

»Pflegebedürftig« in der »Gesundheitsgesellschaft«

Tagung vom 26.–28. März 2009 in Halle (Saale)

Der Einfluss von Kognition, Depression, Sturzangst und selbst eingeschätztem Gesundheitsstatus auf motorische Fähigkeiten: Eine sekundäre Datenanalyse einer Studie zur Sturzprävention hilfs- und pflegebedürftiger Älterer in Deutschland

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HERAUSGEBER: JOHANN BEHRENS

REDAKTION & GESTALTUNG: GERO LANGER & MARIA GIRBIG

8. JAHRGANG

ISSN 1610-7268

34

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Redaktionsschluß: 3. Juli 2009p

IMPRESSUM

Die »Halleschen Beiträge zur Gesundheits- und Pflegewissenschaft« werden herausgegeben von Prof. Dr. phil. habil. Johann Behrens
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ISSN 1610-7268

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Zusammenfassung

Da Sturzgeschehen im Alter ein sehr häufiges Phänomen mit einschneidenden Komplikationen und Konsequenzen für den Betroffenen als auch die Gesellschaft ist, gilt es mit Blick auf die Ausrichtung von Interventionsmaßnahmen nach möglichen Einfluss- und Risikofaktoren zu suchen.

Mit dem physiologischen Alterungsprozess kommt es zu kognitiven Veränderungen und motorischen Einschränkungen beim Menschen, die oftmals mit Ängsten, depressiven Symptomen oder veränderter Selbsteinschätzung und Gesundheitsbeurteilung verbunden sein können.

Im Rahmen der vorliegenden Abschlussarbeit wurde anhand einer Sekundäranalyse zu einem Sturzpräventionsprojekt in Ulm/Deutschland der Frage nachgegangen, ob bei Älteren die eigene Einschätzung motorischer Fähigkeiten den wirklich leistbaren und

messbaren Fähigkeiten entspricht. Ausgehend von der Annahme, dass dies häufig nicht der Fall ist, wurde in den psychologischen Dimensionen Sturzangst, Kognition, Depressivität und selbst wahrgenommenem Gesundheitszustand nach möglichen Ursachen dafür gesucht.

Mit Hilfe objektiver motorischer Testverfahren konnte signifikant eine moderate Korrelation mit der selbst eingeschätzten motorischen Funktionsfähigkeit mittels Rivermead Score bestätigt werden. Im Vorliegen von Depressivität und schlecht eingeschätztem Gesundheitszustand konnten teilweise signifikante Zusammenhänge zur motorischen Selbsteinschätzung gefunden werden. Für Sturzangst und Kognition konnten keine statistisch signifikanten Einflüsse auf die motorische Selbsteinschätzung nachgewiesen werden.

In den eingesetzten Testverfahren sowie den Einschlusskriterien der Teilnehmer könnten mögliche Ursachen für den begrenzten Aussagewert der Daten liegen. Die Planung von sturzprophylaktischen Interventionen sollte die Dimensionen der Depressivität und kognitiven Einschränkungen berücksichtigen.

The influence of cognition, depression, fear of falling and self-rated health status on measures of motor performance: A secondary analysis on a translational study on fall prevention among elderly in need of care in Germany.

Abstract

Falls in the elderly are a common and frequent phenomenon. They cause major complications and consequences for the affected person as well as for the society. In order to develop interventions, predictors, and risk factors need to be found.

The physiological ageing process influences cognitive and motor performances. They often result in anxiety, depressive symptoms and changes in self-perception.

A German fall prevention programme was used for a secondary data analysis. It was looked whether the self-estimations of motor performance of the elderly are congruent to objective measured motor performances. It was assumed, that the psychological dimensions fear of falling, cognition, depression and self-perceived health status may cause differences between objective and self-estimated results.

The objective assessment *Rivermead Score* showed moderate but significant correlations with the self-rated motor performances. In depression and bad rated health status partly significant correlations with the motor self-assessment were found. No significant influences on the self-assessment were found for fear of falling and cognitive decline.

Possible causes for the weak results are assumed in the used assessments as well as in the inclusion criteria for the study participants.

By planning fall prevention interventions the psychological dimensions depression and cognitive reductions should be considered.

Schlagworte

- Stürze im Alter
 - Motorik
 - Selbsteinschätzung der Motorik
 - Depression
 - Kognition
 - falls in the elderly
 - self-assessment of motor performance
 - depression
 - cognition
 - fear of falling
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1 Introduction

With a prognostic rate on the elderly over 60 years of 37.4% on the whole German population in 2050, Germany is placed together with Japan on the top position of the world wide demographic ageing in the 21st century (Eisfeld, 2004). This fact is a challenge for science, politics and economy.

Physiological ageing processes lead to changes in physical, psychological, emotional and social aspects of the individual. Rising fears for the effected persons and multiple risks for the society are increasing regarding the need of help in old age which can lead to dependency for daily life. Especially falls in the elderly are an influential risk factor for the loss of mobility and independency. Falls in the elderly are mainly based on a risk combination, connected with an unsteady gait. Causes are mainly related to age dependent chronic and degenerative diseases, changes in the sensory system, in locomotion and posture. Also the misjudgement of own competences, psychological and cognitive influences can be of important relevance for falls. Especially for the health care system falls in the elderly cause enormous costs and are focused by political, societal and health-scientific discussions, research and interventions. The varieties of factors are starting points for prevention and rehabilitation by considering a holistic approach for assessment and treatment. Aim is the positive influence and the quality of life by increased activity, independency and own responsibility for one's life.

Following a literature research, cross-sectional data of a fall prevention study were used to look for relations between subjective and objective motor performances in the elderly. Depression, cognitive restrictions, fear of falling and subjective health status was examined for influences on the motor abilities. The results were discussed; possible interventions and considerable factors were shown.

2 Scientific question

Functional mobility and their self-assessment are based on an intact cognition of a person as well as on emotional und affective components (i.e. depression or fear of falling). That explains the necessity of a holistic approach and a combination of an objective and subjective survey. This approach has no long tradition in the research of motor performances yet. So it was looked for the reliability of the use of both techniques (objective vs. subjective) to evaluate an overall picture of motor abilities. The following research question resulted:

Do the self reported and functional measured motor performances of elderly people correspondent?

3 Status of research

3.1 Central aspects of the ageing process

Ageing is a complex, dynamic and physiological process with changes in biological-genetic, psychological and social contexts (Kruse, 2007). Chronological age, functional abilities

or the needs of help are no reliable indicators for being an old person. That is why gerontological research changed its focus from the age to the process of life long ageing. The old age became an independent stage of development in the human ontogenesis (Schmitt, 2004).

The primary aim of treatment of elderly is the prevention of disability, dependency or the need of care caused by chronically and degenerative diseases. Also context factors like cognitive deficits, depression, falls or less social integration are more and more taken into consideration. Therefore an interdisciplinary research as well as multimodal diagnostics and methodology are needed.

A typical phenomenon in the ageing process is multimorbidity. Especially in the higher ages the interpersonal variability of motor or cognitive abilities is very striking. Mostly the own assessed personal situation, the motor abilities and the competences for daily life can be influenced by reduced cognitive or emotional status. But elderly people very often show impressing strategies for the compensation or management of limitations. Evidence is given for increases beside physiological deficits into higher ages (Baltes, 1987; Heckhausen et al., 1989). Purposeful training and exercising of elderly people can increase the physiological, cognitive and emotional abilities and feelings. Important components for a positive ageing process are seen in being active, in ones own involvement and self-competence (Martin, 2000). Maintaining and supporting independence and well-being should be focused by research and interventions to support a self-controlled and fulfilled ageing process.

3.2 Motor development

The motor development of humans is an individual, multifactoral, age depending process of changes, resulting from the interplay of genetics, the person and environment. It proceeds over the whole life span and is intra- and inter-individual very different. It is signed by regeneration and degeneration of different body systems (Baur, 1994), and was called the *gain-loss dynamic* by Baltes & Graf (1996). Following Wollny (2002) people reach their motor performance level in early adulthood. A turning point with more or less involution starts in the middle adulthood. Table 1 auf der nächsten Seite shows general characteristics of development in adulthood. Essential for the motor performances in high and higher ages are biological aspects, the individual biography of motion, lifestyle, social aspects and interventions for training and exercising. Interactions of them lead to inter-individual motor differences (Wollny, 2002). Especially the survey of motor abilities and skills of the higher age groups are clearly underrepresented in the scientific literature (Baur, 1994; Wollny, 2002).

On the one hand the gender differences of the standard of performance become less with increasing age, but on the other hand there is increasing variability in the functional performances (Haywood, 1993). Often the ability of an independent life gets lost caused by restrictions of motor performances with following inactivity (Nikolaus, 2001).

Learning and training are also possible in older age and are showing positive effects for the physical, functional and psychological health. Haywood (1993; S. 4) said: „Learning and performing motor skills is a lifelong challenge.“

Table 1: Characteristics of development in the stages of adulthood (own arrangement following Baur, 1994 and Wollny, 2002)

early to middle adulthood [18/20 – 30/35 to 30/35 – 45/50 yrs.]	late adulthood [45/50 to 60/65 yrs.]	later adulthood [> 60/65 yrs.]
growth and mature	stability and maintenance	loss and decline
regeneration>degeneration	regeneration=degeneration	regeneration<degeneration

3.3 Self-assessment

Self-assessment is a subjective and conscious information process and can be related to different areas of life, the own abilities, behaviour and being. Self-assessment needs abilities for judgement which depends on personality and cognitive performance (Panzer, 2000). Schönemann-Gieck et al. (2003) showed that people with decreased cognition and dementia tended to overestimate their functional abilities. Further influences on self-assessment were found by Cress et al. (1995) in depressive symptoms, especially among institutionalized people or by Gunzelmann et al. (1999) in the level of education. The self-assessment of the motor performances was found to be very important for the activity level in the elderly as well as for participation or avoidance (Haywood, 1993). Kempen et al. (1996) and Anders et al. (2007) could find a valid overall picture for the real physical and functional abilities by using subjective and objective assessment methods. This approach was underpinned by Reuben et al. (1992) for functioning and health in clinics and research.

3.4 Fear of falling

Anxiety can be found very often in the elderly: in the age group over 65, Nikolaus & Pientka (1999) found a form of anxiety for 20%. Anxiety in older ages can influence the well-being as well as the daily functioning. When depression and anxiety come together in higher ages (Helmchen et al. (1996) found this in 18%), they become important risk factors for disability (Lenze et al., 2001). A frequent kind of anxiety in the elderly is fear of falling, with prevalence between 20 and 60% by Zijlstra et al. (2005) or 45.3% by Anders et al. (2006) in community dwelling elderly. The prevalence increases with age and is higher in women (Arfken et al., 1994). With a quote of 64.6% handicaps in seeing and hearing are influential risk factors for developing fear of falling (Anders et al., 2007). Fear of falling can be a *real anxiety*, resulting from a fall (= post-fall-anxiety-syndrome) or an *anticipated anxiety* by reduced health, functional deficits or personality characteristics. Tinetti et al. (1990), Leischker et al. (2003) and Gagnon et al. (2005) found a post-fall-anxiety-syndrome in 50% of their study population. It was mostly connected with gait deficits or depression. Mann et al. (2006) found a connection of generalized anxiety and depression with fear of falling. Sever consequence for elderly people, connecting fear of falling and age related functional deficits, is the development of a vicious circle (Martin et al., 2005), which includes physical and psychological/emotional deterioration,

dependency, social isolation and reduced quality of life (Mann et al, 2006). Because of its frequency, mobility reduction, reduced quality of life, functional decline and the loss of independency in daily life, fear of falling became highly relevant for research and interventions (Zijlstra et al., 2005).

From these perspectives the necessity of assessing, considering and treating anxiety and fear of falling in the medical, nursing and therapeutic care of elderly becomes clearer.

3.5 Depression

The prevalence of psychiatric diseases in the age group over 70 years is with 24% mostly identical with the rate in younger ages (Mayer et al., 1996). But because of the enormous impact of subdiagnostic, psychiatric diseases on the entirety of the individual and its environment it is more focused in older ages. Depressions are the most frequent and health influential psychiatric diseases in the elderly beside dementia (Mayer et al., 1996; Haupt, 2004) with prevalence between 18% (Bojack, 2003) and 27% (Helmchen et al., 1996). Among institutionalized older people depression can be found four times often (Plati et al., 2006). The number of unreported cases might be much higher: Heuft et al. (2006) guess about 40% of not identified depressions in the elderly. But these diagnoses are not treated well: about 80 to 90% of elderly depressed patients were not appropriately medical treated (Harris et al., 2006).

Age by its own can not be seen as risk factor for depression (Harris et al., 2006) but the ageing process with its physiological and/or pathological changes can cause a depression (Setz, 2003; Wahl & Kruse, 2003). So functional disability can be a risk factor for depression in the elderly (Yang, 2006; Lenze et al., 2001) but on the other side, depression can lead to functional reductions caused by reduced confidence and changed perception (Lenze et al., 2001). Gagnon et al. (2005) found direct connections between fear of falling and depression. Adler et al. (1999), Plati et al. (2006) and Chapman et al. (2006) could show that depression can cause cognitive reductions. A demarcation of both diseases (dementia vs. depression) is still difficult in diagnostic and therapy (Chapman et al., 2006). Also the knowledge about depression as a frequent risk factor for suicide is important for the work with elderly people (Mayer et al., 1996; Albani et al., 2005).

3.6 Cognition

Reductions of the intellectual abilities in older people are the most frequent psychological changes beside depressions (Mayer & Baltes, 1996). As age is the main risk factor for intellectual decline like dementia, the prevalence amounts to 43% in the ninety-year-olds and about 60% in the ninety-five-year-olds (Helmchen et al., 1996).

Cognition includes for example learning, remembering, explaining, reacting, storing or using (again) of information. Out of them our memory and language result as well as executive functions like decision, target, plan and judgement (Fillit et al., 2002). Perception, recognition and understanding of influences of our environment build the base for our knowledge, attention and motivation, concentration and creativity. Perception is an important aspect as well as an active and constructive process, based on sensory input,

like seeing, listening, gait and balance (Haywood, 1993). The cognitive development is a continuous, dynamic and complex process, resulting from the interaction between person and environment. Potential for cognitive development can be found in all ages (Rebok, 1987). Because of the progressive loss of neuronal capacity, the intellectual decline predominates the gains (Lovelace, 1990; Kausler, 1991). In the higher ages the decrease of cognitive performance and plasticity mainly concern memory and perception (Wahl & Kruse, 2003; Kruse, 2007) (see picture 1).

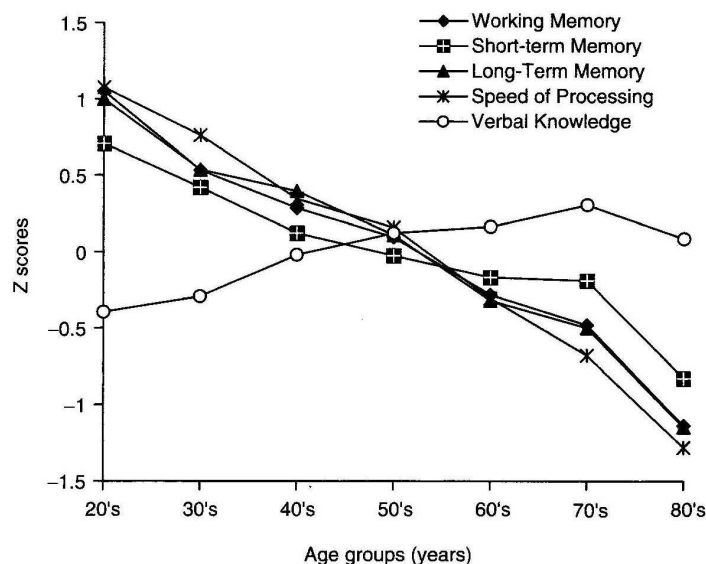


Figure 1: Development of different memory functions over the life span (from Hoyer & Verhaeghen, 2006; S. 211)

The life long process of cognitive development underlies big inter-individual differences, concerning start, extent and kind of change. Following Hoyer & Verhaeghen (2006) the memory function is influenced by the person's biography, life style, knowledge as well as by social, environmental and sensory variables. The differences with task complexity become bigger with age, where everyday functions are less affected than unusual tasks (Lovelace, 1990).

Important senses (listening and seeing) are reduced in older people, which are very important for the regulation of intellectual functioning (Baltes & Graf, 1996). This leads to insecurity and can cause depression and fears in the elderly (Schaller, 1995). Cognitive abilities and emotional health should be looked together in the assessment and care of older people (Carstensen et al., 2006). Cognitive abilities are important for problem solving and decision finding processes concerning daily or exercise specific tasks (Rebok, 1987). So cognitive functionality and physical conditions are equivalent important for the motor-sportive area. Motor and cognitive developments proceed together and influence each other: »Lack of knowledge can limit performance just as much as lack of strength or coordination. ... The development of perceptual-cognitive systems influences motor development.« (Haywood, 1993; S. 282).

The possibility for improvement of physical and intellectual abilities with increasing age is underpinned by Rowe & Kahn (1998; S. 63-64): »Just as we must keep our physical selves active, so we must keep our minds busy in our later years if we want it to continue to function well. . . . ›Use it or lose it‹ is a mental, not just a physical, phenomenon.«

Knowing the enormous rates of cognitive decline in the elderly and its influence on motor abilities and downfalls it becomes most important to consider the psychological dimension by all preventive and treating interventions in order to increase the elderly's security and to help to maintaining their independence and quality of life.

3.7 Quality of life and health status

Both aspects became more common and focused by gerontological researchers and scientists. The main goal is »not only to fill life with years, but to fill the won years with life«.

The subjective physical and psychological health status plays an important role in older ages for the valuation of their quality of life (QoL) (Kuin et al, 2001). Still there does not exist a valid definition of the concept of the health related QoL (Gunzelmann et al., 2006). It is a multidimensional construct, determined by physical, emotional, mental, social or cognitive aspects. In later adulthood, degenerative and chronic diseases are predominant. But especially the autonomic abilities corresponding with daily life (e.g. motor competences in ADL's and IADL's, social participation and leisure-time activities) are of important relevance for the subjective well-being, the perception of health and so with the QoL (Freiberger, 2001; Eisfeld, 2004; Anders et al., 2006).

Borchelt et al. (1996) found connections between the physical, spiritual and intellectual health. And Wahl & Kruse (2003) see an important influence of cognitive reserves in higher ages on the maintenance of independence in daily life. Also for the judgement of QoL cognitive abilities are necessary. In case of decreased cognitive performances the self-assessment of QoL is mostly negative assessed (see review of Scocco et al., 2006). To cope with daily life tasks, beside psychological competences also physical competences are needed (Baltes & Graf, 1996). The better the functional status of the elderly the bigger are the self-esteem and the self-respect. Maintaining independence in higher ages is a necessary factor for experiencing QoL (Yang, 2006). It was found by Ozcan et al. (2005) that fear of falling does negatively influence the QoL. That underlines the importance to consider QoL in the medical, nursing and therapeutic care of the elderly. Lin et al. (2007; S. 499) wrote especially for the fall prevention: »... little is known about potential benefits of fall prevention programs on the QoL of older people.«. Assessing and judging QoL, especially the health status, is a complex challenge and needs a multidimensional approach, considering subjective (e.g. perception and state of health) and objective views (e.g. resources or deficits).

4 Hypotheses

Based on several years working experiences as physiotherapist in the field of Geriatrics and following the literature research it is assumed, that there are connections between

the psychological and motor dimensions of a person. Following the research question of this paper the ability of elderly persons to perceive and to assess their own motor performances adequately underlies changes. They are caused by individual emotional and psychological factors. Two hypotheses are created, looking for answers in psychological aspects:

Hypothesis 1: The subjective assessment and the objective measurement of motor performances often do not correspond in the elderly. Psychological factors have different influential effects: they can cause under- or overestimation.

Hypothesis 2: The psychological dimensions cognition, depression, fear of falling and self-rated health status can cause misjudgement of motor performances.

In these chosen dimensions different directions of influences of the motor self-assessment are presumed. From this the following working hypotheses result:

Hypothesis 2a: Fear of falling causes an underrating of the own motor performances.

Hypothesis 2b: Depression leads to underrated motor performances.

Hypothesis 2c: An overestimation of motor performances is influenced by reduced cognition.

Hypothesis 2d: Bad rated health status can cause an underrating of the own motor performances.

5 Methods

The original project was a non-controlled observational study with translational character. It was carried out in an elderly population with starting or manifest need of help and care (see table 2, table 3 and table 4).

Table 2: Different activities of daily life being independent possible, gender separated

	Unlimited possible		
	female n (%)	maskuline n (%)	total n (%)
Walking in the flat	178 (97.8)	35 (94.6)	213 (97.3)
Using the toilet	176 (96.7)	34 (91.9)	210 (95.9)
Eating and drinking	176 (96.7)	32 (86.5)	208 (95.0)
Transfer	174 (95.6)	33 (89.2)	207 (94.5)
Dress and undress	140 (76.9)	25 (67.6)	165 (75.3)
Locomotion outside	117 (64.3)	19 (51.4)	136 (62.1)
Bathing/ showering	83 (45.6)	15 (40.5)	98 (44.8)

Against this background an interventional programme for prevention of falls (including exercises, hip protectors and information) was offered. Comprehensive assessments, concerning motor activities, psycho-social and care-relevant factors, were carried out in a pre-post-design. The title of the original project was: »Improving mobility and

Table 3: Used walking aid, separated for use in daily life and gait analysis as well as gender separated

	female n (%)	maskuline n (%)	total n (%)
Walking aid			
no	46 (25.3)	7 (18.9)	53 (24.2)
cane	102 (56.0)	27 (73.0)	129 (58.9)
rollator	87 (47.8)	15 (40.5)	102 (46.6)
wheelchair	7 (3.9)	2 (5.4)	9 (4.1)
Walking aid by gait analysis			
no	76 (42.5)	16 (43.2)	92 (42.6)
cane	45 (25.1)	15 (40.5)	60 (27.8)
two sticks	5 (2.8)	1 (2.7)	6 (2.8)
rollator	53 (29.6)	5 (13.5)	58 (26.9)

prevention of falls in community dwelling elderly, being in need of help and care«. It was located in Ulm/Germany and carried out from April 2002 till March 2005 (Becker et al., 2003, 2004, 2005). The main results were positive outcomes on falls (reduced frequency and injuries) and fall-related physical, psychological and social dimensions.

The secondary analysis is a cross sectional study as only the data from the first survey are considered. The determination of the correlation between data of self reports, clinical and functional measurements concerning balance, stability, mobility, and health were done via SAS-programme by a statistician. The data of 219 participants were surveyed by the author of this paper. They are scrutinized and discussed by the influencing factors cognition, fear of falling, depression and self-perceived health status. In table 5 the used assessments and screenings to assess the psychological dimensions and physical abilities are shown.

The correlative connection was shown by the *Spearman's Rho*. With help of the *Fishers Z-Transformation* the correlation of the differences of two samplings was calculated. The *level of significance* was fixed by $\alpha = 0.05$; the tolerable risk of mistakes was 5%. For some data the *confidence interval* »CI« was calculated. It was fixed with 95%. To proof the correspondence of the subjective judgement of mobility with standardized test results, the self-assessed results of the RMI were examined with the motor-assessed measurement. Here for the Spearman's rank correlation coefficient was calculated.

6 Results

The average age of the 219 participants was 82.4 years. The results of the assessed psychological dimensions are shown in table 6.

After the dichotomisation (see table 7) the following statements resulted:

1. Fear of falling was found in 43.4% of the study population.
2. 44.3% had depressive symptoms.

Table 4: Kind of care service dependent on the level of (nursing) care required («–» stands for not fulfilment of the criterions)

	level of (nursing) care required	female n (%)	maskuline n (%)	total n (%)
Health and advice centre	no	23 (12.6)	4 (10.8)	27 (12.3)
	level 1	36 (19.8)	5 (13.5)	41 (18.7)
	level 2	6 (3.3)	1 (2.7)	7 (3.2)
	level 3	1 (0.6)	1 (2.7)	1 (0.5)
	applied and rejected	8 (4.4)	3 (8.1)	11 (5.0)
	applied	9 (5.0)	1 (2.7)	10 (4.6)
Day care	no	1 (0.6)	-	1 (0.5)
	level 1	3 (1.7)	-	3 (1.4)
	level 2	2 (1.1)	1 (2.7)	3 (1.4)
	level 3	-	-	-
	applied and rejected	1 (0.6)	-	1 (0.5)
	applied	1 (0.6)	-	1 (0.5)
Family care	no	20 (11.0)	9 (24.3)	29 (13.2)
	level 1	4 (2.2)	2 (5.4)	6 (2.7)
	level 2	3 (1.7)	1 (2.7)	4 (1.8)
	level 3	-	1 (2.7)	1 (0.5)
	applied and rejected	1 (0.6)	-	1 (0.5)
	applied	4 (2.2)	-	4 (1.8)
Friends/neighbours	no	8 (4.4)	1 (2.7)	9 (4.1)
	level 1	2 (1.1)	-	2 (0.9)
	level 2	-	-	-
	level 3	-	-	-
	applied and rejected	1 (0.6)	1 (2.7)	2 (0.9)
	applied	-	-	-
Sheltered housing	no	24 (13.2)	2 (5.4)	26 (11.9)
	level 1	4 (2.2)	-	4 (1.8)
	level 2	-	-	-
	level 3	-	-	-
	applied and rejected	2 (1.1)	-	2 (0.9)
	applied	1 (0.6)	-	1 (0.5)
House keeping	no	1 (0.6)	2 (5.4)	3 (1.4)
	level 1	-	-	-
	level 2	-	-	-
	level 3	-	-	-
	applied and rejected	-	-	-
	applied	-	-	-
No care	no	14 (7.7)	3 (8.1)	17 (7.8)
	level 1	-	-	-
	level 2	-	-	-
	level 3	-	-	-
	applied and rejected	1 (0.6)	-	1 (0.5)
	applied	-	-	-

3. With a Median of 6.0 (females) and 4.0 points (masculine) and a fixed cut-off at ten points most of the participants were only minor limited in their cognitive performances.
4. Almost half of the study population (47.1%) estimated their health status as poor.
5. The Median of the self-assessed mobility is the same for women and men with 11.0 points. With a maximum score of 15 points for very good mobility, the overall score of 11.0 points stands for good subjective estimated motor performances.

Table 8 shows the results of the correlation for the single motor assessments, divided in functional and measured tests in relation to the self-assessment with the RMI. In the functional tests moderate correlations between 0.52 and 0.59 occur which are significant to the self-assessment. In the measured tests (gait parameters) moderate associations were found for the walking speed (with $r=0.56$) and the step length (with $r=0.50$) in relation to the self-assessment via RMI. Slightly associations to the self-assessment exist for the

Table 5: Used assessments with relevance for the secondary data-analysis (own arrangement)

ASSESSMENT	DIMENSION
SF-12 [question 1] (Ware et al., 1996)	Subjective health status
Short Orientation-Memory-Concentration Test (SOMC) (Katzmann et al., 1983)	Cognition
Geriatric Depression-Scale (GDS) [short form with 4 items] (Yesavage et al., 1983)	Depression
Rivermead Mobility Index (RMI) (Collen et al., 1991)	Daily routine/ Mobility
Single question	Fear of falling
Motor assessment: - clinical <ul style="list-style-type: none"> - Standing position - Three Chair Rise (CR) (Guralnik et al., 1994) - Two minutes walk (TMW) (Butland et al., 1982) 	<ul style="list-style-type: none"> - Functional balance - Functional power - Walking distance
Motor assessment: - equipped measures <ul style="list-style-type: none"> - Chair rise-measure - Isometric power of knee extension - Gait analysis 	<ul style="list-style-type: none"> - Functional power, time to transfer - power, power differences - Gait speed + step length + their variability

variability of the walking speed (with $r=0.25$) and the variability of the step length (with $r=0.30$). The objective recorded functional abilities (stand, TCR, walking distance) as well as walking speed and step length depict the self-rating via RMI good. Finally *hypothesis 1* needs to be disproved. The correlations are significant, but the associations are slightly to moderate. Only for the isometric power difference the hypothesis can be confirmed.

With the help of the secondary data analysis, *hypothesis 1*: »Subjective assessed and objective measured motor abilities of older people do not often correspond. There are under- and overestimations.« could not be confirmed. The RMI seemed to be a good assessment to reflect the objective acquired motor abilities of elderly people.

Hypothesis 2: »The psychological dimensions cognition, depression, fear of falling and self-rated health status can influence the personal judgement of motor abilities in the sense of misjudgement.« could be confirmed partly for depression (*hypothesis 2b*) and self-rated health status (*hypothesis 2d*)).

6.1 Depression

In table 9 the correlation of the step length shows a significant difference ($p=0.04$) in the case of depression. A tendency of a significant association with depression can be seen in the time to stand up with $p=0.05$. The working hypothesis *2b*) is confirmed for the gait parameter step length, however only in the sense of misjudgement.

6.2 Self rated health status

In table 10 a significant tendency occurs that poor self-assessed health influences the functional gait parameter ($p=0.05$). Significant differences between the assessments of the health status on the self-assessed and the measured motor abilities are shown for the

Table 6: Result of the dimensions, gender specific

	female	maskuline	total
Fear of falling n (%)			
not at all	57 (31.3)	15 (40.5)	72 (32.9)
a little bit	43 (23.6)	9 (24.3)	52 (23.7)
moderately	37 (20.3)	9 (24.3)	46 (21.0)
considerable	26 (14.3)	2 (5.4)	28 (12.8)
very	19 (10.4)	2 (5.4)	21 (9.6)
Depression n (%)			
yes	82 (45.0)	15 (40.5)	97 (44.3)
no	100 (55.0)	22 (59.5)	122 (55.7)
Cognition in points			
Min	0.0	0.0	0.0
Mean	6.7	6.1	6.6
Median	6.0	4.0	6.0
Max	28.0	25.0	28.0
SD	6.5	6.8	6.6
SF-12(1) n (%)			
excellent	1 (0.6)	-	1 (0.5)
very good	7 (3.9)	-	7 (3.2)
good	90 (49.5)	18 (48.7)	108 (49.2)
less good	76 (41.8)	12 (32.4)	88 (40.2)
poor	8 (4.4)	7 (18.9)	15 (6.9)
Rivermead in points			
Min	3.0	6.0	3.0
Mean	10.7	10.6	10.7
Median	11.0	11.0	11.0
Max	15.0	14.0	15.0
SD	2.2	2.0	2.2

Table 7: Dichotomisation of the psychological dimensions

	Variable 1	Variable 0
Subjective health status	poor status	good status
Cognition	with limits	no limits
Mobility and ADL's	immobility	good mobility
Fear of falling	with fear	no fear
Depression	depression	no depression

walking speed ($p=0.03$) and the step length ($p=0.04$). With those, the hypothesis 2d) can be verified for the walking speed and the step length.

7 Discussion

7.1 Results

Sample and statistical data: The aimed study population was included with the primary project: very old people with starting need of help for walking and in their daily life. The available data could only point to a misjudgement of the motor abilities, not to under- or over-estimation. The detailed verification of the working hypotheses was not possible.

Table 8: Correlation between self-assessment (RMI) and assessed from outside (functional and measured tests) of the motor performances. *When participants could not come to the measured tests, the number of participants is sometimes reduced

	Rivermeadscore Rho (n*) [p]
<i>Functional tests</i>	
Stand	0.52 (216) [< 0.001]
Three-Chair-Rise	0.55 (216) [< 0.001]
Walking distance	0.59 (216) [< 0.001]
<i>Measured tests – parameters of power</i>	
Functional power	0.22 (208) [0.001]
Time to stand up	0.31 (210) [< 0.001]
Isometric power	0.39 (206) [< 0.001]
Isometric power difference	0.04 (206) [0.58]
<i>Measured tests – parameters of gait</i>	
Walking speed	0.56 (216) [< 0.001]
Variability of walking speed	0.25 (216) [< 0.001]
Step length	0.50 (216) [< 0.001]
Variability of step length	0.30 (216) [< 0.001]

Table 9: Description of significant and mostly significant parameters of power and gait, related to the RMI, divided after having depression or not. *3 participants (=p), °9 p, °11p, °13p could not fulfil the exercise

Depression	yes	no
Time to stand up (in sec.) [°]		
n	90	120
Rho	0.16	0.41
95%-KI	(-0.05; 0.36)	(0.25; 0.55)
p-value	0.05	
Step length (in m) [*]		
n	94	122
Rho	0.40	0.61
95%-KI	(0.22; 0.56)	(0.48; 0.71)
p-value	0.04	

Fear of falling: People who were not afraid of falling had better agreements of their self-assessed and measured functionality. There was a tendency, that people with fear of falling could not estimate their power abilities very good.

Depression: The step length as a parameter of the gait showed a significant difference ($p=0.04$) between the measured and self-assessed motor abilities in the case of depression. This was also found in some other studies (Kempen et al., 1996; Gagnon et al., 2005). When a person is depressed and has reduced step lengths, it should be possible to conclude, that the walking speed and therefore the walking distance are affected as well. But no significant association was found in this analysis. With $p=0.05$ a tendency can be seen in the time for standing up.

Cognition: A minimum- and maximum score from zero to 28 points (among women) and from zero to 25 points (among men) was found. The Median of 6.0 is clearly under the threshold value of 11 points (Katzmann et al., 1983) for a possible demential change.

Table 10: Description of significant and mostly significant parameters of gait, related to the RMI, divided after poor or good estimated health status. *3 participants (=p), ⁹p, ¹¹p, ¹³p could not fulfil the exercise

SF-12(1)	poor	good
Walking distance (in m)*		
n	113	103
Rho	0.66	0.48
95%-KI	(0.54; 0.75)	(0.32; 0.62)
p-value	0.05	
Walking speed (in m/sec.)*		
n	113	103
Rho	0.65	0.44
95%-KI	(0.53; 0.75)	(0.27; 0.58)
p-value	0.03	
Step length (in m)*		
n	113	103
Rho	0.61	0.40
95%-KI	(0.48; 0.71)	(0.22; 0.55)
p-value	0.04	

Some of demented people in this sample could weaken the results. Contrary to that, Schönemann-Gieck et al. (2003) found in decreased cognition and demential diseases a tendency to overrate functional abilities in older ages. To clarify the influence of cognitive changes on the self-assessment of motor abilities, further research should include also people with sever cognitive limits.

Self-rated health status: For the walking speed (with $p=0.03$) and the step length ($p=0.04$) significant differences were found between bad rated health status and the self-assessed and measured motor abilities. Evidence therefore was also found in the literature (Kempen et al., 1996; Gunzelmann, 1999 and 2006; Ozcan et al., 2005). An association was found for step length, walking speed and walking distance (which was not the case in depression).

In general: Following the results by depression and bad self-rated health and their relevance for daily life, especially standing up and gait could be good parameters for further research in motor activity. The significant results were found in the apparatus measured tests. A better accuracy than by clinic-functional assessments is assumed.

7.2 Methods

Sample: The participation in the study was voluntary. As a result the study participants mostly had to be open minded, motivated, active and interested on the topics of motion and falls in the elderly. They showed a good mobility and independence or had good support. In the psychological dimensions more than half of them were evaluated as not affected. So it is assumed that heavily depressed, cognitive declined or very anxious test persons are underrepresented in the sample. So the study sample is not representative for the total population.

For the aspect of »age« the sample was very representative for higher age groups with an average of 82 years.

Home – versus laboratory environment: Especially the motor tests were done in a safe, but for the elderly person’s unknown environment. An unusual room, light, floor covering or chair, an observational person and a test situation can cause different actions and movements. The reality of the person’s daily routine is mostly well adjusted to their known environment. So the results could have been better or worse than normal.

Used assessments: For some of the participants the ten- or five-chair-rise was already a training intervention for power. In the usage of the chair-rise as assessment the range of tolerance in measurements with a stopwatch was one second for three times.

1. Changing position in bed	yes	no
Can you turn yourself in bed from the back to the side without others help?		
2. Changing position from laying to sitting	yes	no
Can you sit yourself upright on the edge of the bed from a laying position?		
3. Sitting balance	yes	no
Can you sit on the edge of the bed for 10 seconds without others help?		
4. From sitting to standing	yes	no
Can you stand up from a chair in less than 15 sec. and afterwards stand for 15 sec.?		
5. Free stand	yes	no
Can you stand for 10 sec. without help or aid?		
6. Transfer	yes	no
Can you transfer from your bed into a chair and back from the chair into the bed without others help?		
7. Walking within the house (aids are allowed)	yes	no
Can you walk 10 m in your flat without any others help? You are allowed to use a frame.		
8. Stairs	yes	no
Can you walk on flour without personal help?		
9. Walking outside the house (even surface)	yes	no
Can you walk by yourself on even surface outside of the house?		
10. Walking within the house (without aids)	yes	no
Can you walk 10 m in your flat without any walking aid and personal help?		
11. Picking up something	yes	no
In case something falls on the ground – can you walk 5 m, picking up the thing and come back?		
12. Walking outside the house (uneven surface)	yes	no
Can you walk on uneven surface outside the house without help?		
13. Using the bath	yes	no
Can you walk independently into your bathroom/ shower room and do your personal hygiene?		
14. Stairs up and down	yes	no
Can you go 4 steps upstairs and downstairs without using the banister?		
15. Running	yes	no
Can you run or walk very fast 10 meters?		

Figure 2: Rivermead Mobility Index

The sensitivity of the RMI is reduced by the two answering options with yes or no. No alternative (use of aids or persons) was possible. The 14 items of the RMI (see graphic 2) describe typical daily tasks. Finally the functional and measured tests focus the same dimensions, but they were done in standardized situations and with standardized methods. It also has to be considered the difference between self-report and professional consultation. Especially in the case of cognitive deficits misunderstandings with some questions may arise, leading to wrong answers (e.g. »What is uneven ground?«, »How long are 10 meters?«).

Knowing about the high rate of sub-clinical depressive symptoms, the use of only four questions of the Geriatric Depression Scale (see graphic 3) could not be as valid as the whole scale. The information gathered must be seen as a screening.

- | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none">1) Are you basically satisfied with your life?2) Do you have the feeling of an empty life?3) Are you permanently afraid that bad things could happen to you?4) Do you feel mostly happy and satisfied? |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Figure 3: Geriatric Depression-scale

Fear of falling was assessed with a single question. Knowing, that it is a complex construct, influenced by different aspects, it might be a better approach to perform an assessment with a more comprehensive test (like FES-I). This could increase the validity of the single self-information. The same is the case for the first question of the health related QoL. And still, the clarification of the validity and reliability of instruments to assess the QoL of elderly people is an important research object.

8 Prospects

Getting older is accompanied with (chronically) diseases and physiological processes of degeneration and losses, concerning bio-psycho-social processes of involution. Especially in higher ages enormous inter-individual differences can be found. But these declines can be slowed down or reduced by interventions and training. It is an important societal concern to value for a healthy and active life style. Beside losses, the life span is signed by wins as well. Therefore not only prevention should be supported. The promotion and backing of wins by learning and training is important as well. There is evidence for the success of preventive and rehabilitative interventions in the elderly. They can profit with increased performance in physical, emotional and psychological dimensions through activation and exercising. The fundamental concern is a holistic approach in the care and treatment of elderly people. Therefore trainings and interventions should focus on different aspects, e.g. power and memory and mood. To develop reliable assessments and multidimensional interventions, further research should be done by interdisciplinary cooperation. The use of subjective judgements and objective measures as well as self- and investigator-rating can create a global picture about the concerned person. Objective

tests should be focused on the daily reality of the elderly person. In a well known setting they have developed special strategies to compensate losses and adaptations on known activities. The goal of rehabilitation and prevention is to support healthy ageing to maintain independency. Multifactor interventions can help to increase subjective well-being and adequate adaptation abilities. Higher age is no contraindication to physical, psychotherapeutic or psycho-social interventions. It is still of a necessary concern to reach interests in fall prevention by the affected persons as well as by the supporting institutions. Risk factors for having a fall include physical, psychological and cognitive dimensions of the person. As a result, intervention programmes should include all these aspects. Beside changes of the environmental or physical conditions the personality has to be focused as well to trace a long-term success of treatments. Therapeutically interventions in the elderly should be carefully focused on QoL and well-being as well. Physical health can support a better self-perception and personal control and therefore protect the body more effective from stress, fears, sorrows or depression. The promotion of health should mainly support the competences of the elderly to maintain satisfied and as long as possible independent in their daily life. The picture of the aged can be strengthened by research results and motivation to keep and improve cognitive and physical competences as well as social engagement also after retirement. The potential of the elderly generation in their daily life should be supported, expected and used by the society.

9 Literature

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