Students’ Achievement Emotions: 
Contrasting Interindividual and Intraindividual Perspectives

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Research in the behavioral sciences

- Theories pertain to within-person psychological functioning (e.g., theories on functions + origins on emotion, motivation, achievement)
- However: more than 90% of studies use sample parameters based on between-person variation
- Problem: cannot infer within-person functioning from between-person variation

Interindividual / intraindividual covariation: statistically independent, can diverge widely

Prior Research

RESEARCH PROBLEM
Covariation between and within persons

- Between-person vs. within-person covariation can be non-equivalent
- Experimental studies: Between-subject mean effects can mask differential effects for different individuals
- Between-person and within-person parameters for levels, development, functions of variables can differ

Theories + empirical studies needed to examine equivalence, combining between-person + within-person approaches

Schmitz & Skinner, JPSP, 1993
RESEARCH ON ACHIEVEMENT EMOTIONS

RESEARCH PROBLEM
Achievement Emotions

- Achievement emotions = emotions related to
  - achievement activities
  - success and failure outcomes
On average, students feel bored 32% of classroom instruction time.

Csikszentmihalyi & Larson, 1987
ESM Study
Interindividual vs. intraindividual perspectives on achievement emotions experienced by students

1. Developmental trajectories
2. Functions for motivation and performance
3. Origins: Appraisals and achievement goals

Theoretical framework
Control-value theory of achievement emotions (Pekrun, 2006)

Empirical evidence
Preliminary (diaries, experience sampling, interviews)

Control-value theory of achievement emotions: Relative equivalence of between-person vs. within-person parameters

1. Process parameters (frequency, intensity, decay time, etc.):
   - vary across domains, genders, contexts, individuals
   → not equivalent
2. Functional relations (functions, origins)
   - proposed to be universal
   → equivalent between / within individuals
   → equivalent across individuals

Prior research
- Academic domains:
  Levels of emotions vary across domains, relations with achievement are similar
- Gender:
  Levels of math emotions vary between females + males, relations with control and value appraisals similar
- Cultural context:
  Levels of emotions differ between Chinese and German students, relations with appraisals, parents' expectations are similar

Present research
- Equivalence between / within individuals

E.g., Goetz, Pekrun et al., Journal of Educational Psychology, 2007
- **Theory**
  - Developmental trajectories (levels, shape) vary across students
    → non-equivalence of between- vs. within-person parameters

- **Method**
  - Diary study of student teachers’ emotions before and during final university exams
  - \( N = 72 \) (53 female), 42 days
  - Daily assessment of exam-related emotions using rating scales
  - e.g., anxiety + hope assessed using substantives: “anxiety”, “hope”; 1 = not at all, 5 = very strong

**Test Anxiety: Average Development**

<table>
<thead>
<tr>
<th>Days</th>
<th>Test anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>5.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Test Anxiety: Individual Developments**

**Development of Test Anxiety: Examples**

Subject No. 120
\( x=4.24 \ s=0.78 \)

Subject No. 105
\( x=3.00 \ s=0.76 \)

Subject No. 115
\( x=1.10 \ s=0.42 \)
**Test Hope: Average Development**

- **First examination**
  - **Test hope**
    - 5.0
    - 4.0
    - 3.0
    - 2.0
    - 1.0

**Development of Test Hope: Examples**

- **Subject No. 24**
  - $x=4.48$, $s=0.44$
- **Subject No. 18**
  - $x=3.01$, $s=0.13$
- **Subject No. 50**
  - $x=2.50$, $s=0.83$

**Conclusions**

- Developmental trajectories (levels, shape) vary widely across individuals
- Parameters based on interindividual distribution (mean development) essentially meaningless
- Development of achievement emotions: between- / within-person parameters not equivalent
Functions for Motivation and Performance

2 x 2 Taxonomy of Achievement Emotions

<table>
<thead>
<tr>
<th>Positive Emotions</th>
<th>Negative Emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activating</strong></td>
<td></td>
</tr>
<tr>
<td>Enjoyment</td>
<td>Anger</td>
</tr>
<tr>
<td>Hope</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Pride</td>
<td>Shame</td>
</tr>
<tr>
<td><strong>Deactivating</strong></td>
<td></td>
</tr>
<tr>
<td>Relief</td>
<td>Hopelessness</td>
</tr>
<tr>
<td>Relaxation</td>
<td>Boredom</td>
</tr>
</tbody>
</table>

Cognitive-Motivational Model of Emotion Effects

- **Positive activating emotions**: (e.g., enjoyment, hope, pride)
- **Positive deactivating emotions**: (e.g., relief, relaxation)
- **Negative activating emotions**: (e.g., anger, anxiety, shame)
- **Negative deactivating emotions**: (e.g., hopelessness, boredom)
Exploratory Analysis: Which Emotions are Experienced in Achievement Settings?

BETWEEN-PERSON STUDIES

FUNCTIONS: BETWEEN-PERSON STUDIES

Types of Studies

(1) Experiments
- Induction of affective states
- DVs: Cognitive resources, problem solving strategies, retrieval-induced forgetting + facilitation, etc.
  (e.g., Kuhbandner, Spitzer, & Pekrun, 2011, Psychological Science; Spachtholz, Kuhbandner, & Pekrun, 2014, JEP: General)

(2) Field Studies
- Cross-sectional, longitudinal
- Achievement emotions, motivation, learning strategies, performance outcomes, etc.
  (e.g., Pekrun et al., 2002, Educational Psychologist; Murayama et al., 2013, Child Development)

Example: PALMA

Project for the Analysis of Learning and Achievement in Mathematics (PALMA)
- Annual assessments of emotions, learning, achievement, classroom instruction, family environments in mathematics
- Grades 5 to 10 (present analysis: 5 to 9)

Sample
- Longitudinal student sample: N = 3,530 (49.7% female)
- 42 schools (Hauptschule, Realschule, Gymnasium)
- representative for Bavarian student population

PALMA: Longitudinal Analysis of Emotion and Performance

(1) Theory
- Reciprocal effects model of emotion and achievement

(2) Variables
- Achievement emotions
  (enjoyment, pride, anger, anxiety, shame, hopelessness, boredom; Achievement Emotions Questionnaire–Mathematics, AEQ-M; Pekrun et al., 2011)
- Mathematics achievement, end-of-year grades
- Covariates: Gender, IQ, SES

(3) Data analysis
- Cross-lagged longitudinal SEM (Mplus 7; Muthén & Muthén, 2012)

Pekrun, Lichtenfeld, Marsh, et al. (2015, to be submitted)
**FUNCTIONS: BETWEEN-PERSON STUDIES**
Longitudinal SEM – Basic Structure

![Diagram showing longitudinal SEM with variables Gender, IQ, SES, Achievement, and Emotion.]

**FUNCTIONS: BETWEEN-PERSON STUDIES**
Longitudinal SEM – Enjoyment

![Diagram showing longitudinal SEM with variables Achievement, Enjoyment, and coefficients.]

CFI = .94. RMSEA = .030. \( p < .001 \) for all coefficients.

**FUNCTIONS: BETWEEN-PERSON STUDIES**
Longitudinal SEM – Anxiety

![Diagram showing longitudinal SEM with variables Achievement, Anxiety, and coefficients.]

CFI = .92. RMSEA = .024. \( p < .01 \) for all coefficients (except achievement 6/anxiety 7).

**FUNCTIONS: BETWEEN-PERSON STUDIES**
Longitudinal SEM – Hopelessness

![Diagram showing longitudinal SEM with variables Achievement, Hopelessness, and coefficients.]

CFI = .96. RMSEA = .027. \( p < .001 \) for all coefficients.

Pekrun et al. (2015, to be submitted)
Functions: Between-Person Studies

Conclusions

- Individual differences in emotions influence differences in achievement over time
- Individual differences in achievement influence differences in emotions over time

Reciprocal links between individual differences in emotions and achievement

However, what about intraindividual relations between emotions and achievement?

Functions: Within-Person Studies

Studies

1. Diary study
   - N = 194 student teachers (intraindividual: n = 72)
   - Exam-related emotion and motivation
     - Trait self-report (AEQ)
     - State self-report, daily rating scales, 42 days before and during final university exams

2. Interview study
   - N = 56 student teachers
   - Situational interviews on emotions, motivation etc. experienced during final university exam in psychology

Diary study: Method

1. Interindividual: Trait emotions and motivation
   - Enjoyment, anxiety, boredom (AEQ, Pekrun et al., 2011)
   - Intrinsic, failure-avoidance, total motivation
     - I invest effort in my studies because I am interested in the material
     - I invest effort in my studies because I want to avoid getting poor grades
     - I study for my courses even if I do not feel well

2. Intraindividual: State emotions and motivation
   - Enjoyment, anxiety, boredom during learning
     - 1 = not at all, 5 = very strong
   - Total motivation to learn
     - "Today I am very motivated to learn"
### Exam-Related Emotion and Motivation: Correlations

#### Interindividual analysis

<table>
<thead>
<tr>
<th></th>
<th>Enjoyment</th>
<th>Anxiety</th>
<th>Boredom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation</td>
<td>.51**</td>
<td>-.21**</td>
<td>-.44**</td>
</tr>
<tr>
<td>Failure-avoid. motivation</td>
<td>.09</td>
<td>.30**</td>
<td>.01</td>
</tr>
<tr>
<td>Total motivation</td>
<td>.33**</td>
<td>-.30**</td>
<td>-.44**</td>
</tr>
</tbody>
</table>

#### Intraindividual analysis

<table>
<thead>
<tr>
<th></th>
<th>Enjoyment</th>
<th>Anxiety</th>
<th>Boredom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total motivation a</td>
<td>.47**</td>
<td>-.06</td>
<td>-.37**</td>
</tr>
</tbody>
</table>

Note. Interindivdual: N = 194. Intraindividual: N = 42 assessments within each student.

* $p < .05$.  ** $p < .01$.

### Qualitative Interviews: Boredom

**Question:** What has this feeling motivated you to do?

- What would you have liked to do?

"The boredom caused a feeling of dissatisfaction and lack of motivation to finish the task ..." (136)

"You are bored, lose the motivation to read everything carefully " (142)

"I’d rather leave and postpone the task ” (136)

"... could no longer sit in my chair, just wanted to get away “ (250)

"I drifted away mentally and no longer listened to the presenter ... " (421)

"I thought of something else, day-dreamed “ (256)

"... tiredness, bad posture, yawning “ (164)
FUNCTIONS: WITHIN-PERSON STUDIES

Interviews: Anxiety

Question: What has this feeling motivated you to do?
What would you have liked to do?

“I’d rather have avoided the exam” (16)
“... no motivation anymore” (504)
“I just wanted it to be over ...” (40)
“This feeling has prompted me to pray. The days before even to weep. I just
wanted it to be over or that I didn’t have to do it in the first place ... I’d rather
have done anything else instead of sitting there and studying ...” (515)

“I want to pass it ... I don’t want to fail the exam” (427)
“I have to manage to finish it” (485)
“I wanted to do on the test as well as possible” (276)
“... it has motivated me to see the exam as a challenge” (513)

“... you would rather run away, but on the other hand, you want to fulfill your
obligations, overall really ambiguous feelings” (281)

Relation between emotion and overall motivation:

➤ Activating positive emotion (enjoyment),
deactivating negative emotion (boredom):
- equivalent within vs. between individuals
- equivalent across individuals (in terms of sign)

➤ Activating negative emotion (anxiety):
- not equivalent within vs. between individuals
- not equivalent across individuals

Consistent with control-value theory

CONTROL-VALUE THEORY

Rationale

Propositions of different theories on origins of emotions complementary rather than mutually exclusive

➤ Aims of the control-value theory:

(1) Integration of propositions
   (Expectancy-value theories, attributional theories,
    transactional stress model)

(2) Addressing multiple achievement emotions
   (including outcome emotions + activity emotions)
I. Domain specificity
II. Individual antecedents (e.g., achievement goals)
III. Social environments as antecedents (e.g., learning environments; classroom composition)
IV. Reciprocal causation, emotion regulation, treatment
V. Relative universality

Many factors can contribute to arousal of emotions:
- Genetic + epigenetic dispositions
- Conditioning (evaluative, traumatic)
- Neurohormonal processes
- Facial + motor feedback
- Cognitive appraisals (reflective, habitualized, schematic)

Phylogenetically old and constrained situations:
- Primacy of biologically prepared emotion schemata, conditioning (e.g., enjoyment of physiological need fulfilment; anxiety of falling when perceiving heights; Campos, Bertenthal, & Kermoian, 1992)
- Appraisals less important

Settings shaped by cultural evolution:
- Need to interpret situation, adapt to culturally defined demands
- Appraisals necessary for adaptive thought, emotion, and action

Achievement settings, achievement emotions:
- Appraisals likely of primary importance
APPRAISAL ANTECEDENTS
Control-Value Theory

Control Appraisals
- Causal expectancies
- Causal attributions
- Competence appraisals
  (e.g., self-concepts of ability)

Value Appraisals
- Intrinsic / extrinsic values of achievement activities + outcomes

Achievement Emotions
- Prospective outcome emotions
- Retrospective outcome emotions
- Activity emotions

APPRAISAL ANTECEDENTS
Multiplicative Action of Control and Value

- Achievement emotions = f (Control x Value)
  (In the generation of emotions, control and value appraisals interact in multiplicative ways)

- e.g., Enjoyment of learning
  High when subjective competence (i.e., control) and value of learning are high,
  low when competence or value or both are low

- e.g., Anxiety of failure
  High when control over performance lacking, failure possible and value of performance high;
  low when control is high, or value low, or both

APPRAISAL ANTECEDENTS
Control, Value, and Achievement Anxiety

Experimental manipulation of control and value
Dependent variable: Anxiety

Study 1: Scenarios

Study 2: Test-taking

Study 3: Implicit measure of anxiety

Samples
High school students

Experimental procedure: Nonverbal reasoning test

1. Announcement of test
2. Sample item
   19, 16, 13, 10, 7, ?
   a = 7, b = 4, c = 5, d = 9, e = 3
3. Self-report anxiety
   (AEQ achievement anxiety scale, α = .86)

High control: Easy sample item
Low control: Unsolvable sample item

High value: Math test counting towards final grade
Low value: Number riddles, no assessment of performance, no consequences
APPRAISAL ANTECEDENTS
Achievement Anxiety: Test-Taking Study

- **Dependent variable: Self-reported anxiety**
  (4-item version of AEQ Achievement Anxiety Scale, \( \alpha = .81 \))
  „How would you feel in this situation?
  - I am nervous because I could fail on these tasks
  - I worry I could do poorly on these tasks
  - ...

- **Covariates**
  - Gender
  - Positive and negative trait affectivity (PANAS)

Effects of Control and Value on Anxiety

Control: \( F=4.51, p < .05 \)
Value: \( F=8.71, p < .01 \)
Control x Value: \( F=4.28, p < .01 \)

APPRAISAL ANTECEDENTS
Control, Value, and Students’ Achievement Emotions

- **Field study of appraisals and achievement emotions**
  Longitudinal, t1 / t2 = beginning / middle of schoolyear

- **Sample**
  \( N = 1,518 \) Secondary school students (grades 5 to 10)

- **Variables**
  - Control: Self-concept of ability (SDQ)
  - Value: Perceived importance of success + failure
  - Achievement emotions (AEQ)

SEM Latent Interaction Analysis (Mplus 7, LMS)
APPRAISAL ANTECEDENTS
Control, Value, and Students' Achievement Emotions

<table>
<thead>
<tr>
<th></th>
<th>Enjoyment</th>
<th>Pride</th>
<th>Anger</th>
<th>Anxiety</th>
<th>Shame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>.67**</td>
<td>.68**</td>
<td>-.50**</td>
<td>-.43**</td>
<td>-.40**</td>
</tr>
<tr>
<td>Value</td>
<td>.20**</td>
<td>.16**</td>
<td>.27**</td>
<td>.13**</td>
<td>.24**</td>
</tr>
<tr>
<td>Control x Value</td>
<td>.11**</td>
<td>.05</td>
<td>-.13**</td>
<td>-.13**</td>
<td>-.13**</td>
</tr>
</tbody>
</table>

Note. Time 1. SEM Latent interaction analysis, LMS (Mplus 7).
* p < .05.  ** p < .01.

Becker-Kurz, Pekrun, Frenzel, Scherer, & Marsh (submitted)

Appraisal Antecedents
Control, Value, and Students' Anxiety

Becker-Kurz, Pekrun, Frenzel, Scherer, & Marsh (submitted)

Achievement Goals
As Antecedents:
Within-Person Study

Becker-Kurz, Pekrun, Frenzel, Scherer, & Marsh (submitted)


**Sample**

- $N = 120$ 10th graders (37% female), mean age = 15.61 years

**Procedure**

1. *Trait achievement goals and emotions*
   - in math, German, English, French

2. *State achievement goals and emotions*
   - during math, German, English, French classes
   - experience sampling method (ESM) using iPods
   - $k = 1,779$ assessments over 10 days ($M = 14.83$ per student)

**Measures**

1. Achievement goals
   - Mastery-approach, perf.-approach, perf.-avoidance goals
     - in math, German, English, French
   - Scales adapted from Achievement Goals Questionnaire (Elliot et al., 2001)
   - Trait achievement goals
     - (e.g., “My goal in math is to perform better than the other students”)
   - State achievement goals
     - (e.g., “My goal at this moment is to perform better than the other students”)

Pekrun, Elliot, & Maier, *Journal of Educational Psychology*, 2006, 2009

Goetz, Sticca, Pekrun, Murayama, & Elliot (submitted)
ACHIEVEMENT GOALS AS ANTECEDENTS

Method

(2) Achievement emotions
- Enjoyment, pride, anxiety, shame, anger, boredom in math, German, English, French
- Scales adapted from Achievement Emotions Questionnaire (Pekrun et al., 2011)
- Trait emotions (e.g., "In math classes I usually experience enjoyment")
- State emotions (e.g., "At this moment I experience enjoyment")

(3) Covariates: Age, gender, achievement, subject

Data analysis
- Trait goals and emotions: Multiple regression analysis (goals as predictors of emotions)
- State goals and emotions: Multilevel modeling (Mplus 7.11, Muthén & Muthén, 1998-2012)
  Level 1: ESM assessment within students (N = 1,779)
  Level 2: Students (N = 120)

ACHIEVEMENT GOALS AS ANTECEDENTS

Results

Trait Goals and Emotions: Multiple Regression

<table>
<thead>
<tr>
<th>Activity emotions</th>
<th>Outcome emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
<td>Anger</td>
</tr>
<tr>
<td>Mastery goals</td>
<td>.40***</td>
</tr>
<tr>
<td>Performance-approach goals</td>
<td>.23**</td>
</tr>
<tr>
<td>Performance-avoidance goals</td>
<td>-.07</td>
</tr>
</tbody>
</table>

State Goals and Emotions: Multilevel Modeling (Level 1)

<table>
<thead>
<tr>
<th>Activity emotions</th>
<th>Outcome emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
<td>Anger</td>
</tr>
<tr>
<td>Mastery goals</td>
<td>.22***</td>
</tr>
<tr>
<td>Performance-approach goals</td>
<td>.13**</td>
</tr>
<tr>
<td>Performance-avoidance goals</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. N = 120 students.
* p < .05. ** p < .01. *** p < .001.
- Mastery goals predict enjoyment, anger, boredom
- Performance-approach goals predict pride
- Performance-avoidance goals predict anxiety, shame

- Mastery goals predict enjoyment, anger, boredom
- Performance-approach goals predict pride
- Performance-avoidance goals predict anxiety, shame

Achievement goals and emotions:
Equivalence of between- and within-person relations
CONCLUSIONS

Present Research

- Development of achievement emotions
  - trajectories (levels, shape) vary widely across individuals
  - within vs. between parameters not equivalent

Relations with motivation to learn

(1) Enjoyment, boredom: uniformly positive/negative relations
  - between vs. within relations equivalent
  - relations equivalent across individuals

(2) Anxiety: more complex
  - between relations negative, mean within relations zero
  - not equivalent
  - within relations: negative, positive, or zero;
  - not equivalent

Possible reason: Underlying mechanisms more complex, combination can vary across individuals

Relations with achievement goals

- Mastery goals predict activity emotions,
  performance goals predict outcome emotions
- same pattern for between + within relations
  - equivalence between relations / average within relations
CONCLUSIONS

Future Research

- Need to integrate interindividual + intraindividual perspectives on affect and motivation

- Need theory and empirical evidence:
  - Under what conditions are inter- / intraindividual relations equivalent, when do they diverge?

- Need appropriate methodologies
  - combined idiographic + nomothetic strategies
  - simultaneous sampling of individuals and occasions
  - data analysis: generalizing intraindividual SEM across individuals, inspection of likelihood planes, multi-level modeling, etc.

e.g., Voelkle et al., Multivariate Behavioral Research, 2014

DOCTORAL & POSTDOCTAL STUDENTS

COOPERATION PARTNERS

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Thank you very much for your attention