Dimensional Comparisons and their Consequences for Self-Concept and Motivation

Jens Möller
University of Kiel, Germany

CONFERENCE GENDER AND STEM; 9/6/2012
Exercise:

Please remember a single school subject in which you felt you were just not good in.
Exercise:

Please remember a single school subject in which you felt you were just not good in.

Then think about a second school subject in which you felt you were just good in.
Social Comparison Effects

(„How good am I in math/English compared with my class mates?“)

- Verbal Achievement → Verbal Self-Concept
- Math Achievement → Math Self-Concept
Big-Fish-in-a-little-Pond-Effekt

Students A und B

M_{Class1}

M_{Class2}

Class 1

Class 2

Achievement
Dimensional comparison effects
Comparisons between different domains within a person

How good am I in math compared with my own achievements in German?
With persistent difficulties I was permanently on the edge. On the opposite of the A in German was the E in math. The A in arts could not balance out the E in Latin. The B in history and geography barely managed to compensate the D in English.
With persistent difficulties I was permanently on the edge. On the opposite of the A in German was the E in math. The A in arts could not balance out the E in Latin. The B in history and geography barely managed to compensate the D in English.
Unfortunately the bright heads were also good in sports; weak in orthography does not mean strong in sports

(Walter Kempowski, in Heile Welt, 1998)

“people assess their own skills by comparing their performances with those of other people and with their own performances across domains”

Eccles (2009)

„I am really talented in Physics – and I‘m looking good!“

(Girl, 15 years old)
Overview

Dimensional comparisons?

- ... in everyday life
- ... influencing self-concept of ability
- ... as the basis of Internal/External frame of reference model
- ... in experimental studies
- ... in meta-analysis
- ... and gender?
**Dimensional comparisons**

... in everyday life

- Diary studies, 14 days, students from universities and schools
- Students were asked to write down every dimensional comparison that came to their mind
- Variables
  - Target domain
  - Standard domain
  - Comparison direction
  - Mood
We received our school reports and I compared my grade in Religion which was worse than my grade in Mathematics.

I am less talented in technical things (e.g. understanding computers) than in fine arts.

I had to hurry to get to school. I saw my accordion and the lesson that afternoon came to my mind. I said to myself that I am at least better in physics than I am at playing the accordion.

Although I am not intelligent above average, I have a quite high emotional intelligence.

I guess I am not the most beautiful girl but I have a good heart. I made this comparison while chatting with my best friend about the beauty craze at our school.

In a situation in which I thought I better should have said something else I figured about myself: ”Maybe I do not think about what I say long enough, instead I am spontaneously honest.”
Results

→ 436 comparisons in 2 weeks, $\varnothing=6.51$ pro Person

Domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>Target domain</th>
<th>Standard domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>39</td>
<td>29.4</td>
</tr>
<tr>
<td>Social</td>
<td>39</td>
<td>28.9</td>
</tr>
<tr>
<td>Hobbies</td>
<td>11</td>
<td>12.8</td>
</tr>
<tr>
<td>Self</td>
<td>20.9</td>
<td>18.4</td>
</tr>
</tbody>
</table>
Results

Comparison Direction

- Upwards:
  - All: 70.5
  - Female: 72
  - Male: 59.2

- Downwards:
  - All: 20.9
  - Female: 20.4
  - Male: 24.1

- Same:
  - All: 8.7
  - Female: 7.6
  - Male: 16.7
Results

- Mood impacts comparison direction!
  - Positive mood \rightarrow \text{Downward comparisons}
  - Negative mood \rightarrow \text{Upward comparisons}

- Comparison direction impacts mood!
  - \text{Upward comparisons} \rightarrow \text{Positive mood}
  - \text{Downward comparisons} \rightarrow \text{Negative mood}
Summary

- Dimensional comparisons occur in everyday life.
- People compare different aspects within (academic/academic) and between (academic/friendship) domains.
- Most of them are upward comparisons with better-off domains, in particular females use upward comparisons.
- Dimensional comparisons regulate mood.
Overview

Dimensional comparisons?

• ... in everyday life
• ... influencing self-concept of ability
• ... as the basis of Internal/External frame of reference model
• ... in experimental studies
• ... in meta-analysis
• ... and gender?
Reciprocal Internal/External Frame of Reference Model

Social Environment
- Cultural Environment
- Learning Behavior of Significant Others
- Past Experiences with Learning
- Performance
- Feedback at School
- Gender roles

Subjective Processing
- Perception of the social environment
- Interpretation and attribution of past learning experiences

Expectancy: Will I be able to learn?
- Domain-specific self-concepts

Value: Do I want to learn and why?
- Value - Interest
- Enjoyment
- Importance
- Utility
- Costs

Learning Behavior
- Course Choice
- Learning Amount
- Persistence
- Effort
- Learning Strategies

Learning results
- Comprehension
- Motivational and affective learning results
Hierarchic Self-Concept Model
Shavelson et al. (1976)

- General Self-Concept
  - Academic Self-Concept
    - Academic
      - English
      - History
      - Maths
      - Biology
  - Social Self-Concept
  - Emotional Self-Concept
    - Others
    - Emotions
  - Physical Self-Concept
    - Fitness
    - Appearance

Academic
Non-academic
# Items of the Math Self-concept Scale

<table>
<thead>
<tr>
<th></th>
<th>strongly agree</th>
<th>agree</th>
<th>disagree</th>
<th>strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would like math much more if it weren’t so hard.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Nobody’s perfect. I’m just not good in math.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. In some things in math that I don’t understand, I know from the start that I just won’t get it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Math just does not appeal to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hierarchic Self-Concept Model
Shavelson et al. (1976)

General Self-Concept

Academic Self-Concept
- English
- History
- Maths
- Biology

Social Self-Concept
- Friends
- Others

Emotional Self-Concept
- Emotions

Physical Self-Concept
- Fitness
- Appearance
Modified Self-Concept Model

(Mathash, Byrne & Shavelson, 1988)
Overview

Dimensional comparisons?
• ... in everyday life
• ... influencing self-concept of ability
• ... as the basis of Internal/External frame of reference model
• ... in experimental studies
• ... in meta-analysis
• ... and what about gender?
The I/E Model (Marsh, 1990)

To evaluate their performance students use

• Social comparisons (external frame), comparing their achievement in one subject with the achievement of their classmates;

• Dimensional comparisons (internal frame), comparing their own achievement in one subject with that in other subjects.

• E.g., if their verbal achievement is higher than their classmates’, their verbal self-concept will also be higher.
• Because achievements in school subjects are typically positively correlated, it would seem reasonable to assume that domain-specific self-concepts are positively correlated.

• Effects of dimensional comparisons may explain the domain-specificity of academic self-concepts and the often very low correlation observed between verbal and math self-concept.

• Really high achievement in one domain leads to an underestimation of achievement in other domains.

• As a consequence of dimensional comparisons, e. g. a highly talented student may develop an average self-concept in his worst subject, even though his performance in this subject is well above average.
Internal/External Frame of Reference Model

- **Verbal Achievement**
  - β=++ → Verbal Self-Concept

- **Math Achievement**
  - r=++ → Math Self-Concept

- **Verbal Self-Concept**
  - β=++ → Math Achievement
  - r=0

- **Math Self-Concept**
  - β=- → Verbal Achievement

---

Social Comparison Effects

Internal Comparison Effects
An Experiment

- $N = 258$ students; 7th, 8th und 9th graders
- Got exams back in German and math the same day
- What about their self-concepts?
Math self-concept

Jens Möller Universität Kiel
Math self-concept

Math grade

German grade
- good
- average
- deficient
Math self-concept

Math grade

German grade
- good
- average
- deficient

Math self-concept vs. Math grade

Jens Möller Universität Kiel
Overview

Dimensional comparisons?

• ... in everyday life
• ... influencing self-concept of ability
• ... as the basis of Internal/External frame of reference model
• ... in meta-analysis
• ... in experimental studies
• ... and gender?
Meta-analysis of all studies on the I/E model: Sample of studies

69 studies from different countries (Australia, Arab Emirates, China, Germany, Norway, US, etc.)

Total N = 126,455 between 72 and 14825

Age between 8 and 23

Different self-concept measures

Different achievement measures: Grades and tests
Results of the Meta-Analysis: All Studies

Verbal Achievement \[ \beta = -0.27 \]

Verbal Self-Concept \[ \beta = -0.21 \]

Math Achievement \[ r = 0.67 \]

Math Self-Concept \[ r = 0.10 \]

Social Comparison Effects

Dimensional Comparison Effects
Results of the Meta-Analysis: Grades / Tests

Verbal Achievement

Math Achievement

Verbal Self-Concept

Math Self-Concept

β = -0.25 / -0.28

β = -0.20 / -0.18

β = 0.68 / 0.47

β = 0.75 / 0.57

r = 0.54 / 0.74

r = 0.07

Social Comparison Effects

Dimensional Comparison Effects
The meta-analysis confirmed the central assumptions of the I/E model.

(a) Math and verbal achievements correlate positively and substantively;

(b) Math and verbal self-concepts correlate moderately

(c) Achievements in both domains positively affect the corresponding academic self-concepts

(d) Achievements in both domains negatively affect the non-corresponding academic self-concepts.

(e) The I/E model fits the data quite well as particular group of analyses showed, relatively independently of
   1. Gender groups
   2. Participant age
   3. Nationality
   4. Sample size
   5. Kind of achievement measure
Overview

Dimensional comparisons?

- ... in everyday life
- ... influencing self-concept of ability
- ... as the basis of Internal/External frame of reference model
- ... in meta-analysis
- ... in experimental studies
- ... and gender?
Another Experiment
Math feedback impacts on math self-concept

Mathematical Competence: $t = 2.55, p < .05$

Self-concept

Positive math feedback

Negative math feedback
Math feedback impacts on verbal self-concept

Mathematische Kompetenz: $t = 2.55, p < .05$; verbale Kompetenz: $t = 2.84, p < .01$
Math feedback impacts on verbal self-concept

Jens Möller Universität Kiel

Mathematical competence: $t_{34} = 2.55, p < .05$; verbal competence: $t_{34} = 2.84, p < .01$
Conclusions

Dimensional comparisons between domains

- occur in everyday life,
- are useful to regulate (enhance, maintain) self-worth and mood,
- are useful to detect strengths and weaknesses while contrasting self-concepts,
- are useful to facilitate some decisions,
- although they lead to some biased self-evaluations.
Overview

Dimensional comparisons?

• ... in everyday life
• ... influencing self-concept of ability
• ... as the basis of Internal/External frame of reference model
• ... in meta-analysis
• ... in experimental studies
• ... and gender?
Gender

• Only a few studies
• A lot of similarities between gender groups.
• Girls and boys use dimensional comparisons.
• BFLPE and I/E model fit for both groups.
• But: Girls have lower math self-concepts.
• In particular, girls with good achievements in both, math and English, devalue their math abilities.
Negative interdependence of ability beliefs

• \( N = 1.114 \) grade 7 and 8

• Subjective ability beliefs (z.B. „I think that some people are talented in math whereas others are talented in verbal domains“)

  German - Math combination (\( M = 2.57; \ SD = .61 \))  
  German – English combination (\( M = 2.07; \ SD = .51 \)).  
  Math-Chemistry combination (\( M = 1.89, \ SD = .46 \)).

• Median Dichotomization
  - Students with Domain Specific Ability Theory  
    („students’ grades in math and German tend to be quite different“)
  - Students with Domain Unspecific Ability Theory  
    („students’ grades in math and German tend to be similar“)
Ability Beliefs

Verbal Achievement $\Rightarrow$ Verbal Self-concept
$\beta = 0.55$
$\beta = 0.62$

Math Achievement $\Rightarrow$ Math Self-concept
$\beta = -0.20$
$\beta = -0.45$

Math Achievement $\Rightarrow$ Verbal Self-concept
$\beta = 0.53$
$\beta = 0.72$

Verbal Achievement $\Rightarrow$ Math Self-concept

Domain Unspecific Ability Theory
Domain Specific Ability Theory
Gender

- Only a few studies
- A lot of similarities between gender groups.
- Girls and boys use dimensional comparisons.
- BFLPE and I/E model fit for both groups.
- But: Girls have lower math self-concepts.
- In particular, girls with good achievements in both, math and English, devalue their math abilities.
- It might help to talk about domain similarity not distinctiveness.
ENDE

jmoeller@psychologie.uni-kiel.de