

## Abstract

When preparing for exams, students experience various achievement emotions that affect their perceived academic control and achievement. These emotions consist of trait and state components. However, the influence of students' previous emotional experiences on their current emotions remains unexplored. The present study aimed to disentangle different components of achievement emotions (RQ 1), analyze their relations with perceived academic control, and achievement (RQ 2). Using experience sampling, ninety-eight undergraduate students reported their emotions during the final week of exam preparation. Our results showed three variance components (trait, state, and previous experiences) for enjoyment, anxiety, and anger, with no trait variance component for pride. The more stable components (trait and previous experiences) were associated with perceived academic control and academic achievement (cf. beneficial or maladaptive cycles).

## Theoretical Assumptions

Various achievement emotions occur during an exam period. These emotions consist of a stable individual disposition or habitual tendency (trait component - ST) and situation specific circumstances (state component - S) (e.g., Nett et al., 2017).

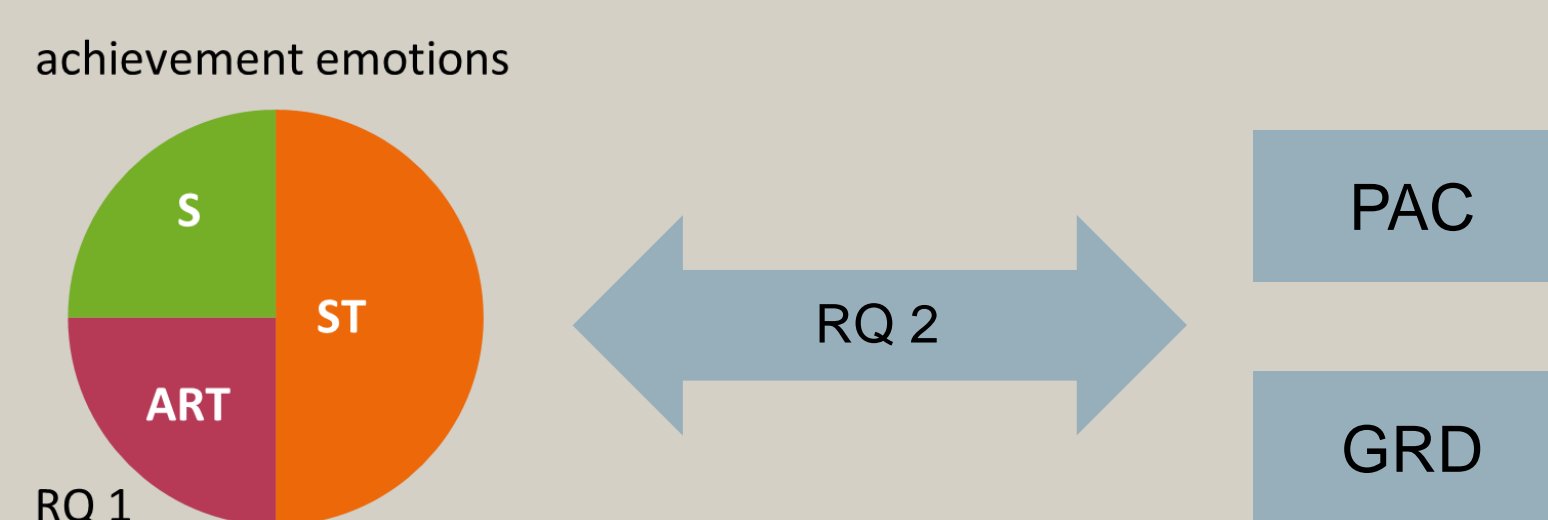
Yet, little is known about the influence of students' previous emotional experiences on their current emotions. Thus, we propose a supplementary autoregressive developmental path component (ART) to take account for previous experiences.

Additionally, achievement emotions are related to perceived academic control (PAC) (e.g., Respondek et al., 2017), which is essential for achievement (e.g., Perry et al., 2001). The Control-Value Theory (Pekrun, 2006) assumes reciprocal effects with this internal attribution of academic outcomes.

Finally, achievement emotions are also related to academic achievement (GRD), again via reciprocal effects (Pekrun et al., 2017).

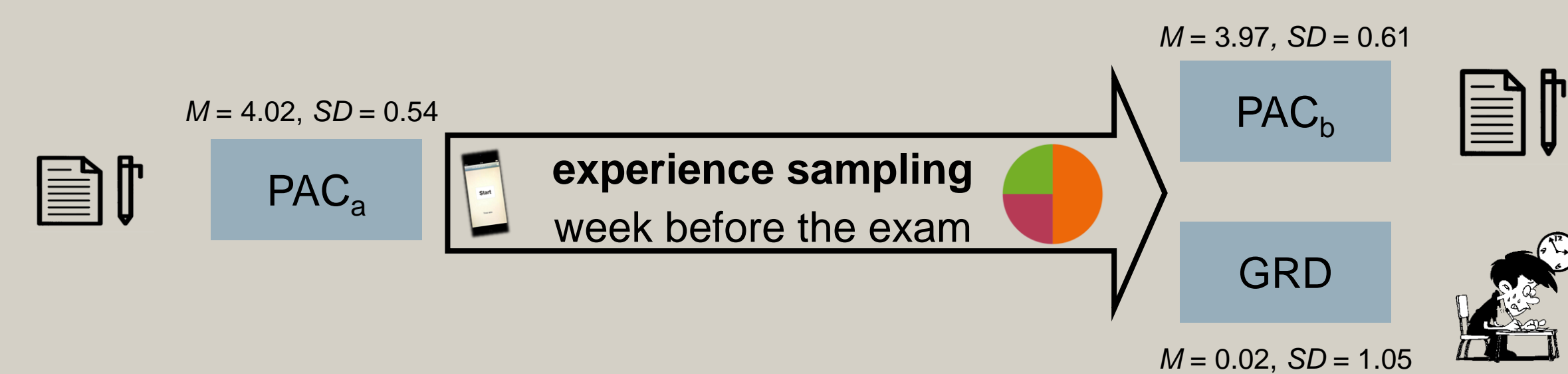
## Research Questions (RQ)

We aimed to disentangle achievement emotions' variances of stable trait, autoregressive developmental path, and state (RQ 1) and to analyze their relations with perceived academic control and achievement (RQ 2).



## Method

- Sample:** N = 98 freshmen; 60.80% female;  $M_{age} = 21.09$ ,  $SD_{age} = 2.41$ ; fields of study: Computer Science, Economics, Physics, Psychology



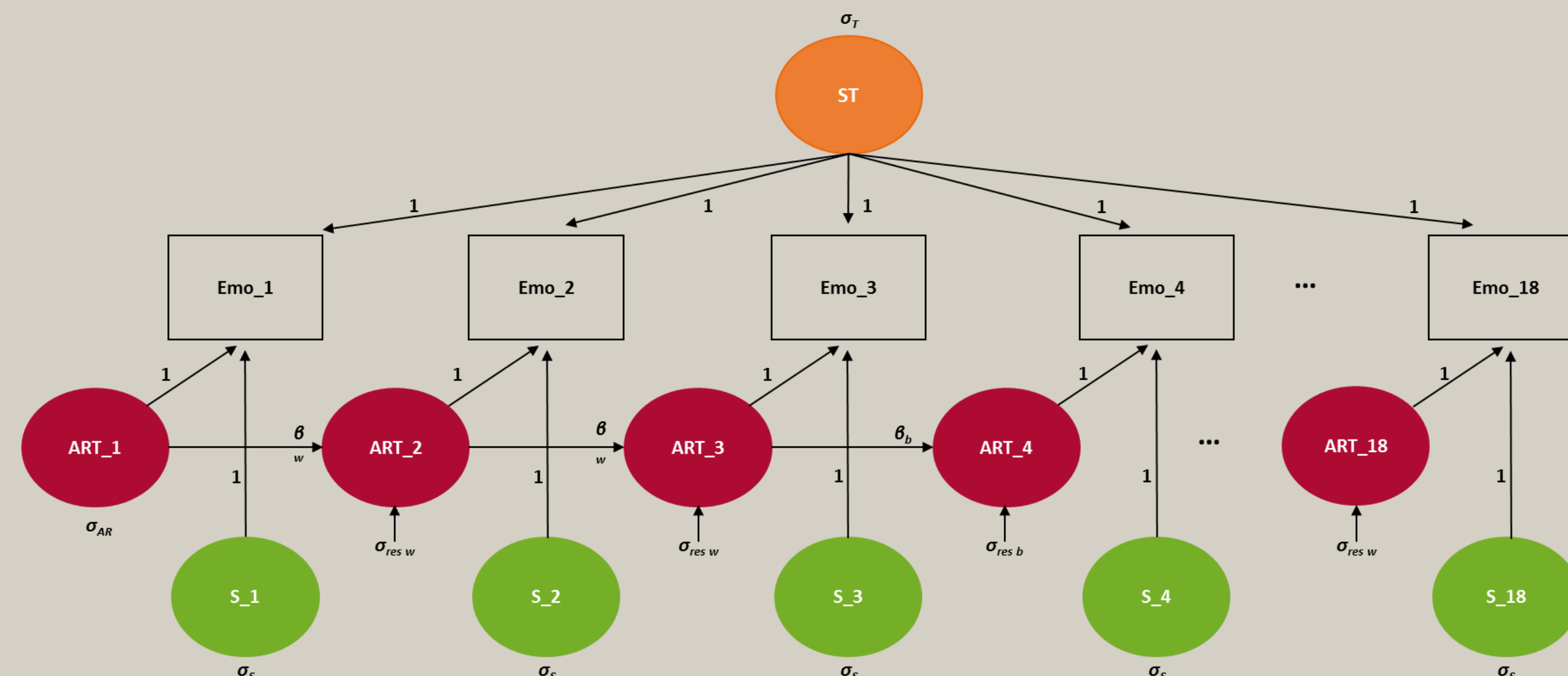
- Experience Sampling:** via iDialogPad on iPod touch® devices (Mutz, 2016), 1774 measurements (98 participants x 6 days x 3 signals per day) prior to an important exam, random interval sampling (from 10am to 8pm), compliance 86.05%

- Measurements:**

- achievement emotions focusing on upcoming exam via single-items adapted from the AEQ (Pekrun et al., 2011) with a five-point Likert scale
- PAC perceived academic control via PAC scale (Perry et al., 2001) with a five-point Likert scale (ranged from 0 to 4)
- GRD achievement via exam result, group-centered concerning students' major cohort, high GRD reflects high achievement (ranged from -3.00 to 2.00)

## Rational of Analysis

RQ 1: We used the STARTS model (Kenny & Zautra, 2001). It disentangles stable trait across all measurements (ST, habitual tendency), autoregressive state depending on previous measurements (ART, developmental cycle of previous on subsequent experiences), and actual state random over time (S). We assumed the autoregression to be stationary each within and between days, respectively.



RQ 2: Additionally, we added perceived academic control (PAC) and achievement (GRD) to the model, allowing correlations with all emotional variance components.

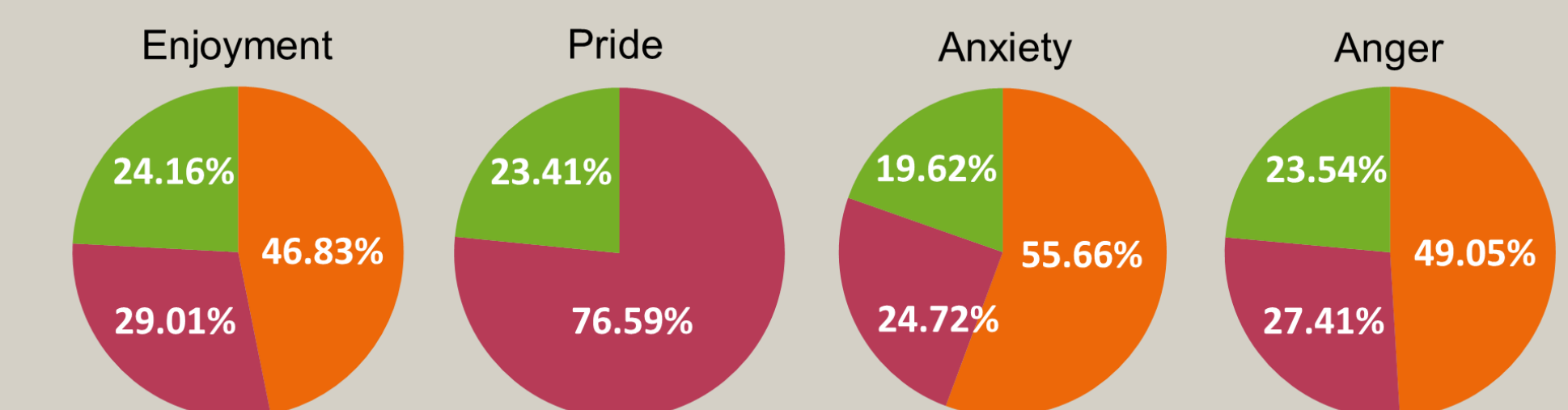
## Achievement Emotions Variance Components (RQ 1)

We established the assumed STARTS model for Enjoyment, Anxiety, and Anger via model comparison. For Pride the model without trait factor fitted the data best.

Model	$\chi^2$	$\chi^2/df$	RMSEA (90% C.I.)	CFI	SRMR	BIC <sup>1</sup>	AIC
<b>Enjoyment</b>							
1. stable trait – state (ST-S)	337.97***	169	0.10 (0.05 0.12)	0.83	0.09	3259.98	3271.44
2. autoregressive path – state (ART-S)	229.20***	167	0.06 (0.04 0.08)	0.94	0.08	3125.10	3137.70
3. basic STARTS	228.14***	166	0.06 (0.04 0.08)	0.94	0.08	3124.33	3137.51
<b>Pride</b>							
1. stable trait – state (ST-S)	372.89***	169	0.11 (0.10 0.13)	0.82	0.10	3430.51	3441.97
2. autoregressive path – state (ART-S)	227.43***	167	0.06 (0.04 0.08)	0.95	0.08	3260.78	3273.38
3. basic STARTS	226.69***	166	0.06 (0.04 0.08)	0.95	0.08	3261.11	3274.29
<b>Anxiety</b>							
1. stable trait – state (ST-S)	391.87***	169	0.12 (0.10 0.13)	0.81	0.10	3632.09	3643.55
2. autoregressive path – state (ART-S)	254.92***	167	0.07 (0.06 0.09)	0.93	0.07	3463.82	3476.43
3. basic STARTS	250.56***	166	0.07 (0.05 0.09)	0.93	0.07	3459.45	3472.63
<b>Anger</b>							
1. stable trait – state (ST-S)	326.21***	169	0.10 (0.08 0.11)	0.84	0.11	3920.76	3932.21
2. autoregressive path – state (ART-S)	208.10***	167	0.05 (0.02 0.07)	0.96	0.09	3780.11	3792.72
3. basic STARTS	200.00***	166	0.05 (0.01 0.07)	0.97	0.08	3771.94	3785.11

Note. <sup>1</sup>sample-size adjusted BIC; <sup>2</sup>MLR corrected values; \*  $p \leq 0.050$ , \*\*  $p \leq 0.010$ , \*\*\*  $p \leq 0.001$ ; N = 98.

We found hypothesized variance distributions for Enjoyment, Anxiety, and Anger. The largest variance sources were stable traits ( $\approx 50\%$ ), with the exception of pride.



## Relations with Perceived Academic Control and Achievement (RQ 2)

Enjoyment showed only positive relations to achievement, especially trait component ( $r_{GRD} = .33^{**}$ ) and autoregressive path component (cf. beneficial cycle;  $r_{GRD} \approx .31$ ). Proud students with a beneficial cycle were more likely to perceive higher levels of academic control after their exam ( $r_{PACb} \approx .47^{**}$ ) and were more likely to perform well ( $r_{GRD} \approx .25$ ).

Anxiety showed negative relations to perceived academic control and achievement, especially trait component ( $r_{PACa} = -.29^*$ ,  $r_{PACb} = -.39^{***}$ ,  $r_{GRD} = -.37^{***}$ ) and autoregressive path component (cf. maladaptive cycles;  $r_{PACa} \approx -.48^*$ ,  $r_{PACb} \approx -.41^{**}$ ,  $r_{GRD} \approx -.43^{**}$ ). The trait component of anger was negatively related to perceived academic control and achievement ( $r_{PACa} = -.28^*$ ,  $r_{PACb} = -.31^{**}$ ,  $r_{GRD} = -.39^{***}$ ), with no maladaptive cycles. Thus, in some situations anxiety or anger related positively to perceived academic control or academic achievement.

## Conclusions

We should not only focus on emotional traits when supporting freshmen, but also consider specific learning-related situations and their repercussions. It is important to create learning situations that enhance students' positive achievement emotions.

## References

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