

# **The planning and design of a longitudinal study**

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# Overview of presentation

1. Basic idea and considerations concerning a longitudinal study.
2. Example: The IDA program is briefly overviewed.
3. You plan a longitudinal study.
4. Example: The long term-development of gifted children: A newly started project.
5. You discuss some of your plans for longitudinal studies

# The longitudinal study

A longitudinal study is usually defined as a study where the same persons are studied on at least two occasions in a nonexperimental setting and the time period covered is not very "short".

The basic purpose can be different: 1. The study of individual development or 2. The study of group development.

In a simple longitudinal study one sample is studied repeatedly but there are more complex design like longisectional designs where several samples are followed longitudinally but with different start ages.

*Green is our focus*

# *Pros et cons of a longitudinal design*

## **Advantages**

To understand individual development you must study individual development.

The design is a powerful tool for detecting changes when group development is at focus (which is not the case here).

Age effects are not contaminated by cohort/generation effects.

## **Disadvantages**

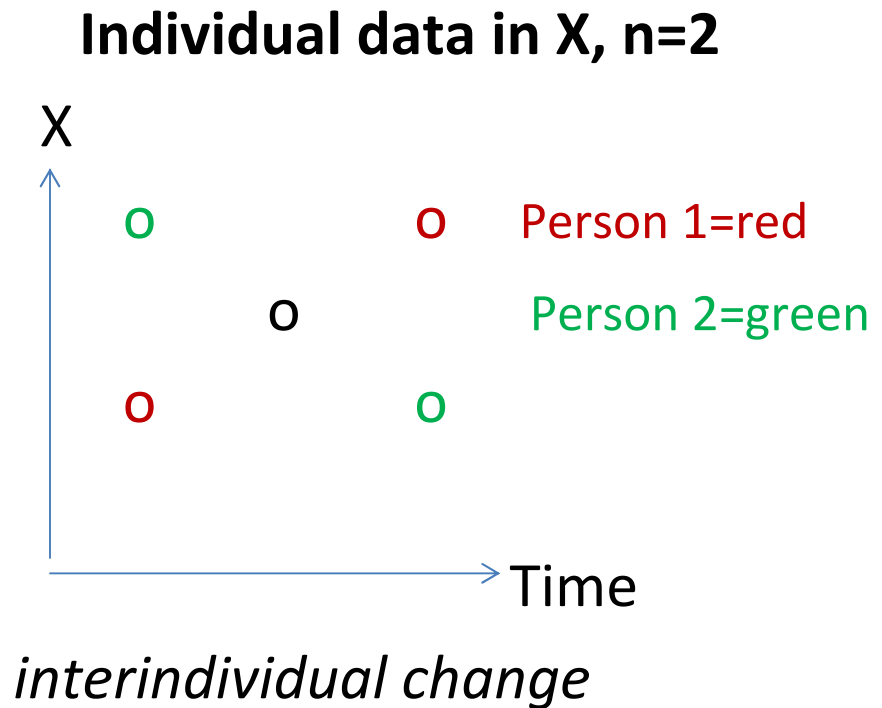
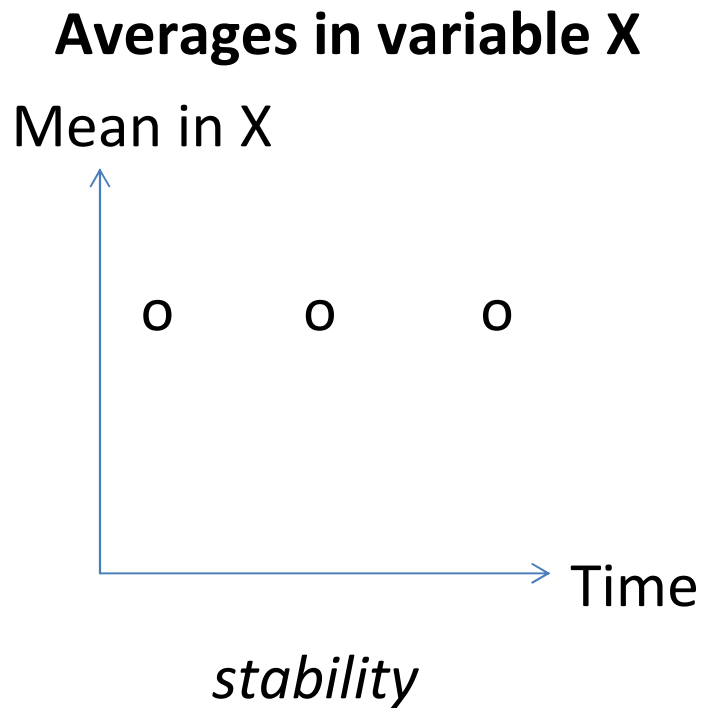
Generalization across cohorts/generations can be difficult.

Expensive and time-consuming.

Can be hard to fund.

The problem of fading relevancy.

# Conclusions from different designs



If instead a cross-sectional design with two different samples from the two ages is used, cohort and age effects confounded.

# Overview of IDA: Basic idea

- During the beginning of the sixties the idea of a longitudinal study of school children's adjustment took form. The originators were David Magnusson and Anders Dunér, both with a background as elementary school teachers.
- They were unhappy with current knowledge that was focused on variables regarded separately or in pairs.
- They wanted to understand the development of children in a school context and then, as far as possible, to understand the growing individual as a "whole".

# Basic design considerations

A longitudinal design is necessary.

Information from many different areas must be collected.

A good-sized “representative” group necessary to study children with pronounced adjustment problems.

The design must be optimized to reduce sample attrition.

A representative community cohort preferable to a random sample from “all Sweden”.

# Brief overview of major data collections: I

The first data collection was performed in 1965 and covered two whole school grade cohorts in Örebro, the ***pilot group*** (grade 6, aged 13 years) and the ***main group*** (Grade 3, aged 10). *Only the main group is presented here.* It consisted of about 1000 children in 1965 and through the coming years children who moved into Örebro were added to the study group.

In grades 3, 6, 8, and 9 major data collections were performed that at one or more time-points covered, for instance, achievement, intelligence, peer relations, self- parent-, and teacher-rated adjustment, criminality, psychiatric problems, norms, etc.

In grade 6 a biomedical subsample (n~250) was studied with regard to physical fitness and the excretion of catecholamines.



# Brief overview of major data collections:



In high school grades 1, 2, 3 and at age 26 more limited data collections were performed, mostly concerned with self-rated adjustment and educational and vocational preferences and plans.

A full medical examination was carried out for the biomedical sub sample at age 26.

At age 43 (women) and age 47 (males) extensive new data collections were carried out. They concerned, for instance, social adjustment, educational and vocational career, detailed life history, personality inventories, self-reported health data, SWB, memory data, etc. Drop-out below 20%

At age 43 (females) an extended biomedical sample was studied in various ways: A full medical examination, various medical questionnaires, blood, urine, and saliva samples taken and stored and various medical parameters measured.

## A selection of ongoing project within IDA

Project	Project leader
The long-term development of intellectually gifted children	Lars Bergman (just started)
Health & stress; health & positive function	Petra Lindfors & Ulf Lundberg
Criminality in a life-span perspective	Håkan Stattin, Örebro University
The importance of peer group relations for long-term adjustment	Peter Zettergren
Friendship in childhood and adult outcomes	Brett Laursen, Florida Atlantic University
Networks of peer relations and the vocational career	Katariina Salmela Aro & Noona Kiuro, University of Jyväskylä
The importance of skills in childhood for adult outcomes	Greg Duncan, University of California
The vocational and educational career	Magnus Sverke
Intelligence & health-related factors	Karin Modig, KI
Vitamin D status & cognitive and personality factors	Lars Bergman & Petra Lindfors (to be started)

# More about IDA

IDA was led by David Magnusson from its start in 1964 to 1994 when Lars Bergman became the PI. In November 2011 Henrik and Anna-Karin Andershed, Örebro University became the new PI:s.

Research related to the IDA program has per January 2007 resulted in 121 articles published in peer-reviewed scientific journals, 18 books, 78 chapters in edited books, and hundreds of other publications. 16 doctoral dissertations have been based on IDA data.

***IDA is a unique data base and it contains data of interest to many researchers.***

The researcher interested in using IDA data should contact the new PI (Henrik Andershed).

## **You plan a longitudinal study and we discuss**

**You are interested in the individual development of personality and your framework is the Big Five Factor model (Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). You are interested in the development between the ages 18 to 28 and you believe educational & vocational experiences, family formation, IQ, Parents' SES, and urban vs. rural environment are important to personality development. And you just received adequate funding for a longitudinal study of this topic ....**

- 1. Design a longitudinal study.**
- 2. Indicate some basic statistical analyses you want to perform.**

***I will be back in 20 minutes, you present your design & analyses & we discuss.***

**Note. If you instead prefer your own topic, that is fine.**

# The long-term development of intellectually gifted children: A newly started project\*

Lars R. Bergman

Presentation at a seminar, Department of Psychology, Stockholm  
University, April 3, 2012

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STINSEN foundation*

# The long-term development of intellectually gifted children

The project has recently started and it will mainly be based on IDA data.

With “intelligence” is here meant the g-factor.

Different definitions of “intellectually gifted” will be applied but often the top 10% ( $z \geq 1.28$ ;  $IQ \geq 119$ ) will be studied and contrasted to those with normal intelligence (IQ between the 40<sup>th</sup> and 60<sup>th</sup> percentile).

The average IQ of those in various qualified professions (like civil engineer, doctor, social scientist, etc.) is according to some American studies in the range 110-120 (Houser, 2002; Huang, 2001).

# The broad research areas within the project

1. The adjustment of gifted children in childhood and adulthood.
2. The extent to which outcomes for gifted children are decided by factors that “should” be irrelevant (like gender and social background).
3. Estimating the talent reserve.
4. Intellectual giftedness in a general competence profile and its importance for educational and vocational success.
5. The importance of intellectual giftedness for health-related outcomes.

# Strengths and limitations of the project

It is a limitation the cohort is restricted to one “old” generation, to one country and, within that, to one community.

It is a strength that rich data are available for a fairly large and representative Swedish sample and for a very long part of development (age 10 to midlife).

It is also a strength that we can measure IQ with very high reliability (above 0.95) and that the measures are taken *before* streaming in school.



# The project group

Håkan Andersson

Lars Bergman

Jelena Corovic

Laura Ferrer Wreder

Karin Modig, KI

Linda Wänström, Department of Statistics

Peter Zettergren

**Own income before taxes in midlife according to gender and intelligence group. Means in thousands of SEK (95% CI:s within parenthesis).**

***Only employed and preliminary findings***

Intelligence group	Men	Women
IQ below 40 <sup>th</sup> percentile	23.2 (21.6, 24.8) N=111	14.1 (13.5, 14.7) N=138
IQ 40 <sup>th</sup> -60 <sup>th</sup> percentile	<b>25.9</b> (23.4, 28.4) N=52	<b>15.3</b> (14.5, 16.1) N=85
IQ 60 <sup>th</sup> -80 <sup>th</sup> percentile	30.0 (24.9, 35.2) N=56	16.1 (15.0, 17.2) N=113
IQ 80 <sup>th</sup> -90 <sup>th</sup> percentile	27.5 (23.9, 31.2) N=28	17.1 (15.4, 18.8) N=56
IQ above 90 <sup>th</sup> percentile	<b>43.0</b> (32.3, 53.6) N=36	<b>16.4</b> (14.6, 18.2) N=46

**Final education according to Intelligence group. Within each intelligence group the percentages of subjects with a certain final education are given. N=934**

Intelligence group	Not completed 3-year high school	Academic degree
IQ below 40 <sup>th</sup> percentile	69.2 N=233	3.0 N=10
IQ 40 <sup>th</sup> -60 <sup>th</sup> percentile	47.6 N=88	10.3 N=19
IQ 60 <sup>th</sup> -80 <sup>th</sup> percentile	30.0 N=64	15.5 N=33
IQ 80 <sup>th</sup> -90 <sup>th</sup> percentile	24.3 N=24	24.3 N=24
IQ above 90 <sup>th</sup> percentile	13.0 N=13	38.0 N=38

## Cross-tabulation between typical positive competence profiles and high income. Males

Results taken from Andersson & Bergman, in prep.

*High income = top 20%*

	IQ	Task pers.	Asp.	Income		%High
				Low	High	
Cluster 2,	<i>N</i>	<i>N</i>	<i>H</i>	12	4	25%
Cluster 5,	<i>H</i>	<i>H</i>	<i>N</i>	14	13*	48%
Cluster 6,	<i>H</i>	<i>N</i>	<i>H</i>	22	5	19%
Cluster 8,	<i>H</i>	<i>H</i>	<i>H</i>	9	11*	55%
All others				119	8	6%

\*Type,  $p < .01$  after Bonferroni correction

H means clearly above average, N means normal

*The percentage having a high income is 9 times higher for **highly competent** than for “All others”*

Note. In an MRA predicting income at adult age from age 13 information, Task pers. and Asp. were significant predictors but **not** IQ. (Andersson & Bergman, 2011).

# Nonlinear monotonic relationships

Sometimes a theory states there is a monotonic but nonlinear relationship between X and Y.

Two examples:

1. The relationship between cumulative risk and a “bad” outcome is believed to be nonlinear in the sense that the presence of just a few risk factors is not believed to much increase the risk of a bad outcome but when a certain threshold is passed the risk increases strongly.
2. When intelligence increases from low to somewhat above average, the life-style becomes more health conscious but an even higher intelligence level gives no additional benefits.

# Scale level and the detection of nonlinearity

Scales are usually analyzed by methods that assume interval scale data. However, often they are essentially ordinal scales with ties (e.g. 5 items scaled 1-4 are summed and several persons are clustered at each possible sum score).

A small method study on IDA data “supports” this conclusion.

If two interval scaled variables, X and Y, having a “perfect” monotonic relationship, are transformed to ordinal scales, the transformed variables will *always* have a linear relationship.

The issue of scale level and relationships is complex.

However, this issue comes up in our project .....

# Your career & longitudinal research

It is normally not advisable for a PH D student or a post doc to start a longitudinal study (hard to finance, delayed publications).

It can be a good idea to join an ongoing longitudinal project at your department.

It can sometimes be an even better idea to seek out an ongoing longitudinal project somewhere else that has collected data of the type you are interested in.

Often extremely valuable research results from cross-disciplinary research, three good candidates for a psychologist to consider are economics, political science, and epidemiology.

What about your planned or  
ongoing longitudinal  
research?