

## Integration: Summary and Perspective

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The previous chapters describe a heterogeneity of approaches to the study of the trajectories of aging, which is paralleled by the heterogeneity of aging itself. The outline of this volume reflects the original design of LASA: changes with age in four components of functioning are the focus of attention – physical, cognitive, emotional, and social. In view of the close relation between these components or domains during the aging process, the distinction between them is basically artificial. However, the nature of each of these four components, as well as the state of the art in each specific area of research in which they are studied, lead to different approaches in terms of operational definitions and analytical models. Needless to say, the personal preferences of the researchers add to the heterogeneity of the approaches. All these ingredients, i.e. the selection of substantial aspects of functioning, the pertinent scientific area of research, its state of the art, and the preferences and abilities of the individual researchers add to the inter-disciplinary approach taken by the LASA team.

A consequence of making this basically artificial distinction between four components of functioning is that in one chapter one specific aspect of functioning is allotted the role of dependent variable, the change in which is predicted by other variables, whereas in another chapter it is allotted the role of predictor variable of change in another aspect of functioning. One example is functional limitations. Earlier in this volume, in Chapters 3.2 and 3.3, it is studied as the dependent variable indicating physical functioning, in which changes are predicted from baseline chronic conditions. Later on, however, it has been allotted the role of baseline predictor, and serves to predict change in cognitive functioning (Chapter 4.2), in depressive complaints (Chapter 5.2), and in social functioning (Chapters 6.2 and 6.3). Clearly, it is a matter of choice as to which aspect is dealt with as an outcome and which as a predictor variable in a particular sub-study. So far, there are insufficient data available to examine changes in predictor variables in relation to changes in

outcome variables, but even when these data are available, it will be almost impossible to present the full picture of the changes which occur with aging.

A well-known metaphor which is applied to knowledge and insight is the elephant. Several blind-folded men are asked to identify a huge elephant by feeling it with their hands. One man, standing at its back, feels its tail and says: 'Ah, I know what the elephant is like. It's a tall, slender animal.' The second man, who is standing at its side, feels its flank and says: 'Now I have a good impression of the elephant. It is massive and does not have any appendages.' The third man, standing in front of the elephant, feeling its trunk, says: 'This gives me a good picture of the elephant. It's very versatile and not massive.' The rhetorical question is: 'Are all these men picturing the same elephant?' As with the metaphoric elephant, we have to get to know changes in autonomy and well-being with aging by integrating what we observe, in a manner of speaking, by feeling the tail, the flanks, the legs and the trunk. Furthermore, in view of the heterogeneity of trajectories of aging, it will not be sufficient to integrate knowledge about just one elephant – we will have to get to know all the main types of the species.

An alternative to partitioning the research interests of the LASA team into four components, based on individual disciplines, would be to dissect each of the four components of functioning, and adhere to the dichotomy between pathological and normal aging. Indeed, some members of the LASA Advisory Board suggested that the research team should break away from the traditional 'division of labor' in terms of components of functioning, and should adopt an approach along the lines of clinical studies and of studies on normal aging. Clinical studies focus on risks, and are more relevant to clinical practice, by addressing aspects such as prevention and rehabilitation. Studies on normal aging might also benefit prevention and rehabilitation, but their initial focus is on description and on the testing of hypotheses. Moreover, they make it possible to highlight positive changes which occur with aging, rather than just negative ones. Both types of studies integrate all four components of functioning, in other words: 'features of the elephant'.

Despite ongoing discussions in the LASA team between representatives of the various disciplines, and between proponents of clinical or normal aging research, there is no need to determine a final 'division of labor'. Discussions, although confusing at times, are also beneficial, as they help to clarify the research goals of each team member. Individual research goals indicate why each researcher wants to get to know the metaphoric elephant, and which features are most important for her or him. However different these research goals may be, the ultimate goal is the same for all: understanding the changes that occur with aging, and the complex interplay between individuals and their environment in its effect on changes with aging, in order to provide a good quality of life for the increasing number of people who will be reaching old age in the decades to come.

### Is change inherent to aging?

This volume provides an initial overview of changes which occur during aging in relation to a comprehensive range of aspects of functioning. Data on changes in functioning are now available across a period of three years. There is a saying that three years last much longer in youth than in old age. Perhaps this saying is based on the idea that youth is more eventful than old age, so that in hindsight the time seems to have passed more slowly. However, older adults are no strangers to events which change their lives. In fact, the number of events they experience may equal or be even greater than those experienced by young adults. What is different, as old age approaches, is that more events are associated with losses, and fewer with gains (Baltes 1991).

The question which therefore arises is: What substantial change is found in 55-85 year-olds who age to 58-88 year-olds? In the area of physical functioning (Chapter 3), there was considerable incidence of all the chronic conditions studied, and consequently a decline in physical ability was observed more often than an improvement. Cognitive functions (Chapter 4) show more differentiation. Whereas for information-processing speed and fluid intelligence the respondents who showed a decline outnumbered those who showed an improvement, the opposite applied to memory function. Particularly in respondents who were younger than 75 years of age, more improvement than decline was found. With regard to emotional functioning (Chapter 5), it was found that the emergence of depression was not totally outweighed by remission, resulting in a slight increase in the average level of depressive symptoms in the cohort as a whole. However, decline and improvement in mastery and self-efficacy do outweigh one another, so that on average no change was observed across the study period. With regard to social functioning (Chapter 6), the average social network size was found to remain stable. Nevertheless, moderate to strong changes were observed in almost 50% of all respondents, of whom one quarter showed a decrease, and one quarter an increase in the number of personal relationships. Instrumental support received increased over time, although in a minority of respondents a decrease was also observed. Instrumental support given showed no changes, on average, although 7 to 8% of the cohort either gave more or gave less support across the duration of the study period. A similar ratio of stability and change applies to social participation.

Thus, the longitudinal data show that changes do, indeed, occur in older age. Whether these changes are losses or gains depends on the aspect of functioning to which they are related. Overall, slightly more losses were demonstrated. We now return to the question of whether these losses are substantial. In two chapters, an attempt has been made to rule out the observed change, due to measurement error. One chapter addresses 'critical' change, based on the reliability of the measurement

instrument (Chapter 4.2), and the other applies an 'arbitrary' lower limit to the variance explained by time in an individual growth curve approach (Chapter 6.2). Although both approaches are commendable, they do not address the issue of what is substantial change. In particular with regard to memory function, despite the fact that a critical change score was used, a sizeable number of respondents showed improvement, part of which was probably due to a practice effect. This leads to a further question: should a practice effect be considered as a measurement error, and should adjustment therefore be made in the analyses, or is it a substantial outcome that reveals the plasticity of the human mind? Metaphorically speaking: is it a feature of the elephant or a nearby rock?

The issue of the substantiality of change also pertains to the time-interval studied. For the assessment of some aspects of functioning, three years may be too long and important fluctuations could be missed. One example is the changeability of depressive symptoms. Therefore, a sub-study involving more frequent waves of data-collection has been carried out since the first cycle. For the assessment of other aspects of functioning, three years may be too short a period in which to observe substantial change. Personality characteristics may well belong to this category, as well as social support, especially if the objective is to observe positive changes. The disadvantage of a longer study period, of course, is the increased likelihood of attrition.

Another issue involved with change concerns its onset. Does change happen slowly, allowing time for continuous adaptation - perhaps until a critical limit is reached at which adaptation becomes more problematic? Or does change occur suddenly, implying that the risk of maladaptation is high? Both types of change are equally relevant to aging. Metaphorically, both represent important sub-species of elephants. So far, however, there are insufficient data to study these sub-species. At least three cycles of data-collection are needed to study non-linear change, and additional interim measurement, in sub-samples which are likely to show considerable change, are also helpful. Therefore, two years after the second data-collection cycle, approximately 300 frail respondents were re-interviewed. However some changes, such as falls and fractures, are sudden by definition, and answers to interview questions about such events may be sensitive to recall bias. Therefore, a three-monthly follow-up study has been initiated, following the second cycle, to monitor falls and fractures.

### **Aging and gender**

'Any attempt to summarize the findings of the previous chapters does not do justice to their diversity.' This citation from the final chapter of the previous volume which

reported on the baseline data (Deeg and Westendorp-de Serière 1994) was as true then as it is now. By way of compromise, the concluding chapter of the previous volume focused on a demographic aspect which was more or less explicit in every chapter: sex or gender. The chapter dealt with differences, as opposed to changes, as at that time only cross-sectional data were available. The present volume presents some evidence on gender differences in changes in functioning.

The longitudinal data which are now available mainly support the gender differences which were found earlier. Thus, it can be observed that in men there is a greater incidence of respiratory and cardiovascular diseases: chronic diseases that were observed to be more prevalent in men than in women at baseline. Vice versa, in women there is a greater incidence than in men of arthritis, fractures, and functional limitations (Chapter 3.2). Corresponding with these differential incidences, men have more contacts with medical specialists and are more often admitted to hospital than women, reflecting the more critical nature of the diseases involved (Verbrugge 1990). In contrast, women have more contacts with paramedical services (e.g. physiotherapy) than men (Chapter 7).

The greater prevalence of depression found in women compared to men, is reflected in a higher risk of both the emergence and persistence of depression. Parallel to these findings on depression, women show slightly more decline in mastery and self-efficacy than men (Chapters 5.2 and 5.3). On the other hand, the cross-sectional finding of a superior memory function in women, compared to men is supported longitudinally by a greater improvement in performance on the memory task found in women (Chapter 4.2).

Gender was not studied in relation to social functioning in Chapter 6.2, but Chapter 6.3 shows that participation in organizations, observed to be greater at baseline for men, was found to decline more rapidly across the study period for men than for women. In contrast, Chapter 7 shows that socio-cultural participation for women was found to decline more rapidly across the study period of three years than for men.

Finally, and not unexpectedly, men are less likely than women to survive the three-year study period. It is even more interesting to observe that this difference in survival rate between the sexes remains, even after controlling for age and disease status (Chapter 3.2). In an earlier study on mortality in the LASA sample, spanning a period of 29 months, persistence of this sex-difference was shown even after controlling for a large variety of psycho-social and life-style characteristics (Penninx et al 1997). There is an obvious trade-off between quality and quantity of life, in which women tend to forfeit quality for quantity, and men, quantity for quality. Without disregarding the ever-present question of why this should be so, it can be concluded that, metaphorically, there are at least two types of elephants to be studied - one of male and one of female gender.

### Identifying sub-groups of special interest

In the chapters which address the individual components of functioning, suggestions for further, interdisciplinary research have been given. More than one author has emphasized the importance of studying socio-economically or psycho-socially defined sub-groups of the sample in order to identify specific patterns of change in functioning. Even if a certain aspect of functioning averaged across the entire sample does not show much change, there will be sub-groups which manifest either more change or less change. Of course, the differential reliability of measurement instruments across sub-groups should be evaluated to prevent artifacts of measurement.

There are several reasons why the identification of specific, vulnerable sub-groups is relevant. Firstly, in the triad of primary, secondary, and tertiary prevention, the first two types are only marginally possible, due to the chronic nature of the majority of diseases which occur in old age. Thus, instead of attempting to identify risk *factors*, attention should be focused on risk *groups*, in which tertiary prevention is possible in principle. In this approach, sub-groups of particular importance are the frail older persons. This risk group is primarily defined by various aspects of health status. However, frailty is a characteristic that extends beyond health per se, and is closely associated with psycho-social, and perhaps even socio-economic aspects. Groups of frail older persons might be more easily recognizable by their socio-demographic characteristics.

Secondly, much can be learned from older persons with health problems who still manage to live a satisfying life. In one way or another, they have been able to adapt to living with their disease, and have come out perhaps even better. These are the successful agers. Most likely they can be identified by their positive psycho-social characteristics.

Thirdly, in adults, level of education is one of the main determinants of health status, in predictive ability exceeded only by age (Fengler 1997). In recent decades the level of education among older adults has been steadily increasing (Claessens 1988), and the number of persons with a low level of education (elementary school only) is expected to decrease by another 33% by the year 2015 (Verkleij 1997). Whether or not this implies that the health status of future older cohorts will be improved as compared to that of current older cohorts, remains to be seen. To settle this issue, it will be necessary to establish which is the stronger determinant of health status: relative inequalities in socio-economic status or an absolute, low level of socio-economic status. Insight into factors that influence health in both high and low socio-economic status groups will be helpful.

In the fourth place, a note of caution should be made with regard to attaching too much importance to vulnerable sub-groups. Consider the case of emotional func-

tioning. As has been stated (Chapter 5.2), the merits of a longitudinal design are particularly noticeable when studying a fluctuating condition such as depression. Because of the danger of over-representation of chronic cases, vulnerability factors appear to be more dominant cross-sectionally than longitudinally. Our empirical data already obtained give cause for rethinking the stress-vulnerability model on the origins of depression. However, before this can be done, the course of depression and its determinants in vulnerable and non-vulnerable groups should be studied carefully.

### **Policy relevance**

As was stated in the original proposal for LASA (Deeg 1993), proper insight into the processes of change – at both societal and individual level – should be the basis of policy-making. In fact, LASA was initiated by policy makers in the expectation of obtaining answers to research questions that are relevant to policies on aging. Based on longitudinal data, new policy objectives can be developed. Similarly, the consequences of existing policies can be assessed, after which, if necessary, these policies can be adjusted. Thus, longitudinal research provides a framework within which the policy-relevant aspects of aging and the effects of changes in policy can be assessed prospectively.

Among all the possible pitfalls which loom ahead of any longitudinal study (Deeg 1989), one of the main problems in LASA might be that in the phase of conceptualization, researchers and policy makers may use the same language, but they may have different expectations and interests. One factor which causes discrepancies is the fact that the longitudinal research design in itself, although it has the potential to fill a gap which is left by other, cross-sectional research designs, does not provide an answer to all possible research questions. For instance, the objective of monitoring changes in a cohort does not permit interventions to be applied in (sub-groups of) this cohort, and thus the implementation of policy measures cannot be evaluated without additional sampling. A second factor which causes discrepancies is the long time-period which is necessary before the data become truly longitudinal. During this time, the research environment may change (Lebowitz 1989). For example, research questions could become obsolete. By the time one predictor of an aspect of functional change has been shown to be of significantly greater influence than another, policy interests may have shifted away from that particular aspect of functioning. Moreover, newly arisen policy questions may require the application of new measurement instruments, the introduction of which into the study will jeopardize the continuity of measurements made with the existing instruments, and thus limit the possibility to monitor change. Furthermore, changes in the research environment

may stem from growing concern about confidentiality, resulting in increasing difficulty in tracking respondents, in studying specific groups, or in linking records for multidimensional follow-up. Such changes in the research environment could enhance the discrepancies between the initial expectations and the actual outcomes of the study. The worst consequence of these discrepancies would be disturbance of the continuity of the study.

In all phases of the study, then, it is of vital importance that use is made of the available data, in such a way that research questions with both scientific and societal relevance are addressed (Lebowitz 1989). For this purpose, both researchers and policy-makers must be sufficiently motivated to formulate and address such questions. The expectations of both researchers and policy-makers need to be monitored closely, and the research questions addressed need to be finely tuned to unite the needs of policy with the feasibility of research. Finally, the societal relevance of a longitudinal study depends on the constant availability of 'translators' who understand the language of both researchers and policy-makers.

Ever since the initiation of LASA, fortunately, the interaction between policy-makers in government and researchers in university has been continuing on a steady basis. Occasionally, this interaction has been extended to include non-governmental policy-makers or practitioners. One of the highlights so far, in January 1997, was the LASA workshop for participants from the fields of policy, health care, and organizations of older persons, on the translation of recent research findings to daily practice. Based on the discussions during this workshop, a symposium was held in May 1997, at which occasion research findings were presented to a broad audience, and were discussed under the active leadership of a Member of Parliament. Symposium participants received a booklet in which, with the help of a publicist, the research findings were described in everyday language (Westendorp 1997).

## Conclusion

This volume presents a comprehensive overview of the change and stability associated with aging, albeit across a study period of only three years. However, several pieces of evidence have already become apparent. Whether the changes that occur with aging are great or small, or can be considered as losses or gains, depends on the component of functioning involved. In all components, a considerable number of respondents show improvement. Overall, however, slightly more losses have been demonstrated. Speaking in the metaphor used above, the elephant is starting to reveal its contours.

Among the recommendations for further research, the third data-collection cycle will be of vital importance. Not only will it provide data across a period that is twice

as long, it will also make it possible to distinguish causes from effects with regard to changes in functioning. However, some suggestions for further, related research can already be made, based on the currently available evidence. For example, adverse consequences appear to be less strongly related to disease than to functioning itself. This suggests the need for interventions focused on improvement in functioning. In addition to presenting new data on changes associated with aging, this volume can form a conceptual basis for the formulation of new interdisciplinary research questions. Ultimately, this volume demonstrates the benefits of the close collaboration between scientists of various disciplines that is characteristic of the LASA study.

### Literature

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