

# A latent growth curve (LGC) analysis to dissociate components of response time (RT) variance

Natalie Borter<sup>1</sup>, Stefan Troche<sup>1</sup>, Yulia Dodonova<sup>2</sup> and Thomas Rammsayer<sup>1</sup>

<sup>1</sup>Department of Psychology, University of Bern, Switzerland

<sup>2</sup>Peoples' Friendship University of Russia

## Introduction

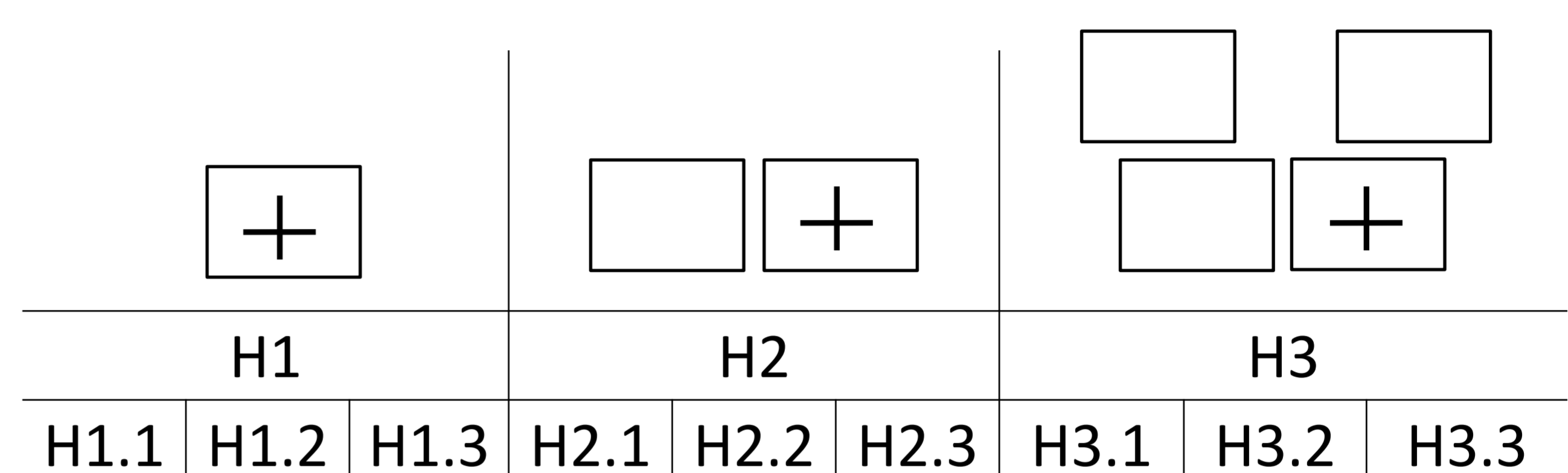
- ❖ RT on more demanding cognitive tasks predicts psychometric intelligence ( $g$ ) better than RT on less demanding ones.
- ❖ Irrespective of task demands, the worst performance rule (WPR) states that the correlations between individual-level worst performance (i.e., slowest RTs) and  $g$  are larger than between individual-level best performance (i.e., fastest RTs) and  $g$ .
- ❖ The WPR effect was found to be more pronounced with more demanding tasks. However, neither best performance nor demand-independent variance were controlled for.
- ❖ In the present study, therefore, we employed two-level LGC to dissociate worst and best performance, in a first step, and variance due to task demands from demand-independent variance, in a second one.

## Method

*Participants* were 228 volunteers ranging in age from 17 to 41 years (mean age  $\pm$  SD = 22.9  $\pm$  3.3 years).

*Hick Task.* There were three levels of task complexity (see Figure 1). Participants had to press a response button corresponding to the stimulus position. Each condition consisted of 32 trials. As an indicator of performance, median RT was computed.

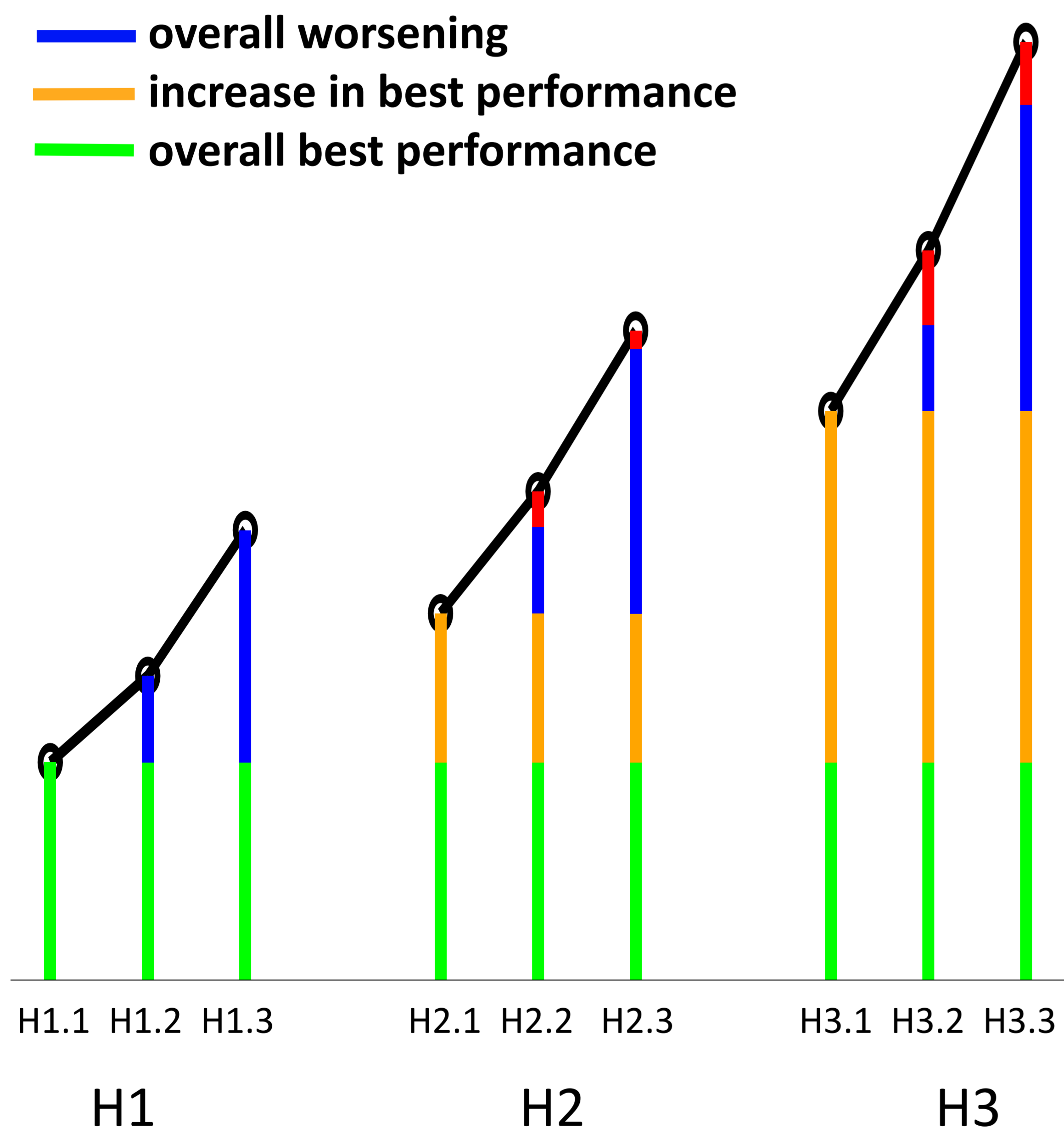
*Intelligence.* Psychometric  $g$  was extracted from the four subtests of Cattell's Culture Fair Test (CFT-20).



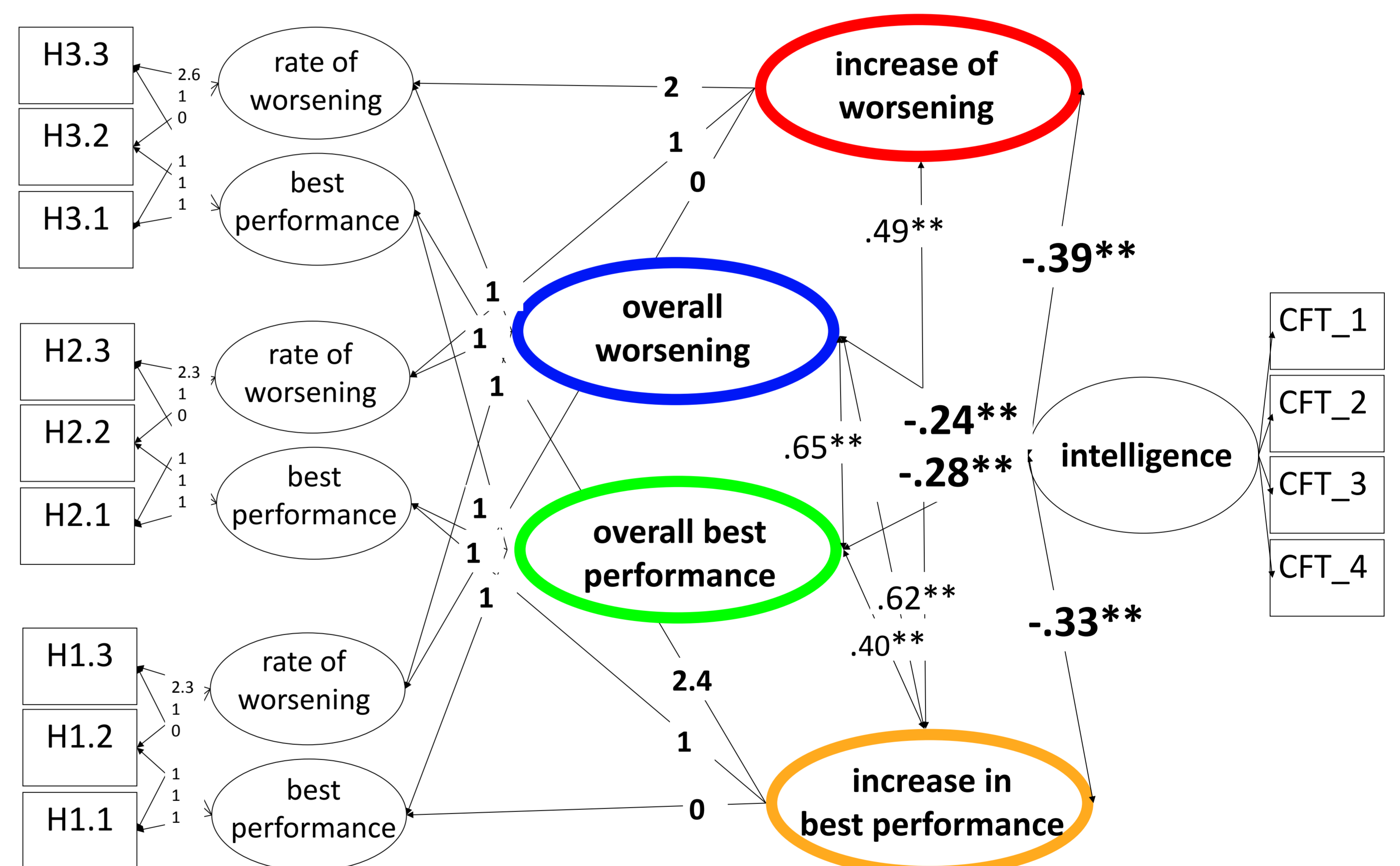
**Figure 1.** Hick task. H1, H2, H3 = simple, two-choice, four-choice reaction time task. Each task is parceled into three RT bands represented by the attached index: .1 = best performance, .2 = moderate performance, .3 = worst performance.

## Results

- increase of worsening
- overall worsening
- increase in best performance
- overall best performance



**Figure 2.** Reaction time components dissociated by means of latent growth curves.



**Figure 3.** Latent growth curve modeling of Hick data.

**Table 1.** Summary of fit statistics for the latent growth curve model.

$X^2$	df	$p$	SB	CFI	RMSEA	90% C.I. of RMSEA
63.267	56	.235	1.7	.99	0.024	.0 - .044

Notes : SB = scaling correction (Satorra-Bentler); CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation;

## Conclusions

- ❖ The LGC model is a useful approach to dissociate worst and best performance as well as task demands and demand-independent variance.
- ❖ The WPR effect was shown to be more pronounced in more demanding tasks when controlled for best performance and demand-independent variance.

<sup>b</sup>  
u

UNIVERSITÄT  
BERN