

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

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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).

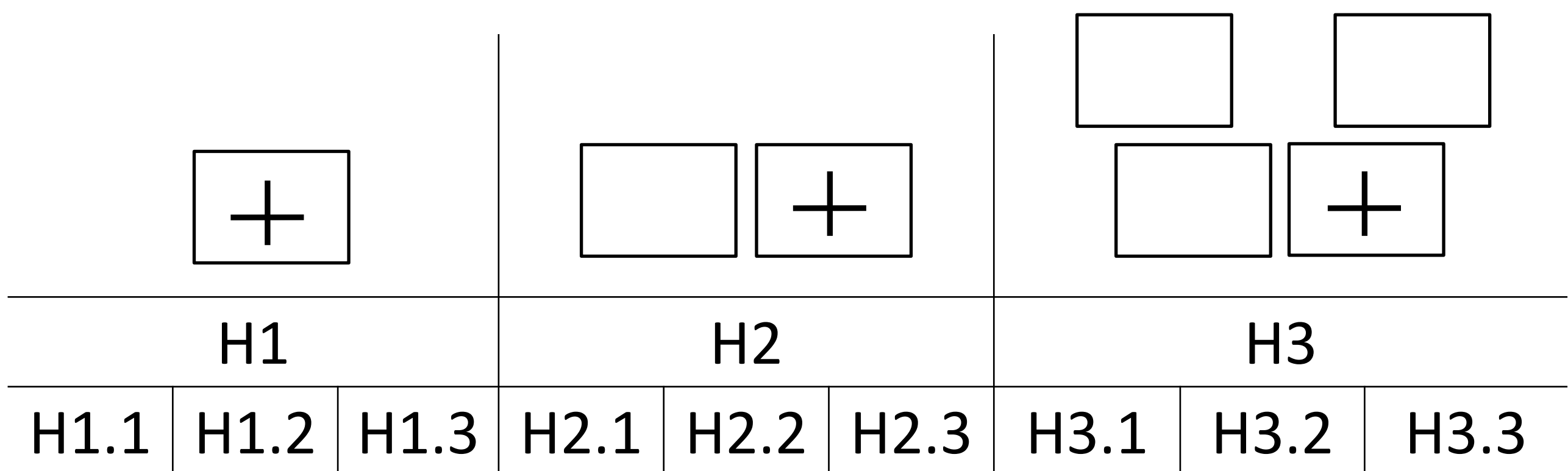


Figure 1. Hick task. H1, H2, H3 = simple, two-choice, four-choice reaction time task. Each task is parceled into three RT bands represented by the attached index: .1 = best performance, .2 = moderate performance, .3 = worst performance.

Results

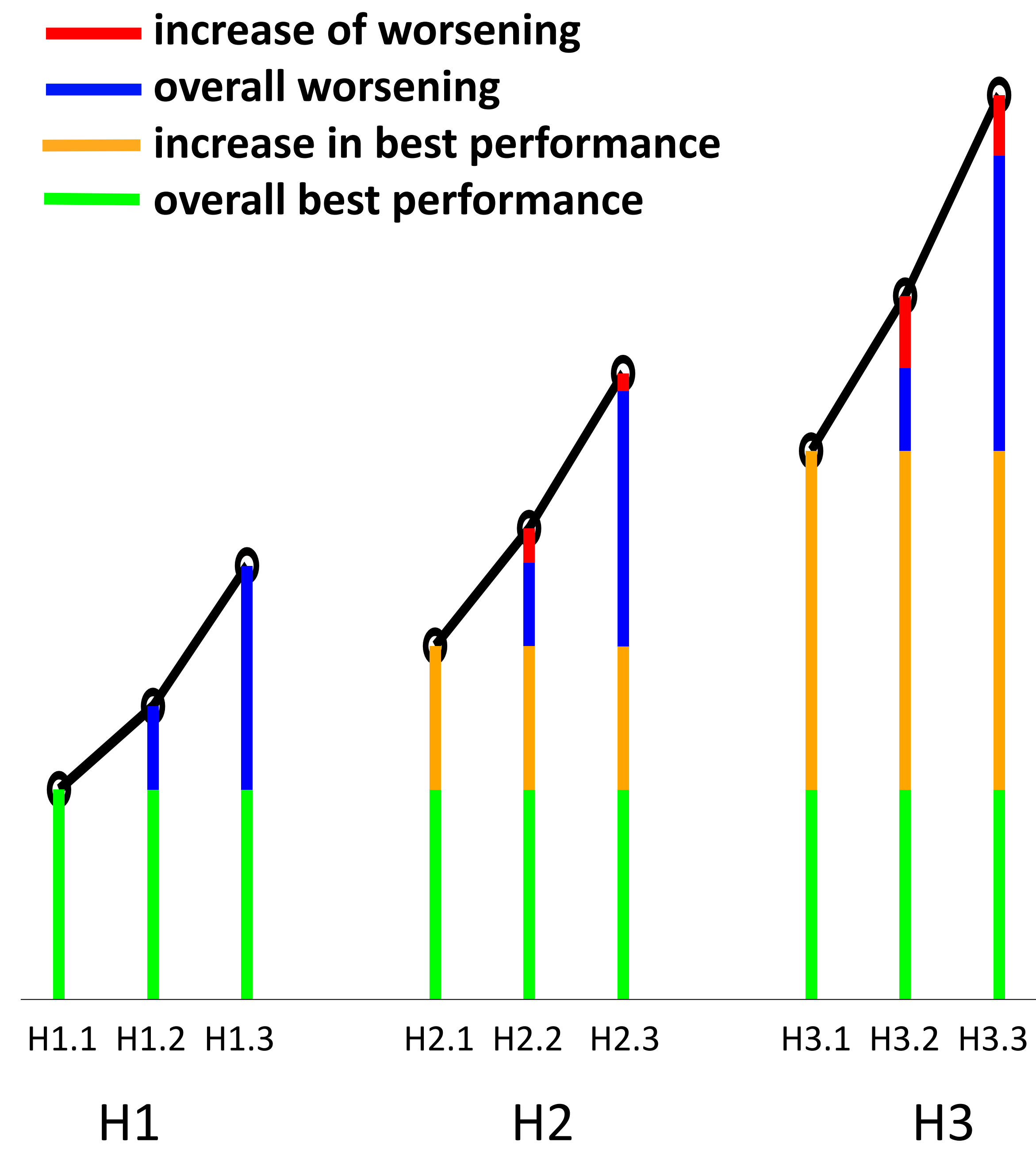


Figure 2. Reaction time components dissociated by means of latent growth curves.

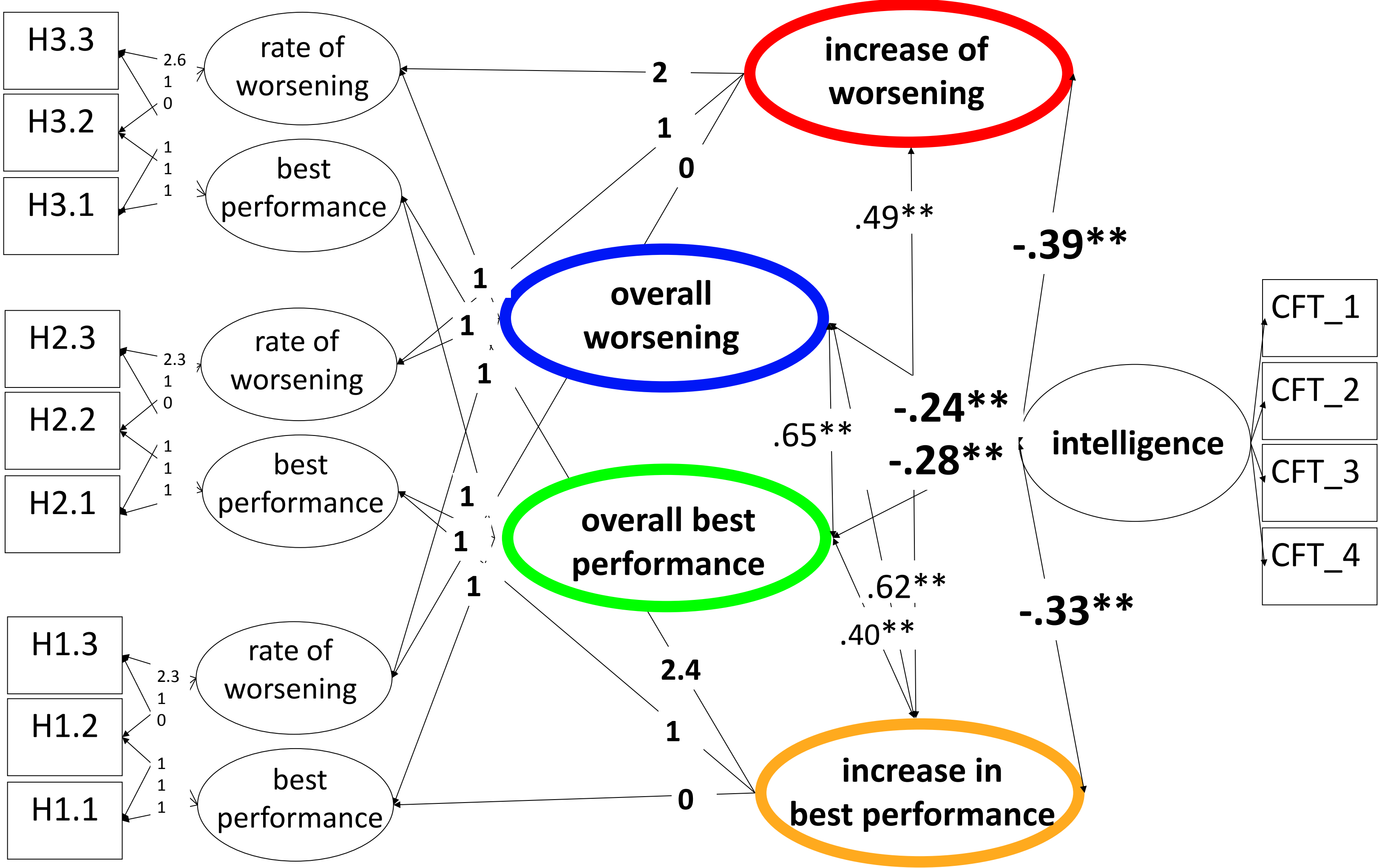


Figure 3. Latent growth curve modeling of Hick data.

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.