

Information Literacy as a Key to Academic Success: Results from a Longitudinal Study

ANNE-KATHRIN MAYER & GÜNTER KRAMPEN
ZPID - LEIBNIZ INSTITUTE FOR PSYCHOLOGY
INFORMATION, TRIER, GERMANY



1. Introduction: Predictors of Academic Success

- **information literacy:** hypothesized to play a major role for academic achievements by:
 - supporting active knowledge construction
 - fostering processes of self-regulated learning and problem solving (Brand-Gruwel et al., 2005; Johnston & Webber, 2003)
 - **but:** empirical evidence is weak
 - intervention studies: participants vs. non-participants of IL instruction (e.g., Bowles-Terry, 2012),
 - associations of library use with academic achievements (Soria et al., 2014)
- inconclusive results; IL not assessed by objective assessment tools

1. Introduction: Predictors of Academic Success

- **General cognitive abilities, e.g.:**
 - **fluid intelligence:** *'... ability to decompose problems into manageable segments, (...) manage the hierarchy of goals and subgoals generated by this problem decomposition, and (...) form higher level abstractions'* (Carpenter et al., 1990, p. 429)
 - **working memory capacity:** capacity of the cognitive subsystem responsible for simultaneous maintenance and active manipulation of information, central prerequisite for integrating new information into existing knowledge structures (Baddeley, 2012)

1. Introduction: Predictors of Academic Success

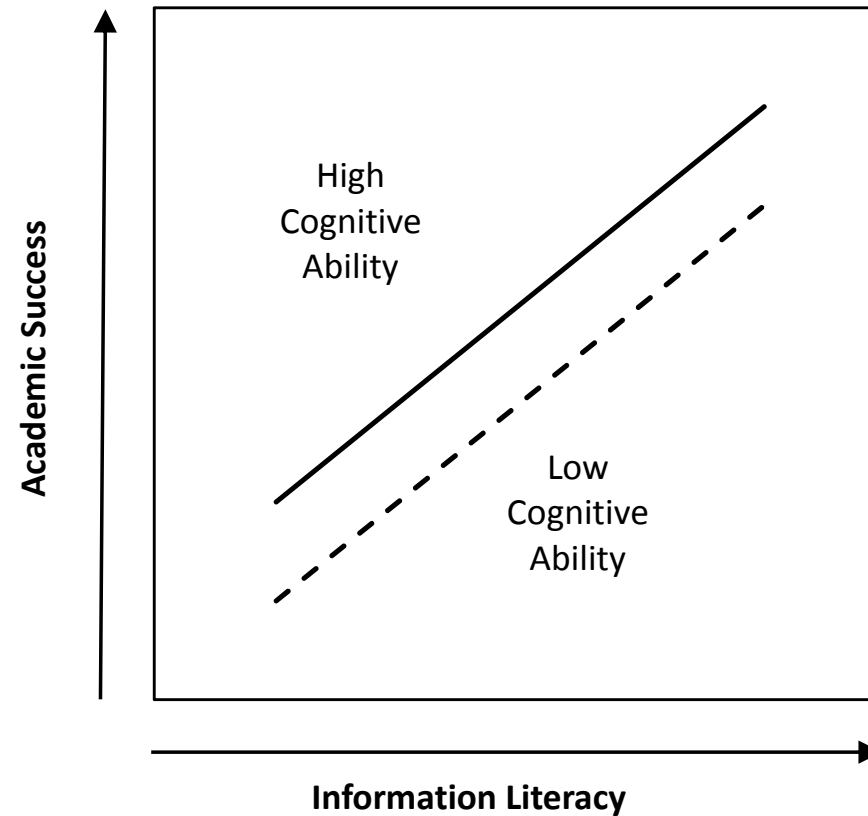
- **general cognitive abilities** = most important predictors of academic achievements and job performance;
- e.g., results from meta-analyses: $\rho = .34 - .54$ between intelligence and scholastic achievements (Roth et al., 2013) → medium – large effect size

2. Present Research

■ Research Questions:

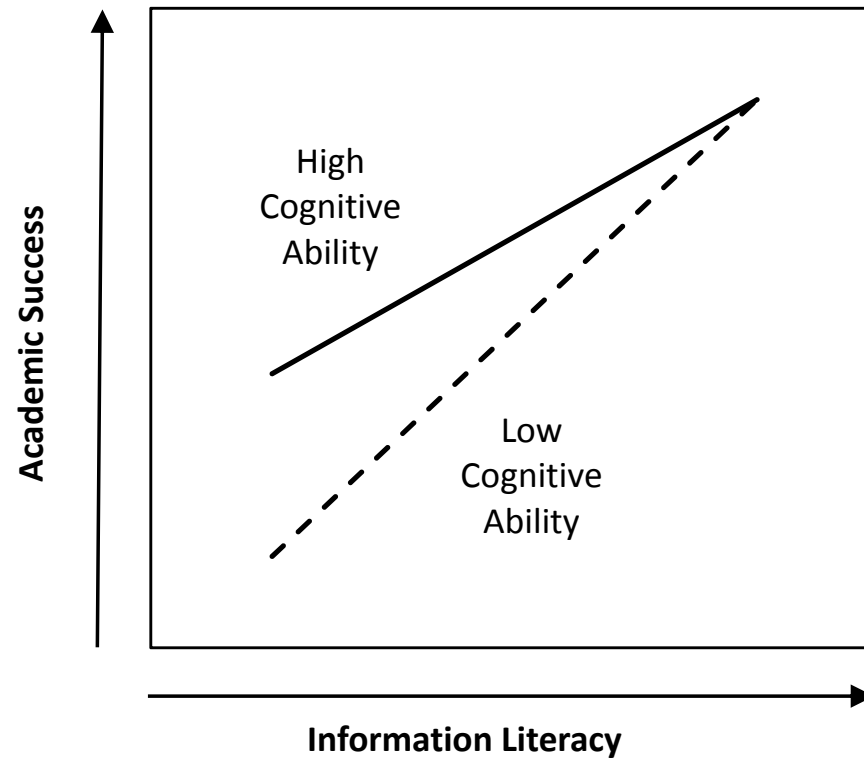
- (1) Is scholarly information literacy associated with academic success in psychology students?
 - (2) Does scholarly information literacy predict academic success over and above students' level of general cognitive abilities?
- **3 descriptive models** for joint effects (e.g., Hambrick & Engle, 2002):
 - additive model
 - compensation model
 - enhancement model

Additive model



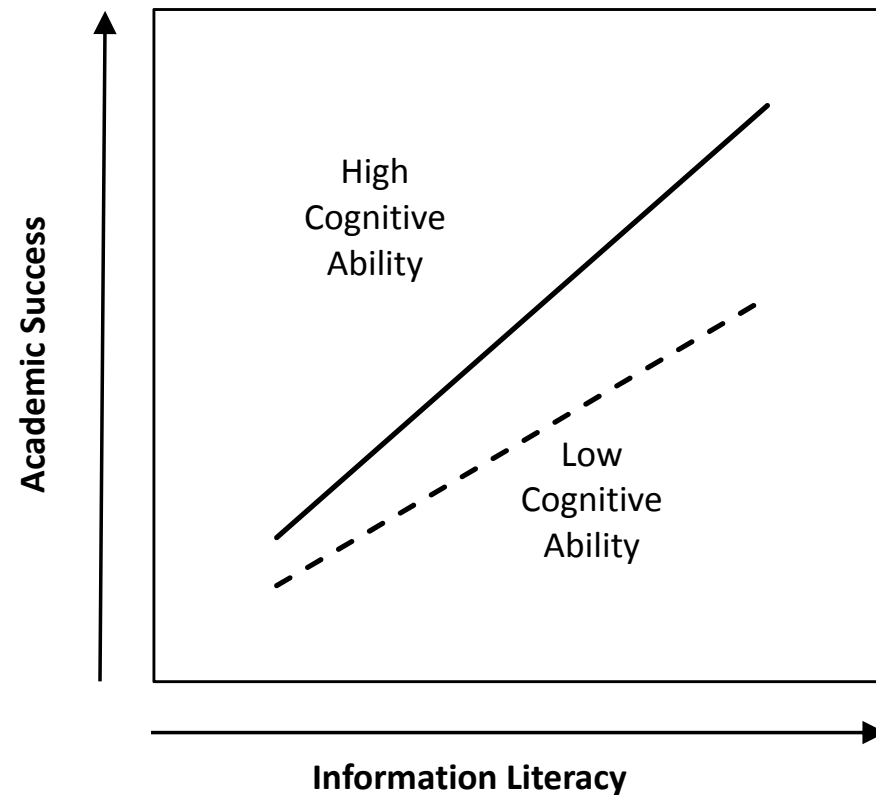
independent effects of cognitive ability and information literacy on academic success

Compensation model



high information literacy compensates for low cognitive ability

Enhancement model



information literacy enhances the positive effect of cognitive ability

3. Methods: Participants and Procedure

■ Participants:

- Bachelor psychology students at the University of Trier, Germany
- longitudinal study on the development of knowledge during the transition from high school to university:
 - 4 waves of measurement (t1-t4): t1 = start of bachelor studies; t2-t4: beginning of semester 2, 3, and 4
 - subsample for present analyses: $N = 53$ (18-25 years, 85% female)

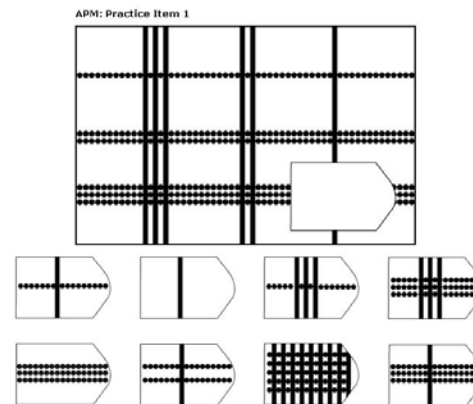
■ Procedure:

- supervised online / paper-and-pencil testing in small groups

3. Methods: Measures

■ Cognitive abilities:

- Fluid intelligence: Raven's Advanced Progressive Matrices APM (Raven et al., 1980) at t1
- 3 computerized tests of verbal working memory capacity (WMC; Wilhelm et al., 2013) at t2



3. Methods: Measures

- **Information literacy:** revised version of the „Information Literacy Test for Psychology“ ILT-P (Leichner et al., 2013) at t4
 - knowledge about scholarly information search and evaluation
 - 35 forced choice items (3 options each, 0-3 options correct)

Which statement is true? The Journal Impact Factor (JIF) indicates

- ... how often articles published in this journal have been cited by other authors during a certain period of time.
- ... how many libraries have subscribed to the journal.
- ... the relevance ascribed to this journal by a group of experts.

3. Methods: Measures

■ Academic success:

- standardized test of basic psychology knowledge (Peter et al., 2015) at t4
- Grade Point Average (GPA; from university records) at t4

3. Methods: Statistical Analyses

- Associations: Correlational analyses
- Joint Effects: stepwise multiple regression analyses
 - **Criterion** = academic success
 - psychology knowledge
 - Grade Point Average
 - **Predictors** (z-standardized):
 - Step 1: APM or WMC
 - Step 2: ILT-P
 - Step 3: Interaction APM x ILT-P or WMC x ILT-P

4. Results: Intercorrelations of the Study Variables.

	APM	WMC	ILT-P	GPA
WMC	.45***			
ILT-P	.42***	.30*		
GPA	-.25*	-.14	-.35*	
Psychology Knowledge	.25*	.17	.50***	-.46***

*** $p < .001$; ** $p < .01$; * $p < .05$

IL is associated with better GPA and higher levels of basic psychology knowledge

4. Results: Joint effects (Raven's APM)

Predictor	<i>b</i>	<i>SE(b)</i>	β	<i>t</i>
Criterion: Psychology Knowledge ($R^2 = 0.155$, $F[2, 47] = 4.30$, $p < .05$)				
Constant	.65	.02		42.88***
z(APM)	.01	.02	.11	0.75
z(ILT-P)	.04	.02	.33	2.26*
Criterion: Grade Point Average ($R^2 = 0.144$, $F[2, 47] = 3.94$, $p < .05$)				
Constant	2.07	.07		28.10***
z(Raven's APM)	-.07	.08	-.13	-0.87
z(ILT-P)	-.17	.08	-.31	-2.05*

IL, but not intelligence predicts academic success!

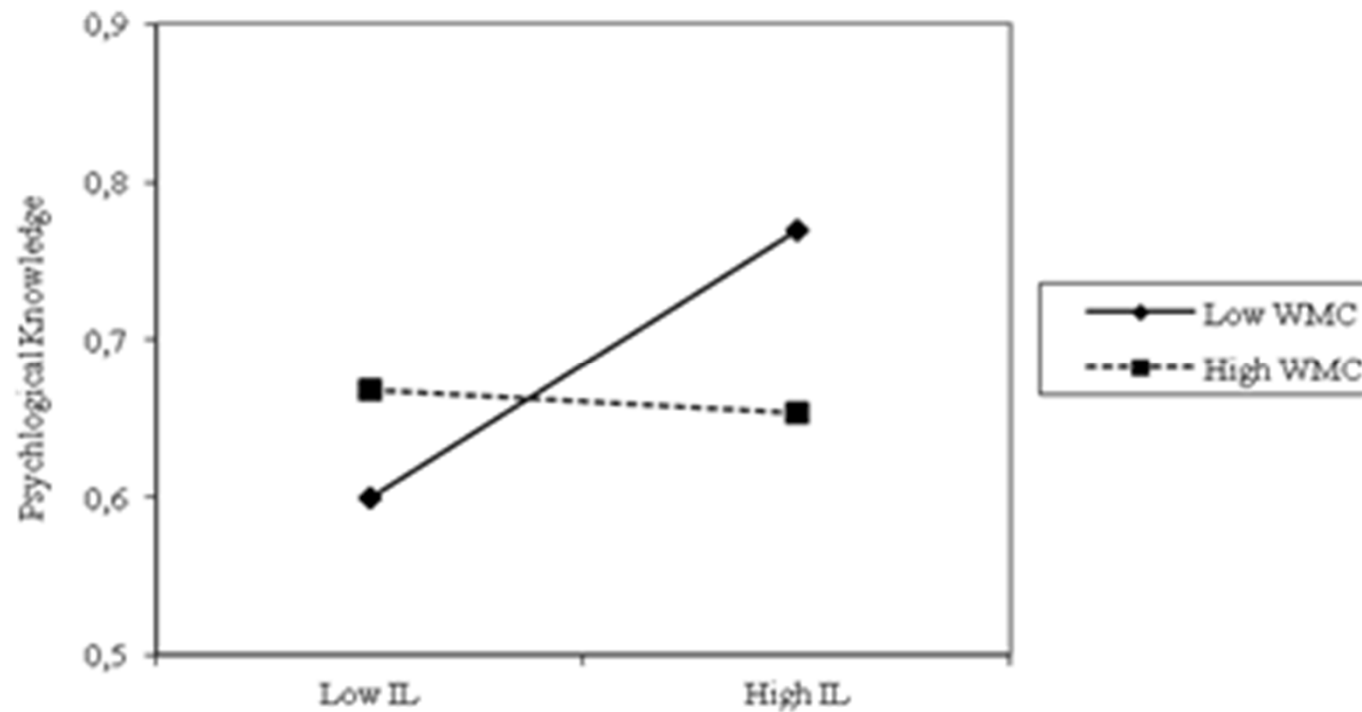
→ no significant interaction effect

4. Results: Joint effects (Verbal WMC)

Predictor	<i>b</i>	<i>SE(b)</i>	β	<i>t</i>
Criterion: Psychology Knowledge ($R^2 = 0.323$, $F[3, 46] = 7.30$, $p < .01$; $R^2_{chg} = 0.175$, $p < .001$)				
Constant	.66	.01		46.08***
z(WMC)	-.01	.02	-.12	-0.84
z(ILT-P)	.04	.02	.37	2.92**
z(WMC x ILT-P)	-.05	.02	-.45	-3.45**
Criterion: Grade Point Average ($R^2 = 0.288$, $F[3, 46] = 6.22$, $p < .01$; $R^2_{chg} = 0.158$, $p < .001$)				
Constant	2.00	.07		27.96***
z(WMC)	.08	.08	.14	1.00
z(ILT-P)	-.20	.07	-.36	-2.77**
z(WMC x ILT-P)	.23	.07	.43	3.20**

Interaction of Information Literacy (IL) and Verbal WMC

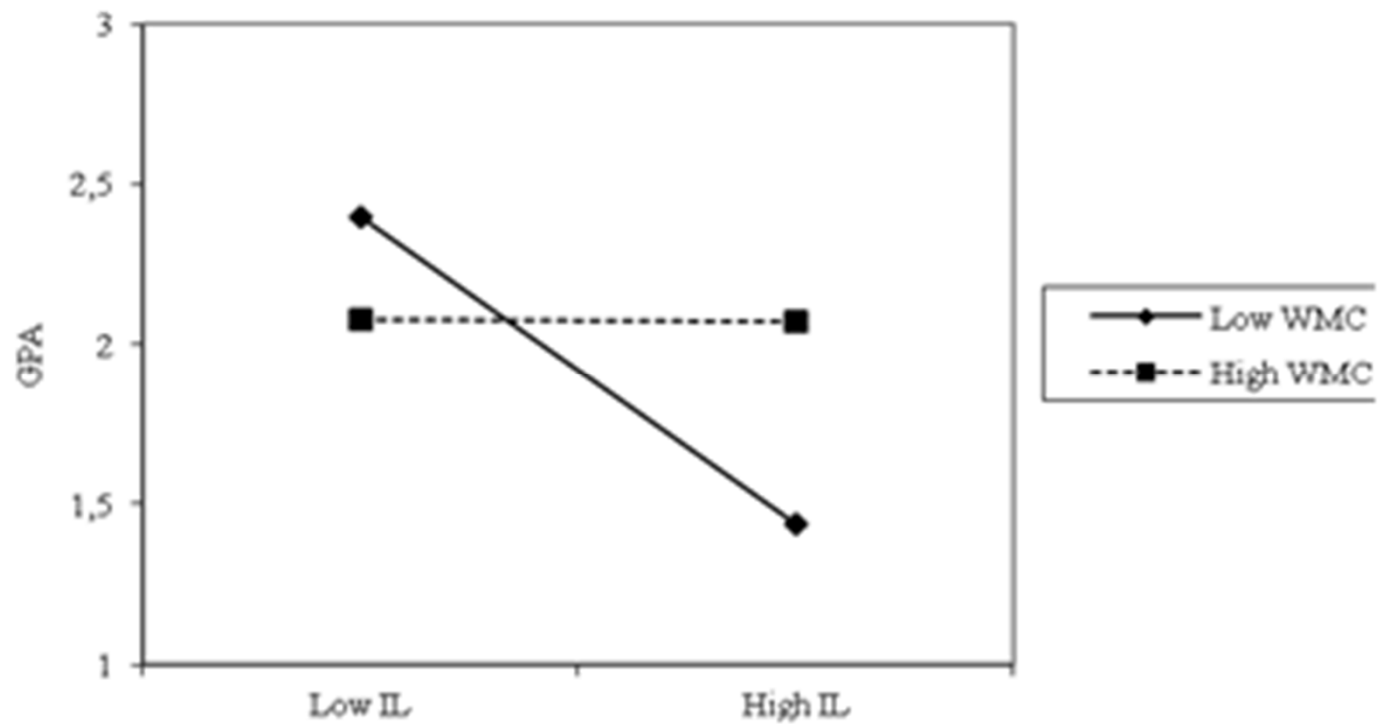
Psychology Knowledge



→ compensation model supported

Interaction of Information Literacy (IL) and Verbal WMC

Grade Point Average (GPA)



→ compensation model supported

5. Discussion: Limitations

- small sample of psychology students from one semester
 - **replication** in larger and more heterogeneous samples
- no inferences about causal effects possible (information literacy was assessed chronologically after GPA)
 - follow-up studies to **assess long-term effects** on academic success (e.g., final GPA, quality of bachelor's thesis/reference lists)
- ILT-P limited to assessment of declarative knowledge about searching and evaluating scholarly information
 - **additional measures of information literacy** (e.g., ability to plan searches and to use information)

6. Conclusions

- cognitive abilities and scholarly information literacy jointly affect academic performance
- information literacy is of high importance for academic success
- increased investment of resources in information literacy education is needed, especially to support students with (relatively) lower cognitive abilities!

Thank you!

Contact:

Dr. Anne-Kathrin Mayer

ZPID – Leibniz Institute for Psychology Information

D-54286 Trier / Germany

mayer@zpid.de



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1. Introduction: Cognitive Abilities and Information Literacy

- **fluid intelligence:** *'... ability to decompose problems into manageable segments, (...) manage the hierarchy of goals and subgoals generated by this problem decomposition, and (...) form higher level abstractions'*

(Carpenter et al., 1990, p. 429) → characteristic processes in information literate behavior during complex information searches

- **empirical finding:** weak correlational associations of fluid intelligence with scholarly information literacy

(Rosman et al., 2015)

1. Introduction: Cognitive Abilities and Information Literacy

- **working memory:** cognitive subsystem responsible for simultaneous maintenance and active manipulation of information, central prerequisite for integrating new information into existing knowledge structures, i.e. for learning (Baddeley, 2012)
 - **empirical finding:** high working memory capacity fosters the acquisition of scholarly information literacy (Rosman et al., 2016)