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Going beyond age comparisons in developmental research:

A plea for the use of a Brunswikian approach to experimental designs in developmental research

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Methodological challenges and possible solutions to developmental research

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Challenges:

- Time frame
- Fuzzy categories
- Recruitment

Problematic practices:

- (Extreme) Group comparisons
- Cross-sectional designs
- Correlational designs

Possible Solutions:

- Cross-sequential designs (but….)
- Continuous age samples
- Experimental designs
- A plea for representative designs

Challenges

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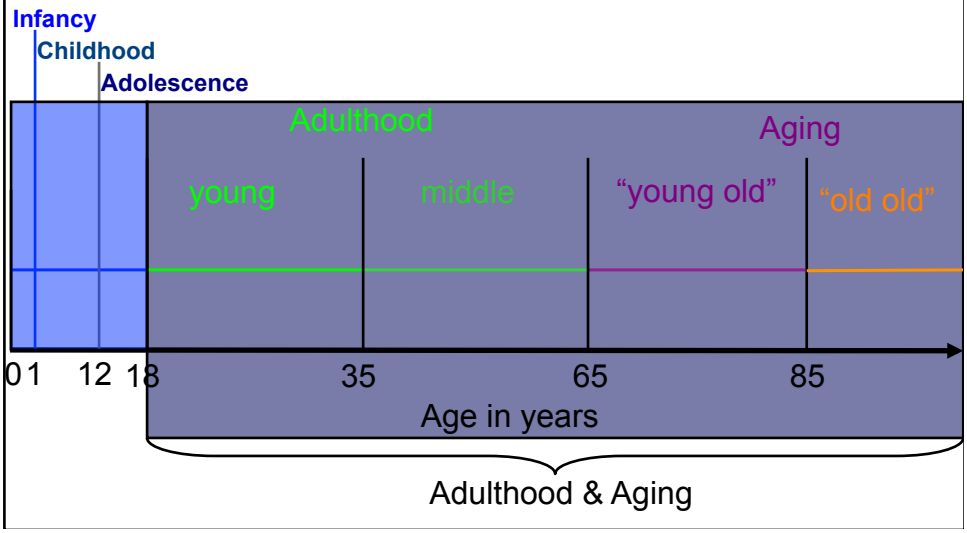
Time frame for developmental research



Longitudinal designs

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Need to span years or even decades can create some problems:

- **Funding**
- **Time-sensitivity of publications for individual career**
- **Research questions & methods change over time**
- **Pragmatic challenge of keeping track of participants over time without compromising data security & anonymity**

Methodological concerns (Schaie, 1965):

-**Confound age-graded, cohort-graded, history-graded influences**

-**Re-test effects**

Cross-sequential designs (Baltes, 1968; Schaie & Baltes, 1975; Baltes, Reese, & Nesselroade, 1979)

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Time of test → Cohort (year of birth)	1980	1990	2000
1920	60 →	70 →	80
1930	50	60	70
1940	40	60	60

longitudinal

Cross-sectional

Cohort effect

And still ….

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… it is only correlational data

-> Temporal information is provided

-> but NO CAUSAL inferences can be drawn

(third variable causation cannot be addressed, even if extending to multivariate space; Nesselroade, 1970).

Not surprisingly, many studies

(1) …use cross-sectional age comparisons
(and interpret age-group differences as developmental change)

(2) …compare extreme groups of young and older adults
(and interpret age-group differences as linear developmental change)

(3) … use mediation analyses to test if a potentially causal variable mediates the relationship between age as an independent variable and the dependent variable
(and interpret mediator as developmental process; for problems with "CAVE" see Lindenberger et al., 2011)

Cross sectional comparisons

(1) Based on the (problematic) assumption that differences *between* persons (e.g., 1 vs. 2 year old children, young vs. old adults) are indicative of developmental differences *within* persons over time

(2) There might be multiple pathways to the same developmental outcomes (i.e., interindividual differences in the factors causing developmental change).

Problems of age-group comparisons

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Selection of age groups

(1) no clear (theoretically derived) delineation of age groups

(2) great heterogeneity in adult development (due to greater impact of non-normative events)

Factors influencing development (Baltes, Reese, & Lippsitt, 1980)

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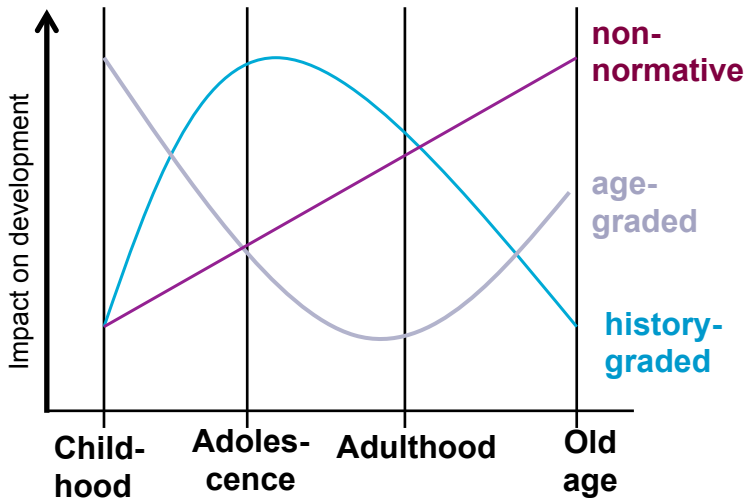

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Pragmatic solution

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- Age group comparisons
- In adulthood and aging: comparison of young and older adults

Recruitment of

- **undergraduate students (18 – 27 yrs; very homogeneous regarding life style, education, …)**
- **community samples of older adults (65 yrs and older; often very heterogeneous regarding life style, education, …)**

Problems with age-group comparisons in adulthood

Comparison of a young students with community dwelling older adults

-> confound of age group and specific effects associated with being a student (e.g., emphasis on achievement; living in shared housing)

Problems with age-group comparisons in adulthood

Comparison of a very homogeneous group (young) with a more heterogeneous group (old)

-> danger of methodological artifacts in finding interactions (i.e., association not present in younger adults due to reduced variance but present in older adults)

Problems of differential heterogeneity in age groups

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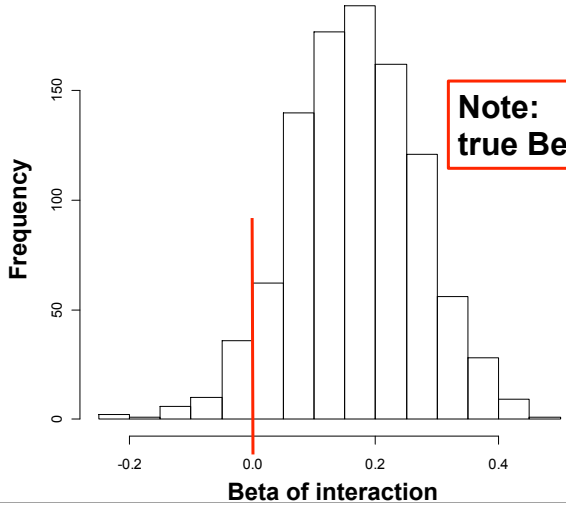
Simulation Results:
Regression weight of interaction age x variable of interest



Note:
true Beta of interaction = 0

Problems of differential heterogeneity in age groups

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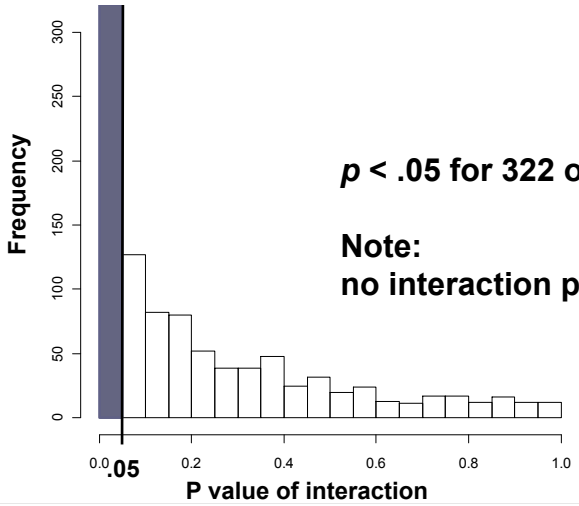
Simulation Results:
P value of interaction age x variable of interest



***p* < .05 for 322 out of 1000 runs**

Note:
no interaction present in the data

Problems of age-group comparisons

Extreme group comparisons

-> overestimation of effect sizes (inflates false-positive findings; Preacher, Rucker, McCallum, & Niecewander, 2005)

-> coupled with reliance on single study papers and low prestige of replications: high costs for wrongly assuming effects

Potential Solutions: Experimental Designs

Simulate aging by manipulating variables that are hypothesized to drive age-related differences

Examples:

Socio-emotional selectivity theory

(Carstensen, Charles, & Isaacowitz, 1999)

- **Hypothesis: Future time perspective drives age-related effects on social motivation**
- **Manipulation of time perspective (extended vs. short) using vignettes describing hypothetical situations: Extended time perspective simulates young adulthood, short time perspective simulates old age**
- **Assessment of effects on extended vs. short time perspective on social selectivity**

Potential Solutions: Training Studies

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Simulate aging by manipulating variables that are hypothesized to drive age-related differences

Examples: Training studies

- **Test of the "disuse" hypothesis (or variants):**
  - **Training can simulate younger ages in older adults by bringing older adults to the same level of use of a given behavior / cognitive operation as younger adults**
  - **Training can simulate older ages in younger adults by inducing life experiences associated with old adulthood in younger adults (e.g., emotion regulation training)**

Problems:

- **Assumes that "atrophied" functioning can be reversed**
- **Can only simulate "use" not "disuse"**

Brunswikian approach to experimentation

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Representative Design

Basic assumption:
Psychological phenomena represent the adjustment of an organism to a probabilistic ("semi-erratic") environment

Experiments need to recreate the organism's ecology in terms of
(a) stimuli / materials,
(b) their interrelations,
(c) the possible responses

"Generalizability of results concerning. . . the variables involved [in the experiment] must remain limited unless the range, but better also the distribution. . . of each variable, has been made representative of a carefully defined set of conditions"
(Brunswik, 1956, p. 53).

Brunswikian approach to experimentation

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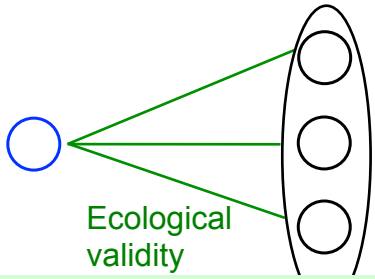

"Ecological validity is a statistical concept based on the principles of contingency or correlation and requiring the … gathering of a representative array of information. In the general case it involves the integration of both positive and negative, confirming and disconfirming (…) instances of concomitance of the distal variable with the cue variable." (Brunswik, 1957, p. 16).

Brunswikian approach to experimentation

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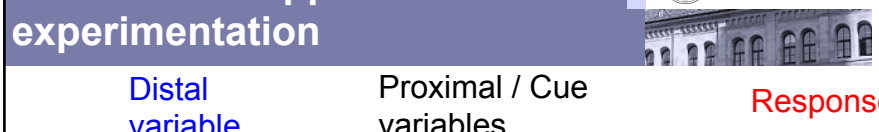

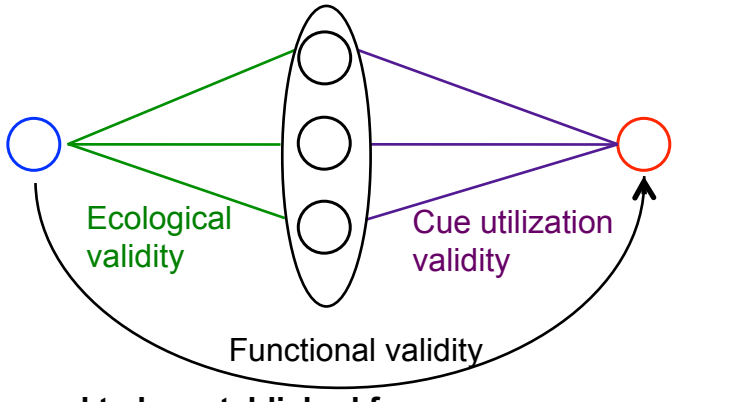

Validities need to be established for the different age groups under investigation