of dysfunctional side effects of assimilative tendencies in individuals that overestimate their objective visual functioning, as has been expected in the second part of hypothesis 3. Though no evidence has been found for an actually disadvantageous effect of TGP, our analyses revealed, however, that individuals with high subjective, but low objective vision take no advantage anymore of being high in TGP (see again Figure 2). Thus, the dysfunctional side effect of TGP seems to consist in a loss of its PA-promoting potential. In general, dysfunctional side effects of both TGP and FGA appear to be restricted to the presence of PA.

Fourth, support has been found for a differential occurrence of the conflicting vs. synergistic aspects of TGP and FGA with respect to AWB. Taken as a whole, our findings support the notion that the conflicting aspects of TGP and FGA are reflected in their interactive effects on NA, while their synergistic interplay is reflected in their interactive effects on PA. In detail, though the results did not provide evidence for a regulatory dilemma between TGP and FGA with respect to the regulation of age-related visual decline as has been expected in our fourth hypothesis, the notion of antagonistic tendencies is nevertheless supported, but independent of age-related visual decline. The beneficial (i.e., decreasing) main effect of FGA on NA was less pronounced for those high in TGP (see again Figure 3), indicating that those with high scores in TGP might have more difficulties to switch to the accommodative mode to reduce NA effectively. Furthermore, the findings clearly support our fifth hypothesis. High TGP does not alter the relationship between PA and subjective vision until FGA is high, too (see again Figure 4), indicating that FGA adds synergistically to the

beneficial main effect of TGP. Thus, the moderating potential of assimilative tendencies seems to depend on accommodative tendencies.

On a more general level, our results might help to explain why the buffering effects of TGP have been found to be weaker compared to FGA or even absent in earlier studies (e.g., Brandtstädter, 1999): While FGA seems to be able to moderate increments in NA and, together with TGP, also decrements in PA, TGP seems to moderate solely decrements in PA. However, our findings revealed strong main effects of TGP on PA. Thus, individuals should be best prepared to deal with challenges of life when they dispose of both high assimilative and high accommodative tendencies, even though these tendencies might conflict sometimes. Such conflicts that result in an increase of NA (or other negative consequences), however, should not be evaluated rashly as being only negative. Brandtstädter and Rothermund (2002) have pointed at the adaptive value of depressive states resulting from a conflict between assimilative and accommodative tendencies. From this perspective, it might be expected that NA increases until the switch from the assimilative to the accommodative modes (that is driven motivationally by its potential to reduce negative mood states; Brandtstädter & Rothermund, 2002) becomes inevitable and at last succeeds.

Finally, our results also add to a broader motivational perspective related to aging and adaptation. In the light of our findings, assimilative and accommodative tendencies appear as cognitive-behavioral agents of the behavior activation system (BAS) and the behavior inhibition system (BIS) (Fowles, 1987), respectively: Signals of reward (PA) activate the BAS (Gray, 1994) that activates goal pursuit (cf. Watson et al., 1999). In case of success, the approach behavior is rewarded with PA (that serves as motivating source of further approach behaviors). In case of failure, a discrepancy between the actual and the desired outcome is experienced, accompanied by NA, a signal of non-reward. Thus, the BIS is activated (Gray, 1994), the approach behavior is inhibited, and a cognitive appraisal of the feasibility of the goal occurs. In case that the goal appears feasible, this new signal of reward activates the BAS

again that activates goal pursuit, more precisely now tenacious goal pursuit, that leads to success or failure again. In case that the goal appears unfeasible, this reinforced signal of non-reward (NA) brings about a persistence of the BIS activity that now induces accommodative reappraisal, search for meaning, and/or identity transformation (Brandtstädter & Renner, 1990). Subsequently, as a second stage of FGA, as it were, the formation of new perspectives and the channeling of resources to feasible goals result in signals of reward (PA) that close the loop by serving as motivating source of further approach behaviors.

Of course, the present study has its limitations. First of all, we have conceived subjective vision as being indicative of the perceived presence of a stressor (i.e., age-related visual decline). However, the subjective evaluation of visual functioning can be also seen as already being part of an ongoing regulatory process. Though subjective vision was unrelated to FGA in our data, a significant positive relation to TGP has been found (see again Table 1). Thus, higher evaluations of subjective vision tend to support assimilative efforts, while lower evaluations tend to undermine assimilative efforts, possibly paving the way for a switch to accommodative flexibility. In terms of the theoretical associations outlined above, subjective vision should contribute to or be part of the cognitive appraisal of the feasibility of goals. At any rate, since subjective and objective vision are substantially correlated in our data (see Table 1), it seems to be justified to conceive subjective vision as an indicator of the perceived existence of an age-related stressor.

Second, as is commonly known, it is not possible to test for cause and effect with cross-sectional data. Thus we cannot answer, for example, the question whether accommodative tendencies really lead to lower NA, or whether the disposition to flexibly accommodate goals simply is incompatible with a disposition to experience NA. Future research is needed to clarify this kind of question.

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Table 1: Bivariate correlations

Variable	M	(SD)	1	2	3	4	5	6	7	8	9	10
1. Age	71.05	(8.93)	—									
2. Gender*	—	—	.03	—								
3. Years of education	10.71	(2.75)	<u>-.23</u>	<u>-.22</u>	—							
4. Network	2.99	(2.74)	-.09	.08	-.01	—						
5. Subjective vision	3.56	(0.82)	<u>-.30</u>	-.04	<u>.25</u>	<u>.11</u>	—					
6. Objective vision	0.48	(0.25)	<u>-.38</u>	-.07	<u>.25</u>	.06	<u>.43</u>	—				
7. FGA	3.44	(0.46)	.07	<u>.11</u>	.01	.04	.05	-.02	—			
8. TGP	2.96	(0.58)	<u>-.21</u>	<u>-.15</u>	<u>.27</u>	.09	<u>.29</u>	<u>.21</u>	<u>-.23</u>	—		
9. Negative Affect	2.11	(0.61)	-.02	.05	-.04	.04	-.09	<u>-.18</u>	<u>-.25</u>	.02	—	
10. Positive Affect	3.03	(0.81)	<u>-.27</u>	-.02	<u>.26</u>	<u>.28</u>	<u>.36</u>	<u>.21</u>	-.05	<u>.45</u>	.06	—

Note.

*1 = women (n=372); 0 = men (n=379). M= mean; SD = standard deviation; FGA = Flexible Goal Adjustment; TGP = Tenacious Goal Pursuit. Underlined correlation coefficients are significant at $p < .01$.

Table 2: Results of moderated regression analyses of positive and negative affect including both assimilative tenacity and accommodative flexibility

Predictor Variables	Dependent Variables					
	Negative Affect			Positive Affect		
	Standard- ized β	Semi- partial R^2	Cumu- lative R^2	Standard- ized β	Semi- partial R^2	Cumu- lative R^2
<u>Control variables</u>						
Age	-.08*	.00	.00	-.15***	.08***	.08
Gender	.08*	.00	.00	.05	.00	.08
Education	.04	.00	.00	.09**	.03***	.11
Network	.04	.00	.00	.19***	.07***	.18
<u>Vision-related variables</u>						
Subjective vision	-.02	.01*	.01	.14***	.04***	.22
Objective vision	-.22***	.04***	.05	-.04	.00	.22
<u>Self-regulation variables</u>						
FGA	-.26***	.06***	.11	.04	.00	.22
TGP	-.03	.00	.11	.36***	.09***	.31
<u>Two-way interactions</u>						
Subj. x obj. vision	-.02	.00	.11	.02	.00	.31
FGA x TGP	.14***	.03***	.14	.08*	.01*	.32
FGA x subj. vision	.18***	.02***	.16	.01	.00	.32
FGA x obj. vision	-.09*	.01*	.17	.07	.01*	.33
TGP x subj. vision	.01	.00	.17	-.06	.00	.33
TGP x obj. vision	.01	.00	.17	.07	.00	.33
<u>Higher order interactions</u>						
FGA x subj. x obj. vision	-.01	.00	.17	.07*	.00	.33
TGP x subj. x obj. vision	-.01	.00	.17	.08*	.01*	.34
FGA x TGP x subj. vision	-.01	.00	.17	-.08*	.01*	.35
FGA x TGP x obj. vision	-.01	.00	.17	-.00	.00	.35
FGA x TGP x subj. x obj.	-.02	.00	.17	-.04	.00	.35

Note.

* $p < .05$; ** $p < .01$; *** $p < .001$. A significant effect (underlined) has to have both a significant β -weight as well as a significant semi-partial R^2 . FGA = Flexible Goal Adjustment; TGP = Tenacious Goal Pursuit.

Figure Captions

Figure 1:

Moderator effect of Flexible Goal Adjustment (FGA) on the regression of negative affect on subjective vision

Figure 2:

The moderator effect of Tenacious Goal Pursuit (TGP) on the regression of positive affect on subjective vision is moderated by objective vision (2nd order moderator effect)

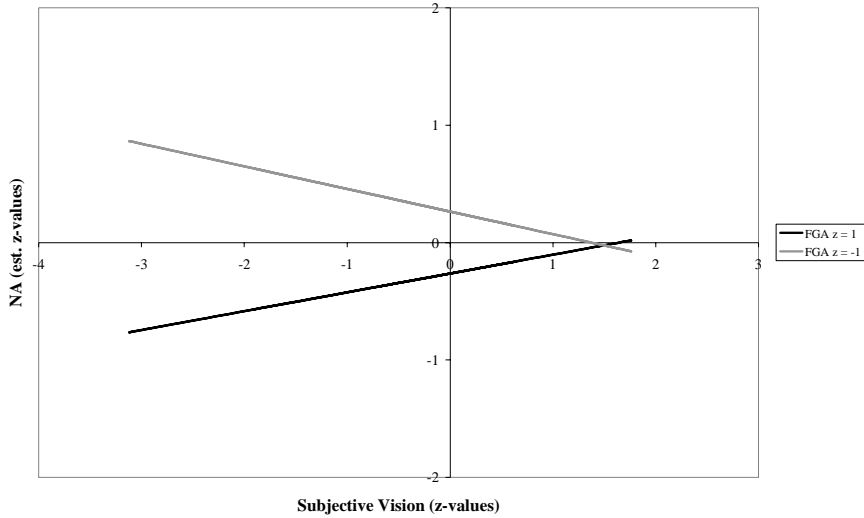
Figure 3:

Moderator effect of Tenacious Goal Pursuit (TGP) on the regression of negative affect on Flexible Goal Adjustment (FGA) (indicating a regulatory dilemma between FGA and TGP)

Figure 4:

The moderator effect of Tenacious Goal Pursuit (TGP) on the regression of positive affect on subjective vision is moderated by Flexible Goal Adjustment (FGA) (2nd order moderator effect indicating synergistic effects of FGA and TGP)

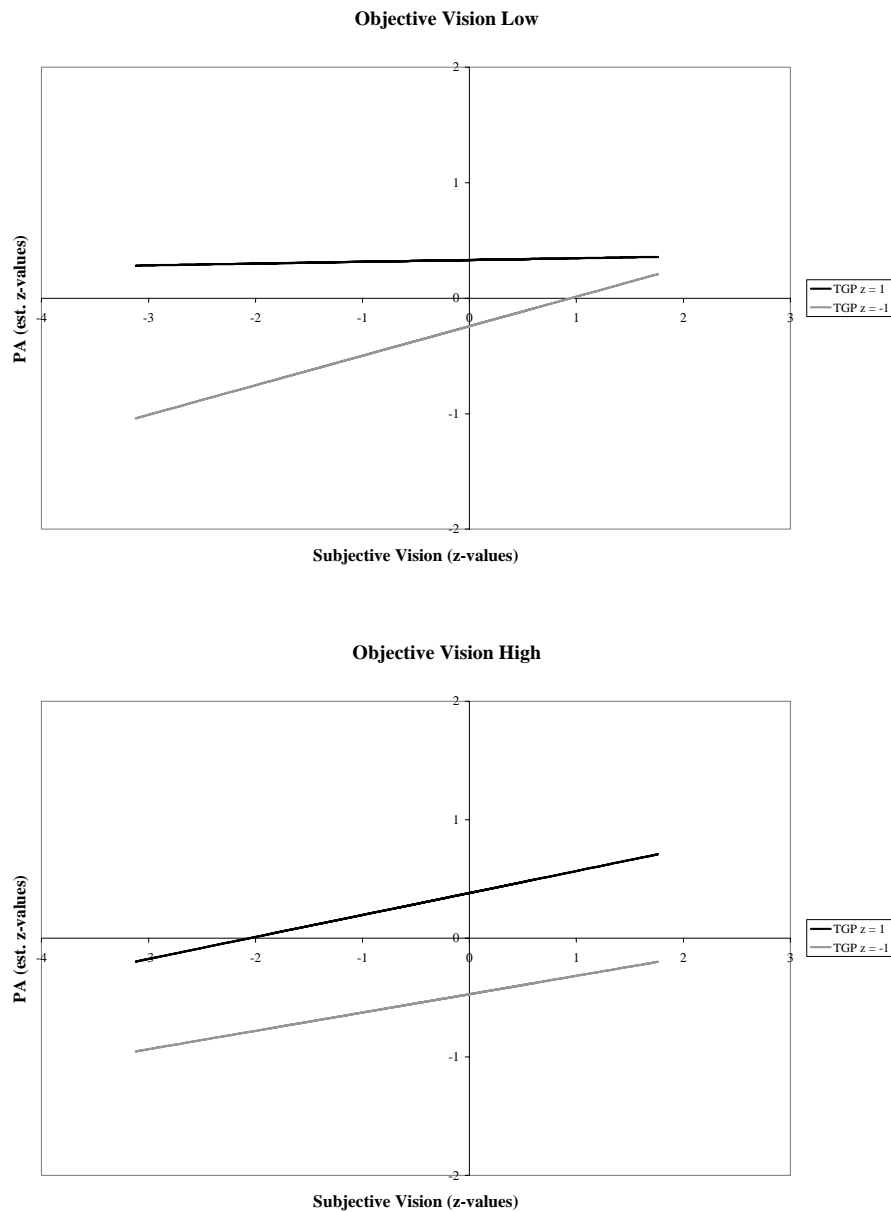
(Figure 1)



Note.

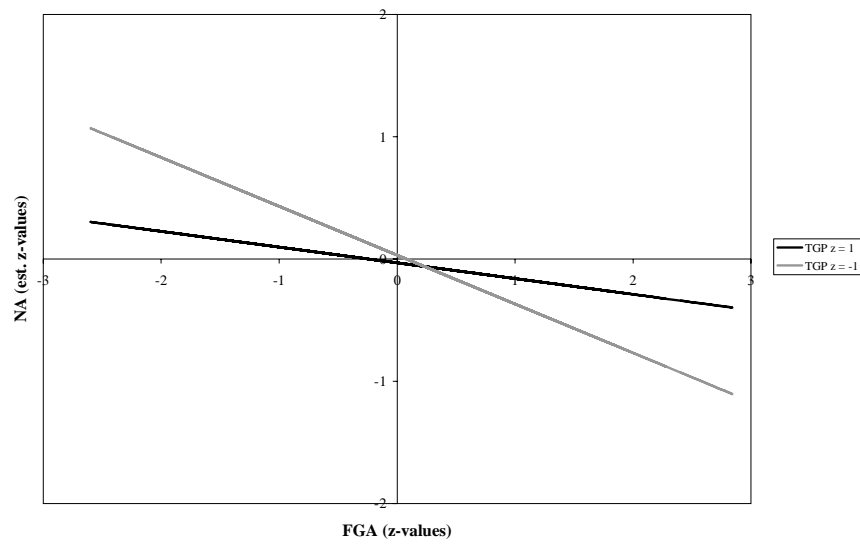
NA = Negative Affect; est. = estimated (NA predicted by subjective vision at high vs. low levels of FGA); FGA = Flexible Goal Adjustment.

(Figure 2)

Note.

PA = Positive Affect; est. = estimated (PA predicted by subjective vision at high vs. low levels of TGP under the condition of high vs. low objective vision); TGP = Tenacious Goal Pursuit.

(Figure 3)

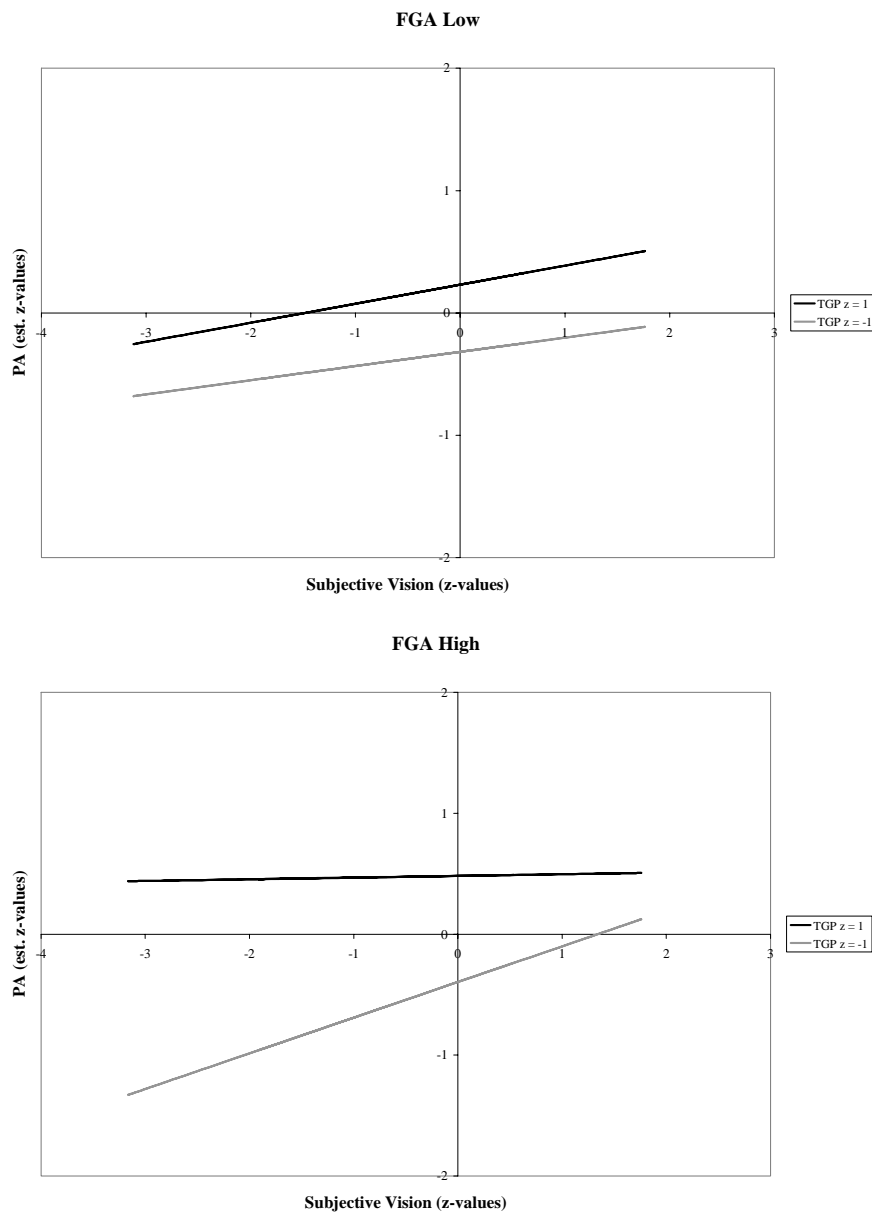


Note.

NA = Negative Affect; est. = estimated (NA predicted by FGA at high vs. low levels of TGP);

FGA = Flexible Goal Adjustment ; TGP = Tenacious Goal Pursuit.

(Figure 4)

Note.

PA = Positive Affect; est. = estimated (PA predicted by subjective vision at high vs. low levels of TGP under the condition of high vs. low FGA); FGA = Flexible Goal Adjustment; TGP = Tenacious Goal Pursuit.

Paper 6

Heyl, V. & Schmitt, M. (submitted). The contribution of adult personality and recalled parent-child relations to friendships in middle and old age. Submitted to *International Journal of Behavioral Development*.

The Contribution of Adult Personality and Recalled Parent-child Relations to

Friendships in Middle and Old Age

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Abstract

In this study we examined personality traits, in particular openness to experience and agreeableness, and – in an exploratory step – recalled parent-child relations as antecedents of friendship involvement in adulthood. Data from 392 middle aged (43-46 years) and 345 older participants (61-64 years) in the first wave of the Interdisciplinary Longitudinal Study of Adult Development (ILSE) support the hypothesis that openness contributes to friendship involvement in middle age, while agreeableness contributes to friendship involvement in old age. Further, structural equation models showed that the relation between recalled mother-child relationship and friendship involvement in old adults was mediated by agreeableness. Recalled father-child relationship was directly associated with friendships in both age groups, independent of personality traits.

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From a life-span perspective growing older is a two-sided coin. While past time continuously increases, remaining future time diminishes. With regard to social relationships these different time perspectives mean that on the one hand social experiences and expertise about others and about social relationships accumulate (Antonucci & Akiyama, 1987; Lang & Carstensen, 1998). On the other hand, diminishing remaining time becomes increasingly precious and will therefore be predominantly spend with selected emotionally meaningful social partners such as family and friends, as suggested by socioemotional selectivity theory (e.g., Carstensen, 1992; Carstensen, Isaacowitz, & Charles, 1999). The present study investigates predictors of social relationships that are in a way related to the future and the past, respectively. Firstly, we ask for the link between personality traits and social relationships in different life-cycle stages, i.e., midlife and later life, when different social motives, i.e., knowledge-related and emotion-related motives, are supposed to guide social behavior because of different perceptions of time left in life (Carstensen, Isaacowitz, & Charles, 1999). Secondly, we are interested in subjective theories of earlier in life acquired social experiences and how they are related to close relationships in adult life. We will focus on relationship experiences with parents because they seem to be a fundamental part of the lifelong history of relationship experiences (e.g., Bowlby, 1969, 1973).

The study focuses on friendships as a form of social relationships that is important throughout life. We define friendships as voluntary and close relationships with others outside the family. However, it is important to note that what makes a relationship close is open to interpretation by the respondent. Some friendships are not based on emotional closeness, but rather on intellectual closeness, shared activities or common interests. As Matthews (1986) has shown, some people's friendship definitions are primarily based on the content of the relationship (that may be realized with many different persons), while others define friendship based on emotional ties to specific and more or less irreplaceable persons. Also, since the literature suggests that the issue of quantity (e.g., network size, contact frequency) vs. quality

(e.g., feeling close to others, perceived social support) of social relationships is an important one (e.g., Chappell & Badger, 1989; Pinquart & Sörensen, 2001), the present study will consider both aspects of friendships (i.e., quantitative aspect: behavioral friendship involvement in terms of contact frequency; qualitative aspect: cognitive-emotional friendship involvement in terms of concern with the friendship role; cp. method section).

The study is mainly aimed at examining personality traits, particularly openness to experience and agreeableness, as antecedents of friendships in later life. Openness to experience and agreeableness are part of the five-factor model of personality (“Big Five”). The five-factor model is founded on five dimensions of individual differences that congruently resulted from factor analysis of many different data sets (Digman, 1990). These dimensions have been interpreted as reflecting conscientiousness, extraversion, neuroticism, openness to experience, and agreeableness. We focus on openness to experience and agreeableness because these personality characteristics correspond to the most essential motives for social behavior throughout all of life as suggested by socioemotional selectivity theory (e.g., Carstensen, 1992; Carstensen, Isaacowitz, & Charles, 1999), i.e. knowledge- and emotion-related motives. Characteristics of open individuals such as imagination, curiosity, and creativity and their receptiveness to new and varied information and experiences (McCrae & Costa, 1997) match knowledge-related motives, while characteristics of agreeable individuals such as kindness, cooperativeness, considerateness, sensitivity, and helpfulness (Graziano & Eisenberg, 1997) match emotion-related motives. Therefore, we assume that these personality features should be particularly crucial for social relationships. However, some exploratory analyses will be done with all Big Five dimensions.

According to socioemotional selectivity theory (e.g., Carstensen, Isaacowitz, & Charles, 1999) social motivation changes across the life span because of changes in time perspective. When the future is perceived as expansive (as in young and middle age), the theory predicts that knowledge-related goals receive priority. In contrast, when the future is

perceived as limited (as in old age), emotion-related goals become most important. In the context of this study we suggest that, because of their intellectuality and willingness to embrace new ideas, open individuals are very attractive social partners for peers pursuing knowledge-related goals. Since friendships are mostly peer relationships, this should increase the probability of open people of being involved in friendships in middle age. On the other hand, because of their sensitivity and positive orientation towards others, agreeable individuals are very attractive social partners for peers pursuing emotion-related goals, and this should increase the probability of agreeable people of being involved in friendships in old age. Thus, based on the different salience of social motives across the life span, we expect openness to be related to friendship involvement in middle age, while agreeableness should be related to friendship involvement in old age. Certainly, agreeableness might be beneficial for friendship formation and maintenance in young and middle age as well, but we argue that in young and middle age, when knowledge-related goals are most important, open individuals should be very attractive for their peers, even when they are low in agreeableness.

Conversely, in old age, when emotion-related goals primarily underlie social action, agreeable individuals should be very attractive for their peers, even when they are low in openness. In this context, it is also important to note that we do not want to suggest that agreeableness or openness change intraindividually when people grow older. While it seems quite possible that changes in personality do occur according to changing interests (less interest in gathering new information and more interest in close relationships; cp. Srivastava, John, Gosling, & Potter, 2003), it is no condition precedent to our hypothesis.

Our second, more exploratory research aim concerns the role of recalled parent-child relations for friendship involvement in adulthood. From the perspective of attachment theory (Bowlby, 1969, 1973) the mental representations (or, to use Bowlby's term, internal working models) based on experiences with the original attachment figures (i.e., parents) can be expected to have some influence on thoughts, feelings, and behavior in close relationships

throughout life, though it has to be recognized that later events can influence (maintain, amplify, counteract) the impact of early experience (e.g., Skolnick, 1986). Research on the influence of early relationship experiences on psychological and physical well-being in old age usually relies on retrospective data, due to practical and methodological hindrances coming with the long observation period from childhood into old age. There has been an extensive debate over the use of the retrospective method that will not be taken up here (e.g., Halverson, 1988; McCrae & Costa, 1988a,b). On the basis of the existing findings it appears to be an open question whether recalled parent-child relations are veridical or not (Schumacher, Eisemann, Strauss, & Brähler, 1999; Schumacher, Hinz, & Brähler, 2002). More precisely, it is not clear whether they reflect actual parent-child relations during childhood and youth or subjective representations of these relationship experiences that are subject to reconstruction and distortion. In the context of this study we assume that recalled parent-child relations reflect subjective theories of early relationship experiences and that these reconstructed experiences are crucial for adult feelings and behavior. However, we are convinced that recollections of childhood do contain kernels of truth and therefore, as mentioned at the beginning, they are in a sense related to the past.

The existing empirical literature is quite consistent in showing that recalled parent-child relations are important in many respects. For example, recalled quality of parenting has an impact on the well-being of elderly people, as the findings from a study by Andersson and Stevens (1993) indicate. Research on psychopathological symptoms revealed significant links between recalled parental rearing behavior such as rejection and overprotection and mental health problems in adulthood such as depression and anxiety (e.g., Gerlsma, Emmelkamp, & Arrindell, 1990; Perris, Arrindell, & Eisemann, 1994). Most important in the context of the present study, measures of recalled parent-child relationships appear to be predictive of contemporary relationships such as adult child-parent relationships (Whitbeck, Simons, & Conger, 1991; Bedford, 1992). Schumacher, Eisemann, Strauss, and Brähler (1999) found

significant links between recalled parental rearing behavior (rejection, emotional warmth, and control) and interpersonal problems as well as satisfaction with social relationships (social integration, marriage/partnership, and relations to own children). Based on these findings we expect significant links between recalled parent-child relations and friendships in adulthood.

However, findings from autobiographical memory research indicate that what one remembers about one's personal history and one's personal relationships is related to personality traits (e.g., Safer, Levine, & Drapalski, 2002). People preferentially remember stimuli that are congruent in emotional tone with their personality (for a review, see Rusting, 1998). For example, higher levels on measures of negative traits such as neuroticism are associated with a tendency toward fewer happy memories and an increased retrieval of negative memories (Ruiz-Caballero & Bermudez, 1995). In the context of the present study, more agreeable persons, for example, might remember the relations to their parents more positively than less agreeable individuals. Therefore, personality traits should be considered when investigating the contribution of recalled relationships to social relationships in adulthood.

We will do this in the first step by considering the focused personality traits openness to experience and agreeableness. We will start with a model that assumes complete interconnectedness among recalled parent-child relations, personality traits, and friendship involvement (all effects model). This model will be tested against two basic alternatives. First, against a model assuming an indirect association between recalled parent-child relations and friendship involvement through the personality traits (mediator model), and second, against a model assuming that personality traits and recalled parent-child relations contribute independently to friendship involvement (independence model). To check the robustness of the resulting final model, in the second step, the other three personality traits of the five-factor model will be included, i.e. extraversion, neuroticism, and conscientiousness.

Method

Sample

The data for this study originate from the first wave of the Interdisciplinary Longitudinal Study of Adult Development (ILSE) where a wide range of data on demographics, health, functioning, and the individual cognitive representation of self and environment was collected from two birth cohorts born 1930-1932 and 1950-1952 (Martin, Grünendahl, & Martin, 2001). Data were collected in two cities of comparable size and infrastructure in East and West Germany between late 1993 and early 1996.

The sample was selected to capitalize on the local registries in Germany which contain the entire German-speaking citizenry (91% of the total population). The sample was stratified by birth cohort and gender. Addresses of 4,800 potential participants were gathered from local registries in Germany (in Germany, all citizens have to be officially registered in their communities). A sample of potential participants was randomly drawn from this complete listing of citizens, and these persons were contacted. This procedure was followed until a total sample of 1,001 participants was obtained; 500 were born between 1930 and 1932, and 501 were born between 1950 and 1952. Half of the data from each birth cohort were collected in East Germany, and the other half in West Germany. Although men were purposely oversampled in both cohorts (52%), and the sample has a somewhat higher education level than the general population, the sample can be regarded as largely representative for the German-speaking population of Germany (Martin et al., 2001).

Since this study comprises recalled mother-child and father-child relationships, only those participants who reported that they have been brought up by mother and father during childhood and youth were included in the analyses. Thus, the following analyses refer to a sample of 737 participants. More detailed information on the sample is provided in Table 1.

- insert Table 1 about here -

Procedure

The participants came twice to one of the two data collection centers (Heidelberg and Leipzig) and underwent a large-scale interdisciplinary assessment program. On the first day, they were given a brief overview of the study. Thereafter, the measurement instruments were presented in counterbalanced order. One half of the sample was first interviewed in one-on-one settings. After the interview, the participants went through a series of tests from different disciplines. The other half of the sample received the tests before the interview. Within one week of their initial visit, participants returned for a second day and went through a detailed medical examination and an additional set of questionnaires.

Instruments

In the following, we focus on those measures that are relevant to the present study.

Personality Traits

Personality was measured with the German version of Costa and McCrae's (1989) NEO Five-Factor Inventory (NEO-FFI, Borkenau & Ostendorf, 1993), an established measure of the five-factor model of personality. 12 items each measure the factors extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. In the context of the present research endeavor, we focused on agreeableness and openness for the reasons discussed in the theory section. The Cronbach's alphas for agreeableness and openness were .64 and .54, respectively. For some additional analyses including also the other three personality dimensions, i.e., neuroticism (Cronbach's alpha = .79), Extraversion (Cronbach's alpha = .70), and conscientiousness (Cronbach's alpha = .77). Since some of the internal consistency coefficients are rather small, taking into account the reliabilities of the measures seems essential for statistical analysis. Therefore, the present study focuses on the analytical framework of structural equation modeling (SEM) to estimate structural relationships between latent true scores.

Social Relationships

The main tool to gather data on personal relationships across the life span was a comprehensive semi-structured interview that was developed and used in earlier studies of aging processes (Schmitz-Scherzer & Thomae, 1983) to analyze the individual's 'life space' (Lewin, 1951) and to supplement other, more objective methods of data collection that are less reflective of subjective experiences. By definition, a semi-structured interview is an oral interview with fixed topics and prescribed questions that are stated in an interview guideline (Kruse & Schmitt, 1998). In the first step, the interviewer asks a general question to raise a certain issue (e.g., family of origin) without predetermining what crosses the respondent's mind (e.g., "When you think about your family of origin, what occurs to you?"). This kind of questions encourages the participants to give spontaneous descriptions of what is subjectively meaningful to them, and allows for an exploration of the participants' perceptions and evaluations. In the second step, more specific questions are asked to explore certain aspects of the respective issue (e.g., "What do you remember about your rearing at home?"). In the course of the interview, these questions are supplemented by supporting and deepening questions such as "Could you explain this in more detail?" or "Anything else that concerns you in this context?". One priority objective of an oral interview is to create an atmosphere of trust that fosters straightforward and honest answers. Moreover, the interview method helps to counteract social desirability effects, for example by asking about concrete behaviors in everyday life, and it provides the opportunity to clear potential misunderstandings or obscurities immediately.

The interviews comprised a biographical section touching issues such as infancy, schooldays and youth, vocational training, occupation and family life in early adulthood, a section on the current life situation touching issues such as current occupation, social network, leisure, health, housing, socio-economic situation and aims in life, and a section on the future perspective. The interviews lasted an average of 5 hours. They were conducted and scored by five experienced and intensively trained interviewers. The interviewer's ratings in selected

parts of the interview were compared against a standard rating. All interviewers reached at least 80% agreement with the standard-rating (the average agreement was 88%, and the average interrater correlation was $r = .946$).

Friendship Involvement. In the interview section on the individual's current life situation, participants were interviewed in detail about their social contacts. Regarding friendships, they were asked about the frequency of contacts ("How often do you meet?") and about joint activities ("What are you doing together?") with close others outside the family as well as about changes ("Did the relationship to your friends change within the last three years?") and conflicts in these close relationships ("Sometimes tensions and conflicts arise, even in friendships. What about your friendships? Anything from the recent time you remember?"). All participants were asked the same questions. As already mentioned in the introduction, it was left to the respondent for what reasons he or she regards a relationship as close (based on the content of the relationship and/or based on emotional ties). The more quantitative aspect of friendship involvement, i.e., behavioral friendship involvement was rated in terms of activity on a 5-point scale ranging from 1 (very low) to 5 (very high). The more qualitative aspect of friendship involvement, i.e., cognitive-emotional friendship involvement, was rated in terms of concern with friendships on a 5-point scale ranging from 1 (very low) to 5 (very high).

Recalled Quality of Parent-child Relationships. Research on recalled parent-child relationships has shown that both the recalled mother-child and the recalled father-child relationship are essential for social integration (e.g., Andersson & Stevens, 1993). Therefore, in the present study, we employed separate measures of the recalled quality of mother-child and father-child relationship. These measures were embedded in the biographical section of the interview described above. In this section the whole biography was explored at length, creating an atmosphere of reminiscence where memories should become more salient than in questionnaires that focus only on specific biographical aspects. Participants were interviewed

about their childhood and youth memories regarding the relationship to their parents (“How was the relationship to your parents?”) and regarding praise (“What happened when you did particularly well?”), criticism (“What happened when you got into mischief?”), and prohibitions at home (“Were there any bans at home?”). All participants were asked the same questions. The emotional tone of the recalled mother-child and the recalled father-child relationship was rated separately on 5-point scales ranging from 1 (very negative) to 5 (very positive). Furthermore, the recalled maternal and paternal appreciation and control were rated on separate 5-point scales ranging from 1 (very low) to 5 (very high).

Results

Age Differences

Prior to examining the actual research questions, we looked at age differences in the indicator variables for personality, friendship involvement, and recalled mother-child and father-child relationships. The personality measures revealed the older age group to be more agreeable and less open to experience than the younger age group (see once again Table 1). This is in line with other cross-sectional studies on both of these personality variables (e.g., McCrae, Costa, de Lima, Simoes, et al., 1999). Further, while there was no significant age difference for behavioral friendship involvement, the older age group showed a significantly higher level of cognitive-emotional friendship involvement. This may reflect the theoretically assumed greater prominence of emotionality in social contacts of older adults.

There was only one significant age difference regarding the recalled quality of the mother-child relationship, indicating a more positive emotional tone between mother and child in the older age group. Regarding the recalled quality of the father-child relationship, all of the measures yielded significant age differences, indicating a more positive emotional tone between father and child, more appreciation and less control by the father in the older age group. That is, the older age group tended to report more positive relationships to their parents, particularly to their fathers. This is in line with literature suggesting that older adults

have a positivity bias in long-term autobiographical memory (e.g., Kennedy, Mather, & Carstensen, 2004; Field, 1981; Yarrow, Campbell, & Burton, 1970). However, in the context of the present study, another possibility has to be considered. As Shmotkin (1999) has shown, the relationship to mother and father, respectively, might be evaluated as more positive when both were deceased. Thus, the more positive ratings of the older participants could also be due to the fact that most of the parents of the younger participants were still alive (about 78% of the mothers, and 41% of the fathers), while most of the parents of the older participants were already deceased (about 84% of the mothers, and 97% of the fathers). To check for this possibility as well as to rule out that participants with living versus deceased parents were systematically different in any of the constructs relevant to this study, we run separate multivariate analyses of variance (MANOVA) for friendship involvement (i.e., behavioral and cognitive-emotional friendship involvement), recalled mother-child and father-child relations (i.e., each with emotional tone, appreciation, and control), openness to experience, and agreeableness considering the effects of age and living vs. deceased parents (both parents alive; mother alive/father deceased; both parents deceased; cp. Shmotkin, 1999).

Corresponding to the age differences described above, we found significant age effects with respect to recalled father-child relationship (Wilks' Lambda = .98, $p < .05$), friendship involvement (Wilks' Lambda = .94, $p < .0001$), and openness to experience (Wilks' Lambda = .97, $p < .01$). The living vs. deceased parents variable had no significant effects at all. That is, with respect to the constructs of the present study no systematical differences between participants with living vs. deceased parents could be observed.

Interrelationships among Personality Traits, Friendship Involvement, and Recalled Quality of Parent-child Relations

To examine our research questions, we developed structural equation models for both age groups to investigate the interrelationships among personality, current friendship involvement, and recalled parent-child relations. Since there were missing values in our data

(see Table 1), we used the full information maximum likelihood (FIML) estimation procedure from the AMOS 4 program package (Arbuckle, 1996; Arbuckle & Wothke, 1999). This procedure allows for the inclusion of observations with missing values. Latent variables were constructed on the basis of theoretical considerations and the examination of zero-order correlations among predictor variables. The correlation matrix of all observed indicators used in the model is provided in Table 2. In the case of the personality traits, we divided the 12 items assessing each construct into 3 parcels consisting of 4 random items each that served as indicators for the respective latent personality construct. Parceling is a commonly used method that has some advantages over using individual items as indicators, e.g., fewer parameters need to be estimated in the measurement model (West, Finch, & Curran, 1995).

- insert Table 2 about here -

Since χ^2 -tests for model fit may be too sensitive when the sample size is rather large (as in our study), the fit evaluation of a single model should be primarily based on indices such as the root mean squared error of approximation (RMSEA; Browne & Cudeck, 1993). Following recommendations offered by Hoyle and Panter (1995), we also considered the incremental fit indices Tucker-Lewis index (TLI) and comparative fit index (CFI). As a general rule, for a model to be evaluated as having a good fit, RMSEA should be $\leq .05$ and TLI and CFI should be at least .95. Likewise, $\Delta\chi^2$ -tests of significant differences between models may be too sensitive when the sample size is large. Therefore, our decision rules regarding model comparisons are also based on the respective TLI, CFI and RMSEA indices, not on significant differences in χ^2 -values. We accepted the more restricted model when the differences between the respective TLI, CFI and RMSEA values of the compared models were below .01 and the RMSEA 90% confidence intervals of the models did overlap (Schilling, 2004).

First of all, a basic measurement model with no constraints on the correlations among the constructs was estimated for both age groups. The error variances and the unstandardized

regression weights were restricted to equality for both age groups. As expected, the χ^2 -statistic was significantly above zero. However, this model had a quite good fit in terms of the fit indices described above (RMSEA=.054; TLI=.985; CFI=.989). Thus, the measurement models for both age groups can be regarded as appropriate and equal. Table 3 provides the standardized factor weights of the measurement models for both age groups.

- insert Table 3 about here -

Age-differential Effects of Personality Traits

Subsequently, we examined the assumed age-differential links between the personality traits openness and agreeableness, respectively, and friendship involvement. For this purpose, models including both personality traits and friendship involvement were specified. In model DIF1, direct paths from openness to friendship involvement and agreeableness to friendship involvement were estimated for both age groups ($\chi^2=86.06$; $df=34$; $p<.05$; RMSEA=.046; TLI=.993; CFI=.997). In model DIF2, we constrained the path from agreeableness to friendship involvement to zero in the younger age group, and in the older age group, we constrained the path from openness to friendship involvement to zero ($\chi^2=91.53$; $df=38$; $p<.05$; RMSEA=.044; TLI=.994; CFI=.997). Both of the models fit the data equally well, i.e., χ^2 -values were not significantly different ($\Delta\chi^2=5.47$; $df=4$; $p<.242$), the differences between the respective TLI, CFI, and RMSEA indices were not greater than .01, and the RMSEA 90% confidence intervals of the models did overlap. Therefore, the more restricted model DIF2 (see Figure 1) that reflects our hypothesis that openness and friendship involvement are significantly associated in middle but not in old age, while agreeableness and friendship involvement are significantly associated in old but not in middle age, was accepted.

- insert Figure 1 about here -

Recalled Quality of Parent-child Relations and Friendship Involvement in Adulthood

In the next step we investigated the relationship between friendship involvement and recalled parent-child relations, and the role personality traits play in this regard. As described

in the introduction, we tested whether personality traits, friendship involvement, and recalled parent-child relations are interconnected (all effects model), whether the relationship between recalled parent-child relations and friendship involvement is mediated by personality traits (mediator model), or whether personality traits and recalled parent-child relations are independently linked to adult friendship involvement (independence model). We computed all of the models as multi-sample models differentiating between the younger and the older sample. We started with the least restricted model, i.e., the all effects model (M1). In model M2, we implemented once again the age-differential effects of openness and agreeableness according to model DIF2. Again, constraining the path from agreeableness to friendship involvement to zero in the younger age group, and from openness to friendship involvement in the older age group did not yield any loss of model fit. Therefore, all of the following models include this restriction. The mediator model was specified in model M3, the independence model was specified in model M4. Both of these models differed significantly from M1 and M2 in terms of $\Delta\chi^2$, but not in terms of the other fit indices, i.e., TLI, CFI, and RMSEA (see Table 4).

Models M1 to M4 each assumed the same model (all effects, independence, mediator) for recalled mother-child as well as for recalled father-child relation. However, it might well be that for mother-child and father-child relation, respectively, different models fit best. For example, recalled mother-child relation might be directly associated with friendship involvement (independence model) while the link between recalled father-child relation and friendship involvement might be mediated by personality (mediator model), or vice versa. Therefore, we computed any possible combinations from the all effects, mediator and independence models for both parents, resulting in six further models (M5 to M10, e.g., mother all effects / father independence; mother all effects / father mediator, and so on).

- insert Table 4 about here -

Model M8 (mother mediator / father independence) turned out to be at the same time best fitting, most parsimonious, and not significantly different from the initial all effects model M1, even in terms of $\Delta\chi^2$. Therefore, this model was accepted to serve as basis for the next step. To assure that the best fitting model was not different between age groups, we computed the models M1-M10 once again separately for each age group. These analyses confirmed M8 in both age groups.

In the next step, the M8 models of both age groups were constrained equally, with the exception of the paths from openness and agreeableness, respectively, to friendship involvement (model M11). That is, model M11 assumes equality across age groups except of the paths from openness and agreeableness, respectively, to friendship involvement. For the fit indices see again Table 4.

Based on the comparison of the respective TLI, CFI, and RMSEA indices, the models M8 and M11 fit the data equally well, i.e., the differences between the respective fit indices were not greater than .01, and the RMSEA 90% confidence intervals of the models did overlap. Therefore, the most restricted model M11 was accepted, although χ^2 -value changed significantly compared to model M8. In model M11, the path from recalled mother-child relationship to openness to experience was not significant. It was deleted in the final model M12. Model M12 (see Figure 2) suggests that, in both age groups, there is a significant relationship between recalled mother-child relation and agreeableness, while no paths are needed from recalled father-child relation to agreeableness as well as from both recalled parent-child relations to openness. Further, the recalled quality of the father-child relation contributes more clearly to adult friendship involvement than the recalled quality of the mother-child relationship. Moreover, the model suggests that openness is crucial for friendship involvement in middle age, while agreeableness is crucial for friendship involvement in old age.

- insert Figure 2 about here -

To check the robustness of our final model, we computed models additionally including the other dimensions of the five-factor model of personality, i.e., extraversion, neuroticism, and conscientiousness. In the first step we computed a starting model analogous to the all effects model ($\chi^2=1301.25$; $df=424$; $p<.05$; $RMSEA=.053$; $TLI=.977$; $CFI=.982$). Subsequently, we constrained the paths between recalled parent-child relationships, friendship involvement and openness as well as agreeableness according to our final model (M12). This model did not differ significantly from the starting model ($\chi^2=1320.52$; $df=434$; $p<.05$; $RMSEA=.053$; $TLI=.977$; $CFI=.982$). In the final exploratory step, we constrained non-significant paths to zero. This model did not differ significantly, neither from the previous nor from the starting model ($\chi^2=1332.17$; $df=449$; $p<.05$; $RMSEA=.052$; $TLI=.978$; $CFI=.982$). In both age groups, this model replicated our final model with a path from recalled mother-child relation to agreeableness, a path from recalled father-child relation to friendship involvement, and differential paths from openness and agreeableness, respectively, to friendship involvement. In the older age group, no additional paths were necessary. In the younger age group, however, there were additional significant paths from recalled mother-child relation to conscientiousness (standardized regression weight $b=.19$) and neuroticism ($b=-.24$), and from recalled father-child relation to extraversion ($b=.21$). That is, in the younger age groups, personality and recalled parent-child relations were closer linked than in the older age group. There were no significant links between personality traits and friendship involvement in both age groups, besides the differential paths from openness and agreeableness, respectively.

Discussion

In the first research question of the present study we asked how adult personality traits (i.e., openness to experience and agreeableness) and friendship involvement are linked in different life-cycle stages (i.e., middle and old age). Based on suggestions made by socioemotional selectivity theory, we assumed differential links between openness to experience and agreeableness, respectively, and friendship involvement in middle and old

age. The second research question addressed the relationship between recalled parent-child relations and friendship involvement and the role personality traits play in this regard.

Concerning our first research question, the results support the hypothesis that the relations among openness and agreeableness, respectively, and adult friendship involvement are different across the life span. In middle age, when socioemotional selectivity theory proposes that knowledge-related social motives are salient (e.g., Carstensen, Isaacowitz, & Charles, 1999), we found a significant association between openness and friendship involvement, but not between agreeableness and friendship involvement. The reverse was true for the older age group. In old age, when emotion-related social motives are salient, we found a significant association between agreeableness and friendship involvement, but not between openness and friendship involvement. Moreover, none of the other personality traits from the five-factor model contributed significantly to friendship involvement. This finding supports our assumption that openness to experience and agreeableness are particularly crucial for social relationships, presumably because these personality traits match the most important social motives throughout life, i.e., knowledge-related and emotion-related motives.

At this point, it is crucial to note that we neither had the intention nor the means to provide evidence for socioemotional selectivity theory. We merely fell back on the assumption of socioemotional selectivity theory that in different phases of life, i.e. in middle and old age, different social motives are prioritized. This was done to bring forward the argument that different personality characteristics are associated with friendship involvement in middle and old age. Only this last part of the line of argument actually is supported by the results of the study. However, there might be alternative explanations for the result that openness predicts friendship involvement in middle but not in old age, and agreeableness predicts friendship involvement in old but not in middle age.

For example, to remain with openness, a correlation that is significant at younger ages might disappear at older ages because of significant restrictions in variance. Although we

found a somewhat reduced variance in openness in the older age group, this seems not to be responsible for the age-differential relations, since the variances of openness in model DIF2 could be restricted to equality across age groups without reductions in model fit (compared to DIF2: $\Delta\chi^2=0.83$; $df=1$; $p<.363$; compared to DIF1: $\Delta\chi^2=6.30$; $df=5$; $p<.278$) and without changing the correlation pattern.

On the other hand, since agreeableness has been found to be related to decreased mortality risk (Martin & Friedman, 2000), an actually existing significant correlation between agreeableness and friendship involvement might be underestimated at younger ages because the sample consists of heterogeneous subgroups that differ in agreeableness and mortality risk. With increasing age the previously underestimated correlation might appear because the subgroups that die at younger ages and have lower mean scores in agreeableness gradually diminish. This would imply higher mean scores and smaller standard deviations in agreeableness at older ages. And in fact, there is convergent empirical evidence that there are significant age differences in agreeableness in the predicted direction (e.g., McCrae, Costa, de Lima, Simoes, et al., 1999; Srivastava, John, Gosling, & Potter, 2003). In our own study, we also found a significant difference in agreeableness between the both age groups. In addition, the standard deviation in agreeableness was smaller in the older age group, though not statistically significant. However, it appears to be moot whether selective mortality may produce notable drop-outs at such a relatively young-old age as we have in our sample (61-64 years old). Nevertheless, it is an interesting question for future research whether the age-related differential correlations between openness and agreeableness, respectively, and friendship involvement really are based upon different social motives (as we have argued) or whether they are based on other grounds. More precisely, it should be examined whether a salient social motive (knowledge-related or emotion-related) enhances the interest in individuals with high levels in personality characteristics that fit this motive (openness or agreeableness).

To explore our second research question, we examined the connections between recalled quality of parent-child relations, personality traits, and friendship involvement in middle and old age. The findings suggest that the association between recalled quality of mother-child relationship and friendship involvement is mediated by personality traits. The recalled quality of father-child relationship was found to significantly contribute to friendship involvement independent from personality. That is, the results of the present study suggest differential patterns regarding recalled mother-child and father-child relationship, respectively, and their impact on friendship involvement in adulthood. While maternal representations contribute to friendship involvement solely through associated variables such as personality (or maybe other third variables not assessed in this study), paternal representations are clearly connected (though maybe mediated by third variables not assessed in this study) to friendship involvement in middle and old age. That is, participants recalled fathers and their relationships to their fathers in ways that are consistent with their descriptions of their friendships. This seems to indicate that there are some similarities between both kinds of relationships. Research has shown that fathers spend a greater percentage of their time with children in play than mothers and that the quality of play is different between mothers and fathers (for a review, see Parke & Buriel, 1998). While fathers seem to be more outward oriented in their play as well as in their general behavior (more involved in physical/outdoor play and fixing things around the house/garden than mothers), mothers seem to be more inward oriented (more involved in caregiving, household tasks, schoolwork, reading, and so on, than fathers). Therefore, relationships to fathers might be largely remembered as kind of playmate relations (that might have laid the foundation for later relations to non-kin, such as friendships), while ties to mothers might be rather remembered as nurturing relations (that might have laid the foundation for later kin relations, such as relations to own children). However, it has to be acknowledged that in the present study recalled father-child relations were rated more variably than recalled mother-child

relations (see again Table 1). Thus, it is more likely that recalled father-child relations will account for greater variation in another variable.

Our analyses showed only a slight association between recalled relationships and personality in the older age group. More precisely, the only link we found was between recalled mother-child relationship and agreeableness. However, in the younger age group, recalled mother-child relationship was significantly linked to agreeableness, neuroticism, and conscientiousness, while recalled father-child relationship was significantly linked to extraversion. That is, participants from the older age-group remembered the ties to their parents, particularly to their fathers, in ways that are less consistent with their personality but more positive (see again Table 1) than participants from the younger age group. This is in line with literature suggesting a general, i.e., independent from personality, tendency of older adults to reconstruct distant personal experiences positively (e.g., Kennedy, Mather, & Carstensen, 2004).

There are several limitations in the present study. Most notably, we relied on cross-sectional and in part retrospective data. There are a number of disadvantages associated with retrospective self-reports, such as memory biases and distortions. However, based on the fact that the results of retrospective studies are often confirmed by prospective studies, McCrae and Costa (1988a; p. 420) conclude that “(...) retrospective reports provide one useful source of evidence (...)” We adopted the view that researchers do not necessarily need to be concerned with the actual parenting behavior but can rely on recalled parent-child relations that reflect subjective theories derived from early relationship experiences and revised in interaction with subsequent social partners (e.g., Andersson & Stevens, 1993; Diehl, Elnick, Bourbeau, & Labouvie-Vief, 1998).

The cross-sectional nature of this study merely allows for relational statements and prohibits any statements concerning cause and effect (please note that a straight arrow or path in Figures 1 and 2 just indicates that there is a source of variance – where the arrow starts

from – that is used to account for variance in a target variable – where the arrow points at – in a regression analytic sense, and does not imply a true causal relation). While an interpretation of the observed connections is justified and necessary, it is important to acknowledge that there are always alternative interpretations. For example, the observed connections between recalled mother-child relation and agreeableness as well as between agreeableness and friendship involvement might be interpreted as personality bias in self-reports on social relationships in such a way that more agreeable persons selectively report more positive social relationships than less agreeable persons because of their greater harmonizing tendencies. While we cannot rule out this possibility, one would expect that such a personality bias should affect reports on social relationships in general. However, we only found significant links between agreeableness and recalled mother-child relationship not father-child relationship, and between agreeableness and friendship involvement in old age not in middle age. Moreover, our analyses showed that the relationship pattern between recalled parent-child relations, openness and agreeableness, respectively, and friendship involvement does not change (e.g., recalled father-child relations continue to contribute directly to friendship involvement), even when all of the Big Five personality dimensions are controlled for.

To conclude, we interpret the results of the present study such that a personality structure that matches social motives and a positive remembrance of a fundamental part of the lifelong history of relationship experiences, i.e., the relationship to parents (particularly relationship to father), enhance chances for being involved in friendships in middle and old age. However, prospective studies including measures of social motives and preferences are needed to prove our interpretation of the data across the life-span and to detect causal mechanisms. Since longitudinal designs covering such a long observation period are very costly and time-consuming, in the first step, already existing data sets that are not analyzed in this respect yet (e.g., Berkeley Older Generation Study; Field, 1999) might be helpful.

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Table 1: Descriptive data

Variable	Age group (in years)	
	43-46	61-64
<u>N</u>	392	345
<u>Women : Men</u>	187:205	161:184
<u>Family status</u>		
Married	73.2%	73.8%
Widowed	0.3%	10.0%
Divorced	14.0%	9.1%
Unmarried	12.5%	7.1%
<u>Income^a</u>		
≤ 2000 DM	9.6%	18.1%
2001-4000 DM	38.8%	62.9%
4001+ DM	51.7%	19.0%
<u>Education</u>		
0-9 years	27.7%	61.7%
10+ years	72.3%	38.3%
<u>Recalled mother-child relationship</u>		
Emotional tone	3.92 (0.93)	4.08 (0.90) *
Appreciation	3.54 (0.95)	3.65 (0.91)
Control	3.22 (0.95)	3.29 (0.91)
<u>Recalled father-child relationship</u>		
Emotional tone	3.61 (1.08)	3.97 (0.91) ***
Appreciation	3.37 (1.00)	3.58 (0.95) **
Control	3.43 (1.02)	3.11 (0.98) ***

Personality

Agreeableness	31.51 (4.90)	32.30 (4.63) *
Openness	27.35 (5.14)	26.03 (4.53) ***

Friendship involvement

behavioral	3.18 (1.30)	3.35 (1.12)
cognitive-emotional	3.04 (1.14)	3.67 (0.96) ***

Note.

* $p < .05$; ** $p < .01$; *** $p < .001$. ^a2000 DM equal approximately \$1000. Higher scores indicate higher levels. N (subgroups) varies between 234 and 392 due to missing data.

Table 2: Correlations among indicators for two age groups

Indicator	(SD _y /SD _o)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Mother: Emotional tone	(0.93/0.90)	—	.67	-.30	.39	.33	-.05	-.14	-.08	-.08	.12	.03	.01	.07	.12
2. Mother: Appreciation	(0.95/0.91)	.68	—	-.32	.19	.43	.01	-.04	-.07	-.09	.15	.13	.14	.10	-.02
3. Mother: Control	(0.95/0.91)	-.29	-.28	—	-.01	-.05	.22	.04	.07	.05	.00	-.02	.02	-.08	-.04
4. Father: Emotional tone	(1.08/0.91)	.51	.36	-.08	—	.67	-.34	-.07	.02	-.05	.10	.05	.00	.15	.28
5. Father: Appreciation	(1.00/0.95)	.44	.57	-.07	.72	—	-.30	-.01	.05	-.11	.12	.08	.05	.22	.24
6. Father: Control	(1.02/0.98)	-.21	-.24	.22	-.40	-.38	—	-.06	-.03	.04	-.01	-.01	.06	-.07	-.12
7. Openness1	(2.34/2.02)	-.05	.09	.03	-.03	.09	-.12	—	.22	.21	.03	.03	-.03	.05	-.06
8. Openness2	(2.18/2.19)	-.04	.02	-.02	-.02	.04	-.07	.25	—	.26	.03	-.00	.09	.05	.06
9. Openness3	(2.47/2.31)	.09	.11	-.10	-.02	.08	-.13	.33	.34	—	.09	.07	.02	.08	.09
10. Agreeableness1	(2.00/2.19)	.19	.16	-.02	.20	.20	-.06	.16	.03	.04	—	.44	.28	.22	.04
11. Agreeableness2	(2.51/2.20)	.16	.08	-.03	.14	.08	-.04	.03	-.06	-.15	.35	—	.35	.08	.10
12. Agreeableness3	(2.04/1.71)	-.06	.00	.03	-.05	.02	-.02	.17	.09	.01	.25	.38	—	.10	.17
13. Behavioral friendship involvement	(1.30/1.12)	-.05	.01	.13	.07	.11	-.02	.26	.12	.10	.13	.00	.11	—	.65
14. Cognitive-emotional friendship involvement	(1.14/0.96)	-.02	.05	.10	.07	.12	-.00	.23	.14	.10	.15	-.05	.13	.76	—

Note.

SD_y = standard deviation for the younger age group; SD_o = standard deviation for the older age group; values for the younger age group are below the diagonal; values for the older age group are above the diagonal.

Table 3: Standardized factor weights of the measurement models for both age groups

	Standardized factor weights	
	Younger age group	Older age group
	(n=392)	(n=345)
Mother-child relationship → Emotional tone	.84	.83
Mother-child relationship → Appreciation	.81	.80
Mother-child relationship → Control	-.35	-.33
Father-child relationship → Emotional tone	.84	.79
Father-child relationship → Appreciation	.86	.83
Father-child relationship → Control	-.43	-.38
Openness → Open1	.55	.47
Openness → Open2	.52	.43
Openness → Open3	.61	.52
Agreeableness → Agree1	.56	.52
Agreeableness → Agree2	.73	.70
Agreeableness → Agree3	.52	.48
Friendship involvement → Behavioral	.86	.81
Friendship involvement → Cognitive-emotional	.88	.83

Note.

RMSEA=.054; TLI=.985; CFI=.989.

Table 4: Fit indices for models of adult friendship involvement

Model	χ^2	df	$\Delta\chi^2$	TLI	CFI	RMSEA
M1 (mother all / father all)	454.18*	136		.983	.989	.056
M2 (age-differential effects)	457.91*	138	3.73 ^a	.983	.989	.056
M3 (mother med / father med)	482.79*	143	28.61 ^{a*}	.983	.988	.057
M4 (mother ind / father ind)	481.81*	147	27.63 ^{a*}	.984	.989	.056
M5 (mother all / father med)	481.45*	141	27.28 ^{a*}	.983	.988	.057
M6 (mother all / father ind)	460.33*	142	6.15 ^a	.984	.989	.055
M7 (mother med / father all)	462.89*	140	8.71 ^a	.984	.989	.056
M8 (mother med / father ind)	465.58*	144	11.40 ^a	.984	.989	.055
M9 (mother ind / father all)	470.01*	143	15.83 ^{a*}	.984	.989	.056
M10 (mother ind / father med)	483.97*	144	29.79 ^{a*}	.983	.988	.057
M11 (equality)	538.15*	176	72.57 ^{b*}	.985	.988	.053
M12 (ns. path deleted)	538.65*	177	0.50 ^c	.985	.988	.053

Note.

* $p < .05$; ^a compared to M1; ^b compared to M8; ^c compared to previous model; df = degrees of freedom; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root mean squared error of approximation; all = all effects model; ind = independence model; med = mediator model. Models are described in the text.

Figure Captions

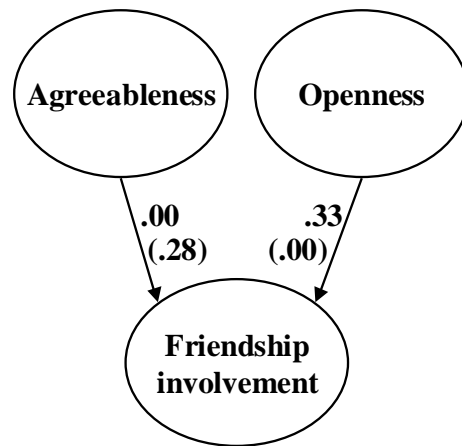
Figure 1

Age-differential links between personality traits and friendship involvement (model DIF2)

Figure 2

Final model (M12) of adult friendship involvement for both age groups

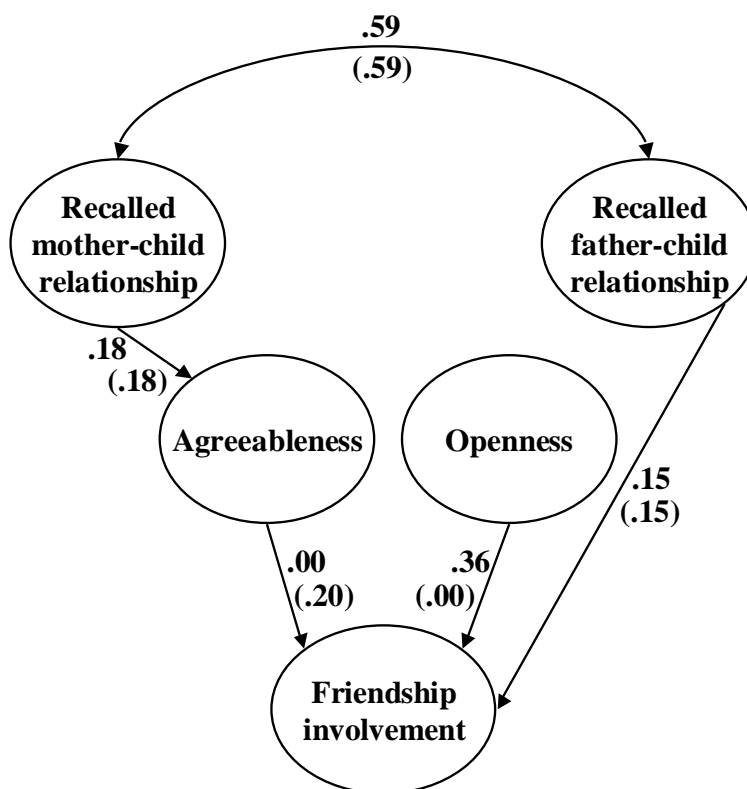
(Figure 1)



Note.

Numbers in brackets refer to the older age group. For all standardized path coefficients that are greater than zero $p < .05$. Model fit statistics: $\chi^2 = 91.53$; $df = 38$; $p < .05$; RMSEA = .044; TLI = .994; CFI = .997.

(Figure 2)



Note.

Numbers in brackets refer to the older age group. For all standardized path coefficients that are greater than zero $p < .05$. Model fit statistics: $\chi^2 = 538.65$; $df = 177$; $p < .05$; $RMSEA = .053$; $TLI = .985$; $CFI = .988$.