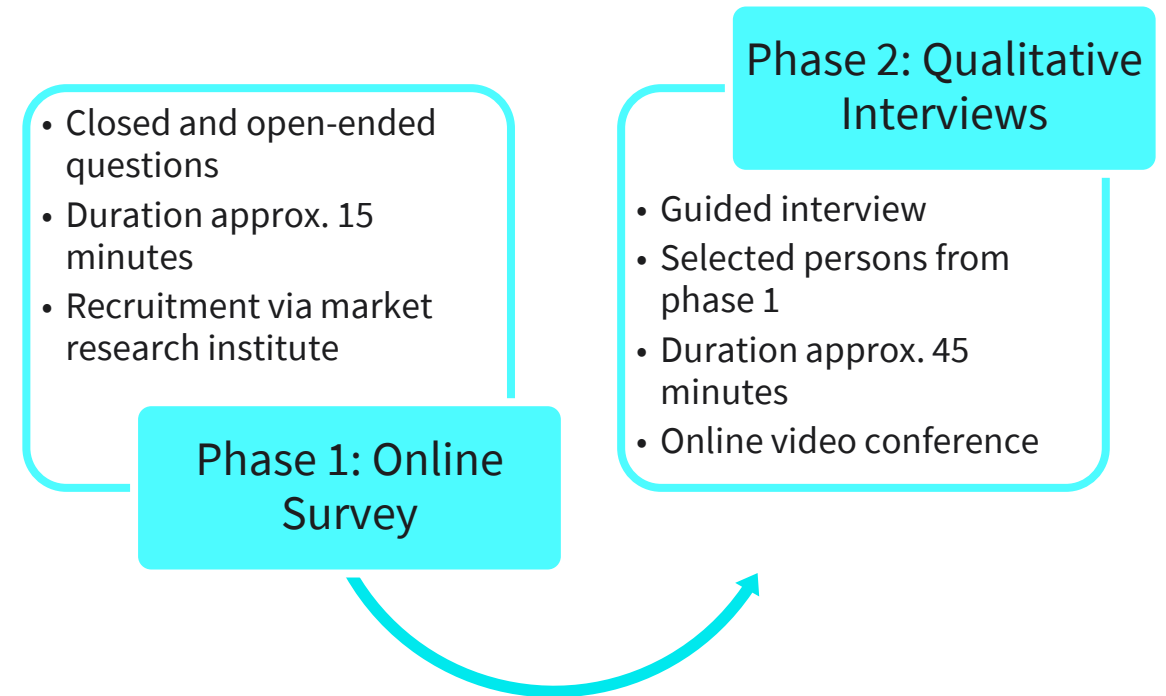**A STUDY AMONG YOUNG ADULTS IN GERMANY**

EXPLORING THE INFLUENCE OF TECHNOLOGY EXPOSURE ON COMPUTER SCIENCE SELF-CONCEPT

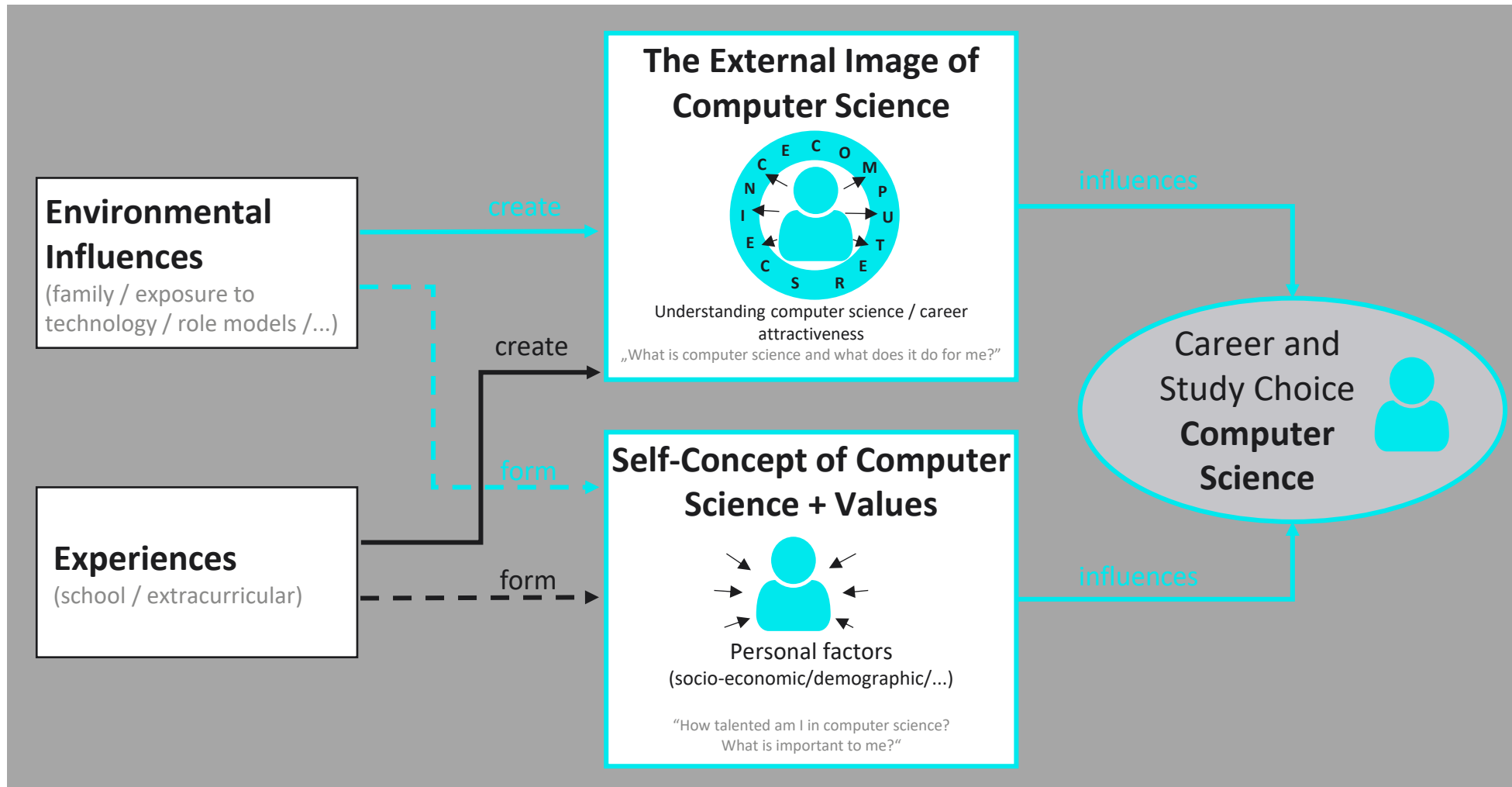Claudia Hess, Sibylle Kunz, Cornelia Heinisch & Adrienne Steffen

iu INTERNATIONAL UNIVERSITY OF APPLIED SCIENCES

CONTEXT OF THE RESEARCH PRESENTED: YOUNG ADULTS' CAREER CHOICES REGARDING COMPUTER SCIENCE

- Mixed-method study about young adults' career choices regarding computer science (CS)
- The "overall" research question:
  - Why do teenagers and young adults decide in favor of or against a university degree or vocational training in computer science?
  - And especially: Are there any differences between the genders and if so, what are they?
- Why is it important to understand these career decisions?
  - High demand for ICT specialists – and at the same time a shortage of skilled labor
  - Gender disparity

Phase 1: Online Survey
- Closed and open-ended questions
- Duration approx. 15 minutes
- Recruitment via market research institute

Phase 2: Qualitative Interviews
- Guided interview
- Selected persons from phase 1
- Duration approx. 45 minutes
- Online video conference

INFLUENCING FACTORS

Source: own depiction

TODAY'S FOCUS: EXPOSURE TO TECHNOLOGY

Environmental Influences
(family / exposure to technology / role models /…)

Experiences
(school / extracurricular)

create

create

form

form

The External Image of Computer Science

Understanding computer science / career attractiveness
„What is computer science and what does it do for me?"

Self-Concept of Computer Science + Values

Personal factors
(socio-economic/demographic/…)

"How talented am I in computer science?
What is important to me?"

influences

influences

Career and Study Choice **Computer Science**

Source: own depiction

Can exposure to technology inspire interest in Computer Science by making young people more comfortable with the basic concepts and applications of technology?

01

## CURRENT RESEARCH ON THE IMPACT OF TECHNOLGY EXPOSURE

TECHNOLOGY EXPOSURE OF YOUNG ADULTS

- **Technology exposure**: various experiences and opportunities through which individuals interact with information and communication technologies (ICT)
- Key indicators include e.g. (Salanova & Llorens, 2009)
  - the amount of time using technology,
  - frequency of use,
  - participation in technology training,
  - personal ownership
- Different situations / locations in which young adults come into contact with ICT

Source: own depiction
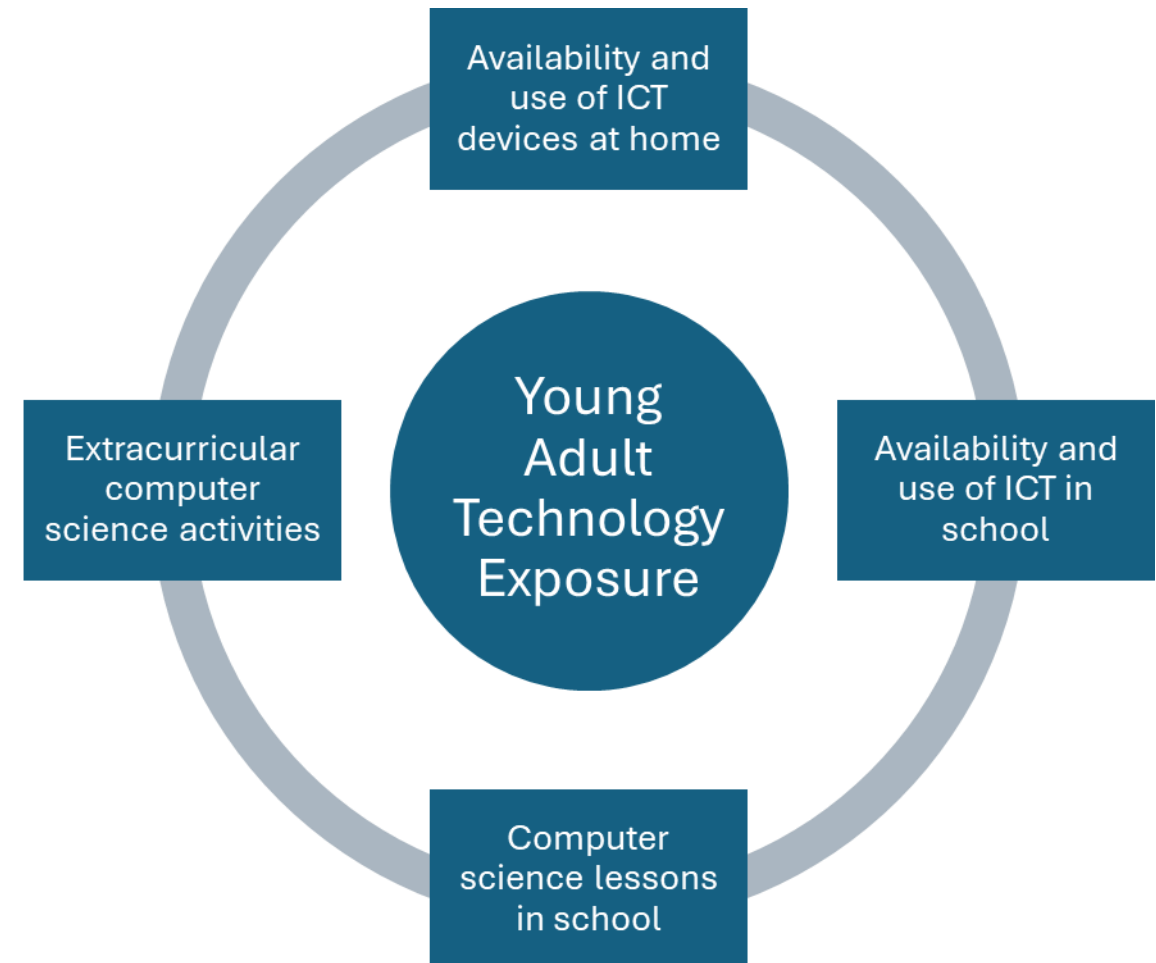
EMPIRICAL STUDIES ON THE IMPACT OF YOUNG ADULT TECHNOLOGY EXPOSURE

— Mixed results based on **PISA** (OECD's Programme for International Student Assessment) data on how ICT availability, use, and engagement affect students' math and science scores (Courtney et al., 2022)

— Starting in 2025, PISA will include the "Learning in the Digital World" test to assess digital literacy (OECD, 2023)

— Pre-tests indicate that students who regularly use ICT across various subjects tend to perform better (OECD, 2022)

— Studies show a positive influence of STEM programs on a career decision in STEM (Yoel & Dori, 2022)

Source: own depiction
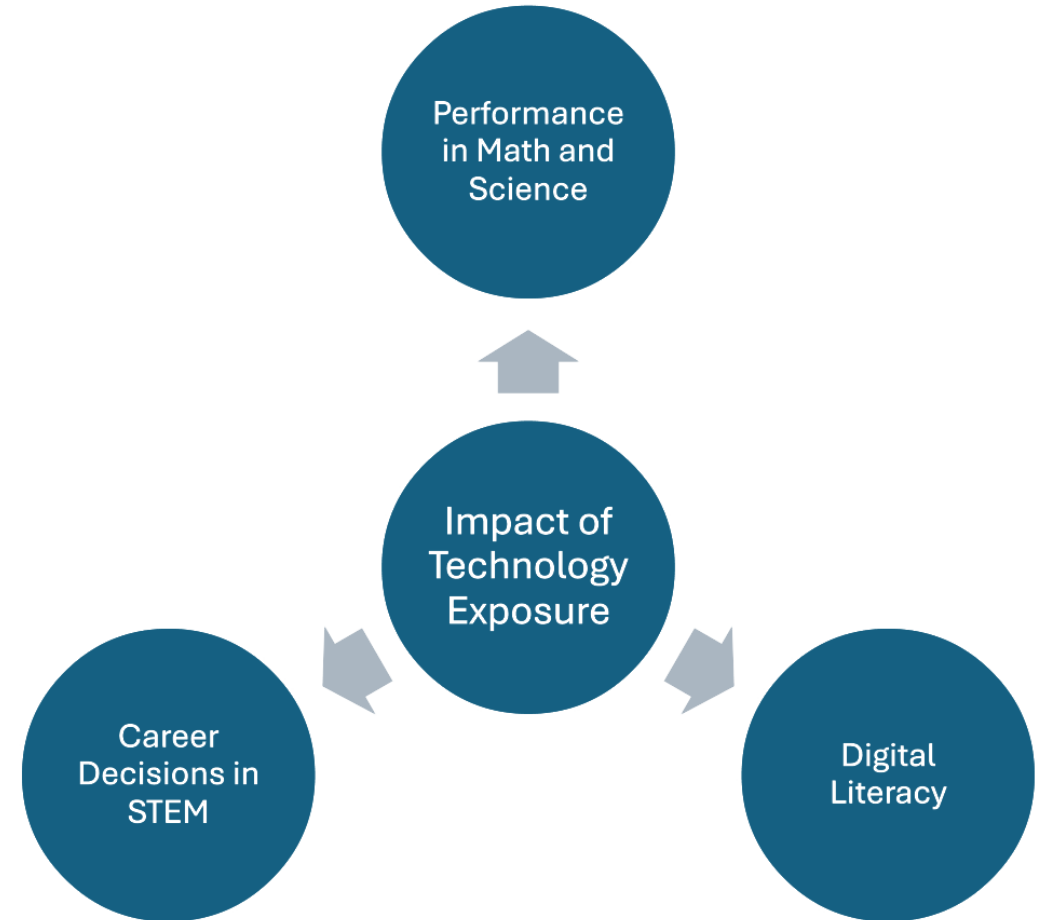
02

COMPUTER SCIENCE SELF-CONCEPT

ABILITY SELF-CONCEPT

- **Expectancy-value theory** by Eccles and Wiegfield (1995) posits that a person's motivation to engage in a particular task is determined by
  - their expectation of success in that task,
  - the value they place on it.
- **Self-concept**: refers to a person's perception of their own competence in a particular domain, e.g., to perform tasks or succeed in activities

- Well research self-concept: **self-concept of math ability**, influenced by, e.g.
  - previous experiences regarding math,
  - feedback from significant others, such as parents, teachers, and peers,
  - social comparisons, e.g., to classmates in math tasks (Sainz & Eccles, 2012)

Source

COMPUTER SCIENCE SELF-CONCEPT

— Refers to the question "How do I assess my own skills in CS?"

- … in computer science as an academic and professional discipline

- Think of a spectrum from using ICT and digital literacy to programming, understanding algorithms, or problem-solving

- CS self-concept: confidence in handling tasks central to the field, such as coding or designing computational solutions

03

OUR STUDY: THE IMPACT OF TECHNOLOGY EXPOSURE ON COMPUTER SCIENCE SELF-CONCEPT
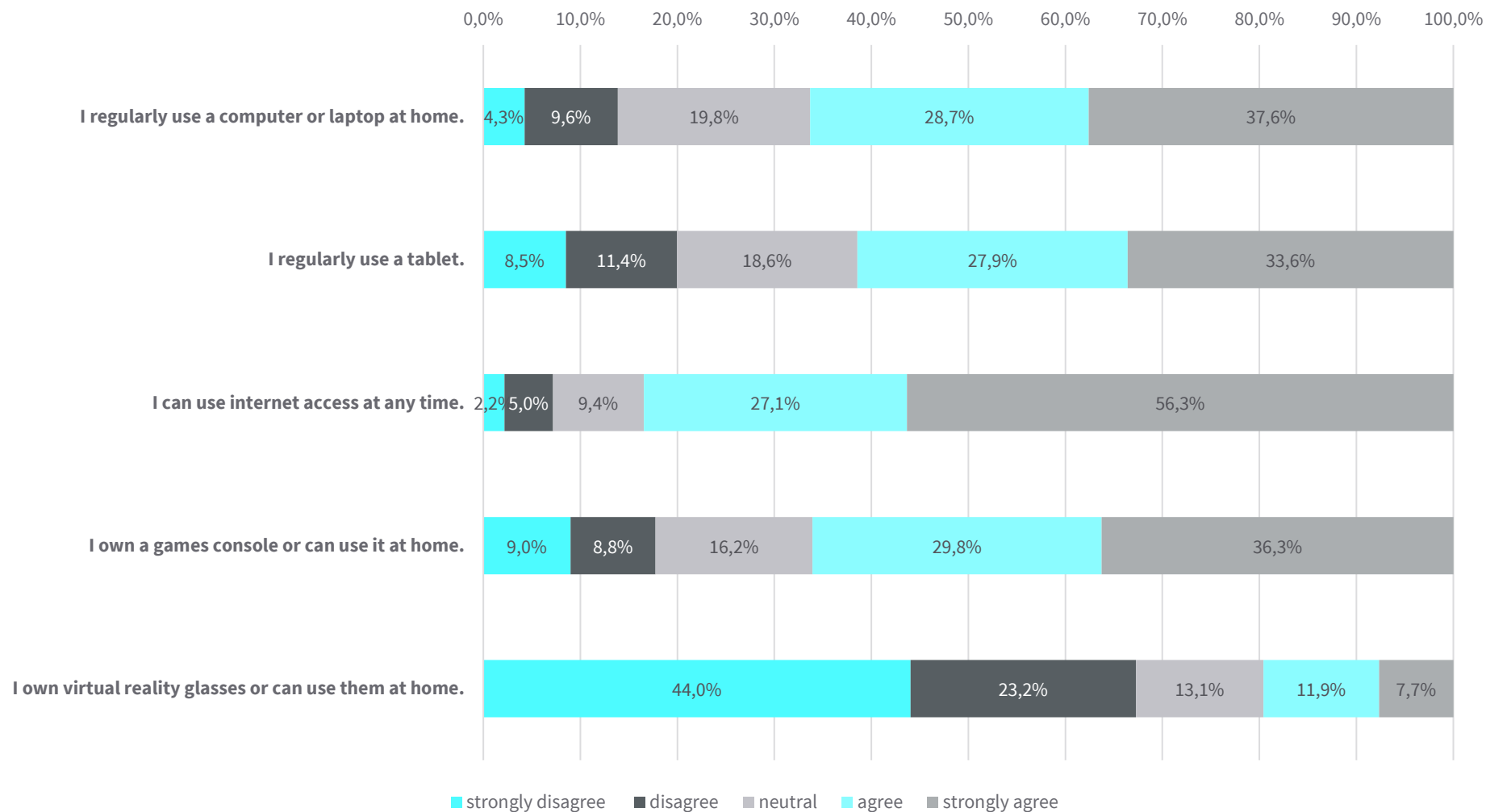
SAMPLE CHARACTERISTICS

- Target group: teenagers and young adults aged between 15 and 20 years
- Online survey conducted in June / July 2024
- Cooperation with a market research organization
- Conducted nationwide in Germany
- Language: German
- Closed and open-ended questions
- About 15 minutes completion time
- 1357 completed questionnaires
- After quality check (e.g. sorting out bot-generated answers): 822 fully completed questionnaires

Age	Female N (%)	Male N (%)	Non-binary N (%)	Total (%)
15	37 (7.3%)	44 (14.0%)	0	81 (9.9%)
16	60 (11.9%)	53 (16.8%)	0	113 (13.8%)
17	84 (16.6 %)	58 (18.4%)	0	142 (17.3%)
18	133 (26.3%)	75 (23.8%)	0	208 (25.3%)
19	99 (19.6%)	37 (11.7%)	1 (100%)	136 (16.6%)
20	93 (18.4%)	48 (15.2%)	0	141 (17.2%)
Total	506 (100%)	315 (100%)	1 (100%)	822

Excluded from all gender-specific analyses

YOUNG ADULTS' TECHNOLOGY EXPOSURE AT HOME

Chart: Young adults' technology exposure at home (percentages by response)

Statement	strongly disagree	disagree	neutral	agree	strongly agree
I regularly use a computer or laptop at home.	4,3%	9,6%	19,8%	28,7%	37,6%
I regularly use a tablet.	8,5%	11,4%	18,6%	27,9%	33,6%
I can use internet access at any time.	2,2%	5,0%	9,4%	27,1%	56,3%
I own a games console or can use it at home.	9,0%	8,8%	16,2%	29,8%	36,3%
I own virtual reality glasses or can use them at home.	44,0%	23,2%	13,1%	11,9%	7,7%

— Most of the young adults have consistent internet access.

— VR glasses have the least exposure.

Source:own depiction.

GENDER DIFFERENCES REGARDING YOUNG ADULTS' TECHNOLOGY EXPOSURE AT HOME

	Young women	Young men
I regularly use a computer or laptop at home.*	3,75	4,04
I regularly use a tablet.*	3,79	3,46
I can use internet access at any time.	4,35	4,23
I own a games console or can use it at home.*	3,61	3,98
I own virtual reality glasses or can use them at home.*	1,93	2,52

■ Young women ■ Young men

t-test, N female: 506, N male: 315, *. p < .001
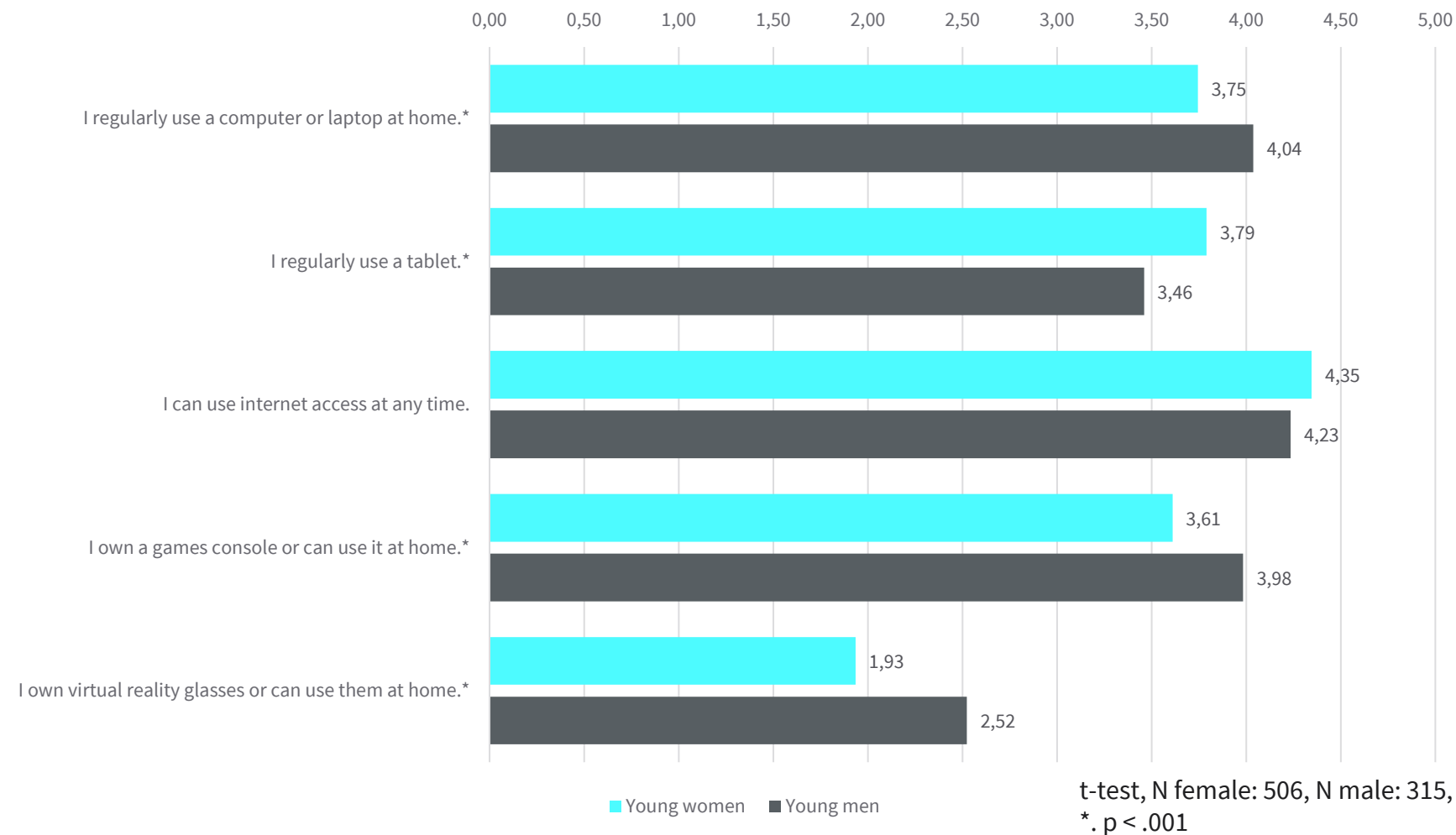
— Young men more often use a notebook / computer at home than young women. The same applies to game consoles and VR glasses.

— Young women more often use tablets than young men.

— Results are in line with a German-wide study on the media equipment and media usage of teenagers in 2024 (Feierabend et al., 2024)

Source: Own depiction.

YOUNG ADULTS' COMPUTER SCIENCE SELF-CONCEPT
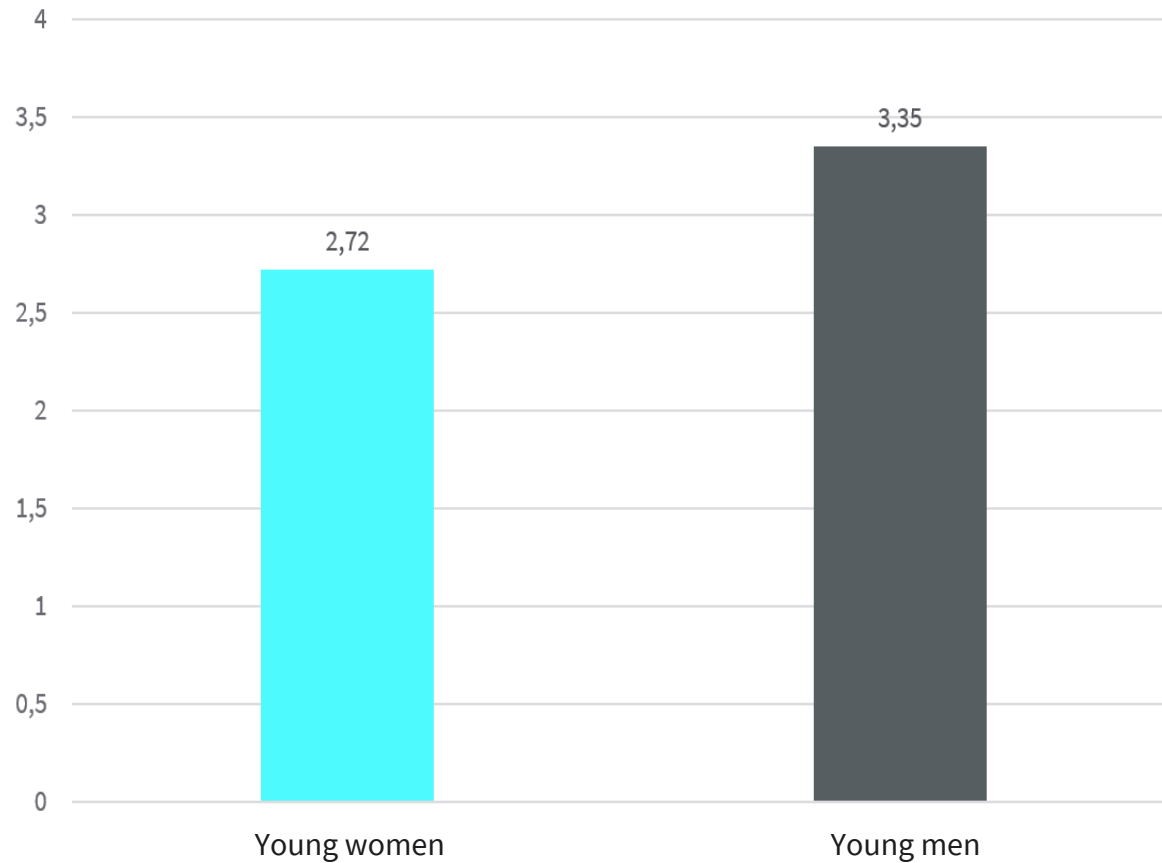
Mean value (aggregated) for computer science self-concept, scale 1-5

- Established scale based on expectancy-value theory
- 5-point Likert scale
- Young men have a significantly stronger computer science self-concept (M_m=3.35, SD=0.891) .
- They rate their own skills significantly higher than young women (M_f=2.72, SD=0.906).
- The difference is statistically significant (t(819)=-9.735, p<.001) with a medium to large effect size (Cohen's d = 0.699)

Source: Own depiction.

IMPACT OF TECHNOLOGY EXPOSURE ON CS SELF-CONCEPT

— Hypothesis: The higher a young adult's overall exposure to technology, the higher their CS self-concept

— Pearson's Correlation Coefficient

— Strong positive correlation for young men (r_m(313)=.542, p<.001)

— Moderate positive correlation for young women (r_f(504)=.292, p<.001)

Only Young Women

Only Young Men

Source: Own Depiction.
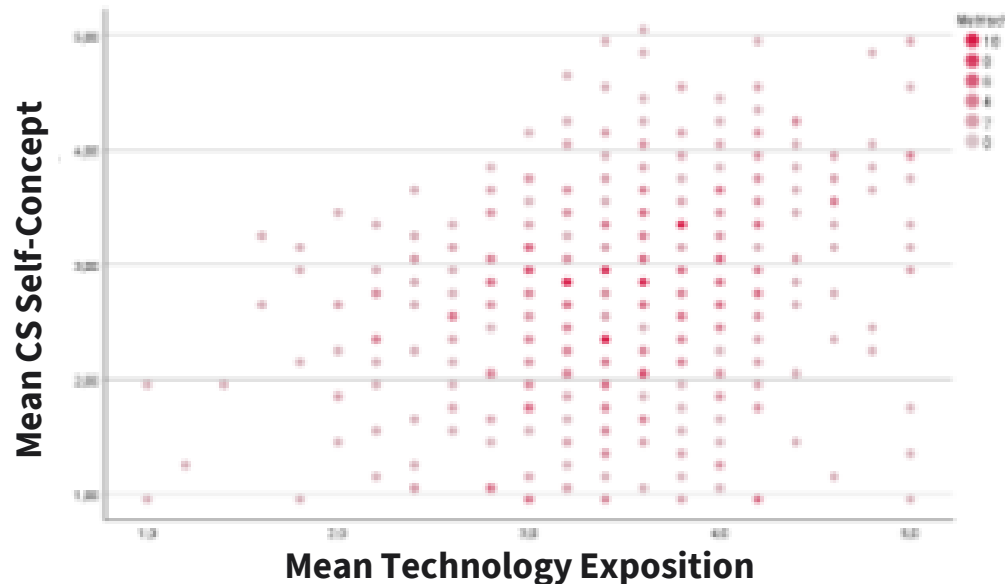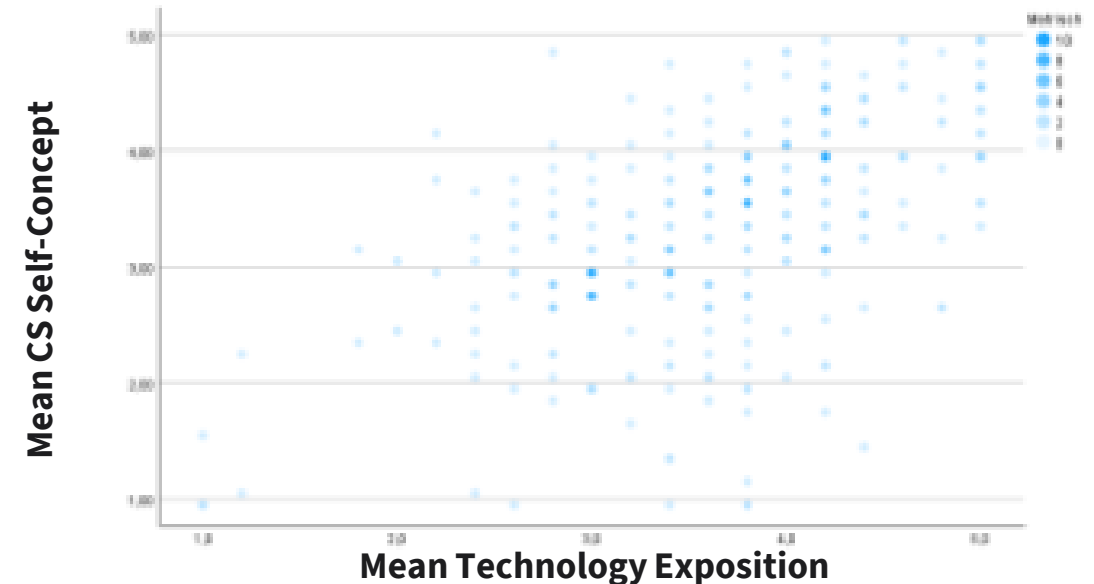
TECHNOLOGY EXPOSURE AS PREDICTOR OF COMPUTER SCIENCE SELF-CONCEPT ?

— Examine whether technology exposure predicts the CS self-concept

— Regression Analysis

  — Small effect for you women with R^2 = .084, F(1,504) = 47.134, p < .001

  — Strong effect for young men with R^2 = .294, F(1,313) = 130.110, p < .001 ➜ Approximately 30% of their CS self-concept is explained by technology exposure

➜ Further factors such as school experiences, family background, or friends contribute

➜ Technology exposure has varying predictive power on the CS self-concept based on gender

➜ Young women need additional initiatives to address other influential factors

04

DISCUSSION

CONCLUSIONS & DISCUSSION

- Technology exposure plays a role in shaping CS self-concept, it is not the sole factor, especially in the case of young women
- Baseline familiarity may build initial confidence
- More advanced experiences – like using a computer for programming or a VR setting for simulations – are required
- Recommendations to translate technology exposure into an increased CS self-concept
  → school lessons that provide creative, hands-on, project-based CS learning opportunities
  → integrate CS concepts across subjects, e.g., use and discuss generative AI in art
  → Particular focus on girls and young women

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THANK YOU

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