

Working Under Distractions

Yang Zhong

University of Warwick

Motivation

Distractions in everyday work:

- Task-switching: phone calls or interrupting colleagues
- Auditory: chatty coworkers in open-plan offices

Motivation

Distractions in everyday work:

- Task-switching: phone calls or interrupting colleagues
- Auditory: chatty coworkers in open-plan offices

Effect of distractions:

- Negative performance effect
- Lower well-being
- Individual differences
- Willingness and ability to deal with distractions

Responses to distractions and willingness and ability to handle distractions

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - Effects on performance and well-being
 - WTP to eliminate distractions

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - Effects on performance and well-being
 - WTP to eliminate distractions
- Validate **survey questions** on distraction resilience in the lab
 - Relationship between distraction resilience and responses to distractions

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - Effects on performance and well-being
 - WTP to eliminate distractions
- Validate **survey questions** on distraction resilience in the lab
 - Relationship between distraction resilience and responses to distractions
- Survey evidence: **LISS panel**
 - Relationship between distraction resilience and labor market outcomes

Results

Responses to distractions and willingness and ability to handle distractions

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - No significant performance effect
 - Both types of distractions hurt well-being
 - WTP correlates with change in well-being but not performance

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - No significant performance effect
 - Both types of distractions hurt well-being
 - WTP correlates with change in well-being but not performance
- Validate **survey questions** on distraction resilience in the lab
 - Heterogeneity in effect on well-being captured by survey measures on distraction resilience

Responses to distractions and willingness and ability to handle distractions

- **Lab experiment:** interrupt a cognitive task with task-switching and auditory distractions
 - No significant performance effect
 - Both types of distractions hurt well-being
 - WTP correlates with change in well-being but not performance
- Validate **survey questions** on distraction resilience in the lab
 - Heterogeneity in effect on well-being captured by survey measures on distraction resilience
- Survey evidence: **LISS panel**
 - Distraction resilience is correlated with income and job satisfaction

Literature

- Task-switching:
 - Negative effect on performance (Monsell, 2003; Coviello et al., 2010; Buser & Peter, 2012)
- Gender differences:
 - Szameitat et al. (2015) Belief that women are better than men at multitasking
 - Adams-Prassl et al. (2023): Mothers earn 20% less than fathers on MTurk due to interruptions in their work
- Noise:
 - Dean (2024): Increase in noise level reduces productivity through impairment of cognitive functions
- Mental well-being:
 - High work pressure (increased multitasking and interruptions) is associated with worse mental health outcomes (Nagler et al., 2023)
 - Smartphone bans decrease consultations for psychological symptoms for girls in Norway (Abrahamsson, 2024)

Experimental Design

Timeline

- Questionnaire
- Practice game
- 3 rounds: (randomized order)
 - No distraction
 - Task-switching distraction
 - Auditory distraction
- Well-being questions after each round
- Final choice round: WTP to avoid distractions
- Survey on demographics

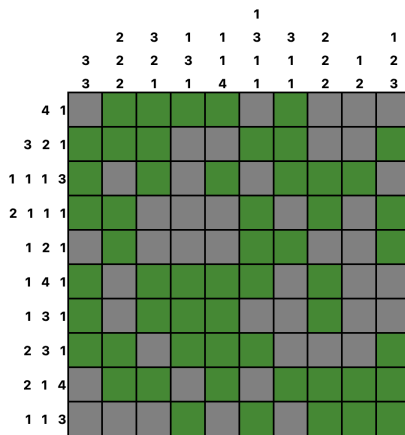
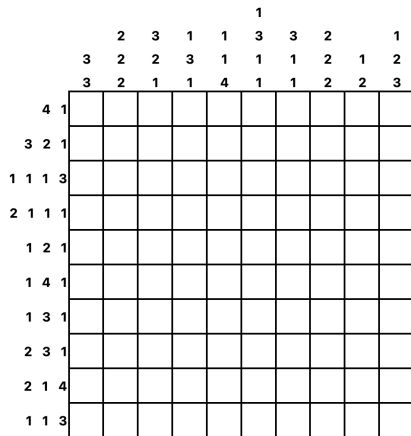
Questionnaire

- Questions to measure resilience in working under distractions:
 - I dislike working in distracting environments. (R)
 - I can focus well in noisy environments.
 - I can easily concentrate after being interrupted.
 - I am good at working on several projects at the same time.
 - I enjoy working on several projects at the same time.
 - I have trouble limiting my phone usage. (R)
 - I constantly check my phone while studying. (R)
 - I am easily distracted. (R)

A composite measure is constructed by performing PCA on all eight questions.
The higher the number, the better at dealing with distractions.

Overview of the tasks

Main cognitive task: Nonogram



Overview of the tasks

Main cognitive task: Nonogram

- 10 minutes
- Piece rate payment: 1 point per correctly labeled square
- Mistakes auto corrected at a cost of 5 points
- If a task is solved within 10 min, a new task is given

Overview of the tasks

Small secondary task: adding-numbers (10 in total)

- Each task needs to be solved within 1 min (otherwise 5 points deduction)

44	12	34
21	52	13
27	57	68

Target Number:

79

0:51

Treatments

- Treatment 1: no distraction
 - Nonogram for 10 minutes followed by 10 adding-numbers tasks
- Treatment 2: task-switching distraction
 - 10 adding-numbers tasks interrupt Nonogram at random moments
 - Covers Nonogram and the timer freezes
 - Nonogram resumes after the adding-numbers task is solved or timer is done
- Treatment 3: auditory distraction
 - Nonogram for 10 minutes followed by 10 adding-numbers tasks
 - A conversation plays in the background while playing Nonogram

Same task order, randomized treatment order

Elicitation of well-being

Questions on feelings while solving the tasks after each round:

- I felt stressed while playing Nonogram.
- I felt happy while playing Nonogram.
- I felt frustrated while playing Nonogram.
- I felt stressed while playing the adding-numbers games.
- I felt happy while playing the adding-numbers games.
- I felt frustrated while playing the adding-numbers games.

A composite measure is constructed by taking the average of all 6 questions.

The higher the number, the better the well-being.

Choice round

- Price list on WTP to avoid distractions
- For each type of distraction, choose between:
 - Play Nonogram with distractions
 - Play Nonogram without distractions but with X points deducted

Round 4 of 4

For each of the following decisions, please indicate which one you would prefer.

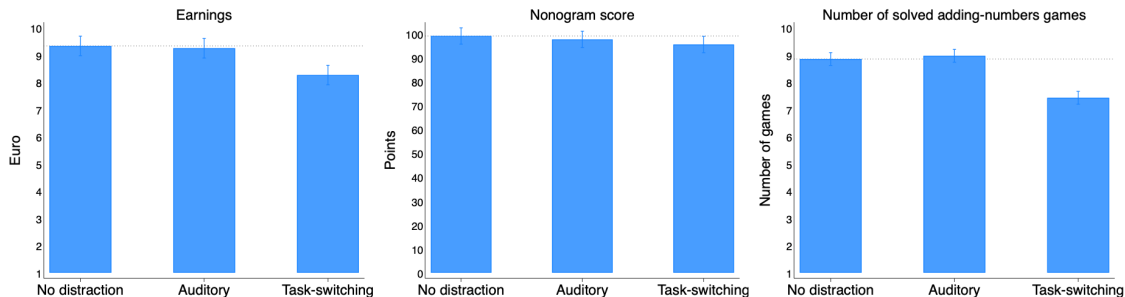
- ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
 - ☐ Interruptions
- ☐ Sequential with 0 point deducted
 - ☐ Sequential with 5 points deducted
 - ☐ Sequential with 10 points deducted
 - ☐ Sequential with 15 points deducted
 - ☐ Sequential with 20 points deducted
 - ☐ Sequential with 25 points deducted
 - ☐ Sequential with 30 points deducted
 - ☐ Sequential with 35 points deducted
 - ☐ Sequential with 40 points deducted
 - ☐ Sequential with 45 points deducted
 - ☐ Sequential with 50 points deducted
 - ☐ Sequential with 55 points deducted
 - ☐ Sequential with 60 points deducted
 - ☐ Sequential with 65 points deducted
 - ☐ Sequential with 70 points deducted
 - ☐ Sequential with 75 points deducted
 - ☐ Sequential with 80 points deducted
 - ☐ Sequential with 85 points deducted
 - ☐ Sequential with 90 points deducted
 - ☐ Sequential with 95 points deducted
 - ☐ Sequential with 100 points deducted

Next

Results

Effect of distractions on performance

N = 217: 117 female, 100 male



Controlled for task and individual fixed effects.

[table](#)

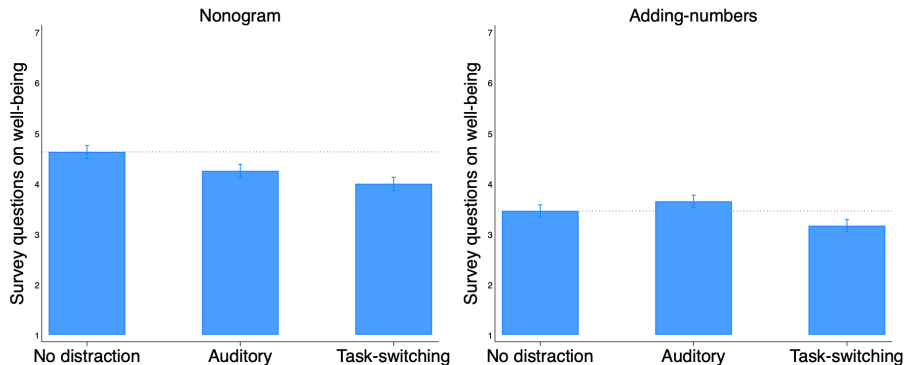
[round 1 only](#)

[summary statistics](#)

[performance over time](#)

[resume work](#)

Effect of distractions on well-being



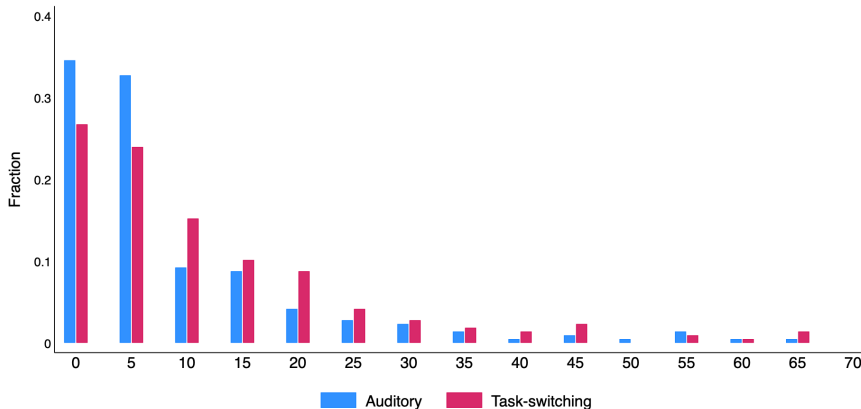
Conversation stopped for adding-numbers games in auditory-distraction treatment.

[table](#)

Controlled for task and individual fixed effects.

Well-being: average of 3 well-being questions for each type of task; the higher the number, the better the well-being.

WTP to avoid working under distractions



- Participants are willing to pay more to avoid task-switching distractions than auditory distractions.

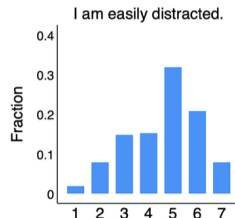
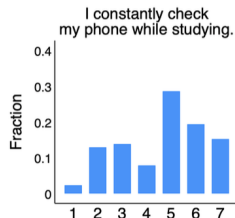
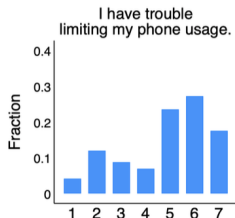
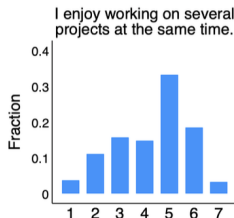
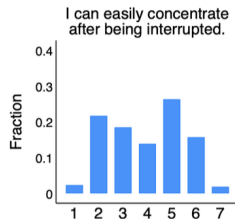
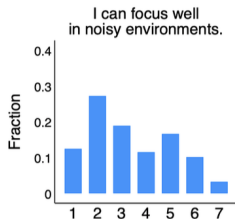
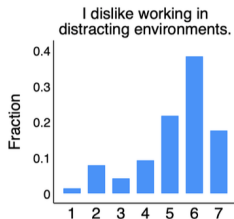
WTP to avoid working under distractions

	(1)	(2)
	WTP	
	Task-switching	Auditory
Well-being	-0.261*** (0.087)	-0.330*** (0.106)
Earnings	-0.062 (0.092)	-0.009 (0.082)
Well-being no-distraction	✓	✓
Earnings no-distraction	✓	✓
N	217	217

- Participants value their well-being more than their earnings.

Questionnaire items on distraction resilience

Distributions of answers to survey questions:



Questionnaire items on distraction resilience

	(1)	(2)	(3)	(4)	(5)	(6)
	Task-switching			Auditory		
	Earnings	WTP	Well-being	Earnings	WTP	Well-being
Distraction resilience	0.078 (0.060)	0.014 (0.066)	0.136** (0.059)	0.016 (0.063)	-0.086 (0.066)	0.157*** (0.060)
Earnings no-dist.	✓	✓	✓	✓	✓	✓
Well-being no-dist.	✓	✓	✓	✓	✓	✓
N	217	217	217	217	217	217

All dependent and independent variables are standardized.

Survey questions: first component from PCA of eight survey questions;

the higher the number, the better at dealing with distractions.

Well-being: average of all 6 well-being questions; the higher the number, the better the well-being.

Distraction resilience and realized labor market outcomes (LISS panel)

	(1)	(2)	(3)	(4)
<i>Panel A: Income</i>				
Distraction resilience	0.153*** (0.023)	0.150*** (0.020)	0.142*** (0.020)	0.089*** (0.023)
Adj. R-squared	0.152	0.298	0.324	0.346
Observations	1,843	1,843	1,843	1,843

<i>Panel B: Job satisfaction</i>				
Distraction resilience	0.206*** (0.027)	0.202*** (0.027)	0.204*** (0.027)	0.111*** (0.030)
Adj. R-squared	0.040	0.045	0.048	0.080
Observations	1,732	1,732	1,732	1,732

Gender, age	✓	✓	✓	✓
Education level		✓	✓	✓
Sector			✓	✓
Personality				✓

detailed gender

Conclusion

Conclusion

- Interrupt a main cognitive task with two types of distractions
- No significant performance effects
- Both types of distractions hurt well-being
- WTP correlates with change in well-being but not change in performance
- Heterogeneity in effect on well-being can be captured by survey questions
- Survey answers correlate with income and job satisfaction

Thank you!

Contact me at: yang.zhong.1@warwick.ac.uk



Sample restrictions

The following participants were excluded:

- 22 participants who completed all three Nonogram tasks within 10 minutes for at least one treatment (14 in no distraction, 14 in auditory distraction, and 8 in task-switching distraction)
- 4 participants with a very low negative final score for at least one treatment (less than -100 points)
- 3 participants who chose the same option for all questions on a particular questionnaire page (attention check)
- 2 participants who tried to turn off the conversation by switching off the computer

[Back](#)

Summary Statistics

	Mean	Std. dev.	Min	Max
<i>No distraction</i>				
Total earnings	9.315	4.646	-2.80	25.30
Nonogram score	98.839	44.806	-19	253
Solved adding-numbers	8.862	1.446	3	10
<i>Auditory</i>				
Total earnings	9.436	4.942	-7.60	23.40
Nonogram score	99.502	47.594	-71	234
Solved adding-numbers	8.972	1.243	4	10
<i>Task-switching</i>				
Total earnings	8.098	5.240	-7.20	21.40
Nonogram score	93.862	45.526	-27	214
Solved adding-numbers	7.424	3.113	0	10

[Back](#)

Effect of distractions on performance

	(1) Total	(2)	(3) Nonogram	(4)	(5) Adding-numbers	(6)
	Earnings	Score	Right	Wrong	Time	Solved
Auditory	-0.083 (0.260)	-1.426 (2.473)	1.467 (1.913)	0.579 (0.383)	-10.354 (7.114)	0.119 (0.170)
Task-switching	-1.069*** (0.259)	-3.569 (2.467)	-1.549 (1.908)	0.404 (0.382)	43.998*** (7.095)	-1.425*** (0.169)
Constant	6.772*** (0.236)	75.184*** (2.249)	128.129*** (1.740)	10.589*** (0.349)	283.182*** (6.469)	8.507*** (0.154)
N	651	651	651	651	651	651

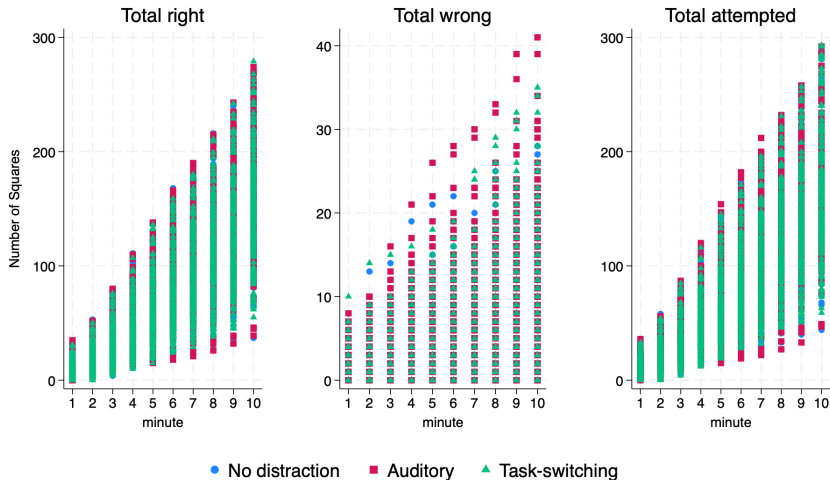
Back

Effect of distractions on performance (using round 1 only)

	Total Earnings	Nonogram score	Adding-numbers Solved
Auditory	1.196* (0.608)	9.745* (5.783)	0.443* (0.249)
Task-switching	-1.186* (0.678)	-2.370 (5.875)	-1.898*** (0.416)
Constant	6.444*** (0.411)	71.493*** (3.862)	8.589*** (0.189)
N	217	217	217

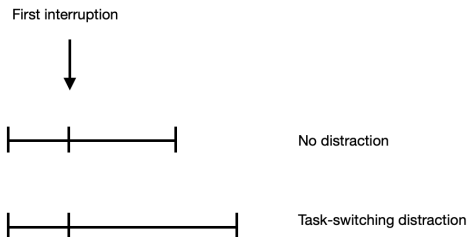
[Back](#)

Performance over time



[Back](#)

Effect of distractions on performance



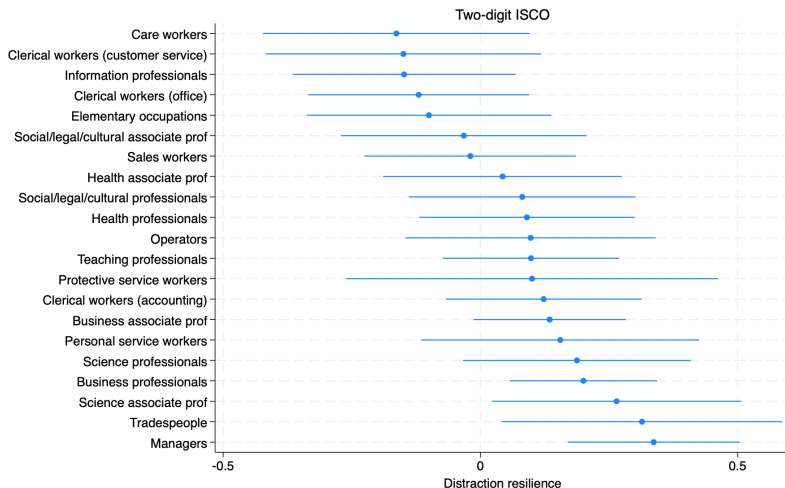
- Interruptions slow participants down by 2.57 seconds. [Back](#)

Effect of distractions on well-being

	(1)	(2)
	Well-being	
	Nonogram	Adding-numbers
Auditory	-0.374*** (0.093)	0.192** (0.089)
Task-switching	-0.632*** (0.093)	-0.292*** (0.088)
Constant	4.595*** (0.085)	3.396*** (0.080)
N	651	651

Back

Distraction resilience across occupations (LISS panel)



[Back](#)

Relationship between distraction resilience and income and job satisfaction

	(1) Income	(2) Job satisfaction
Distraction resilience	0.089*** (0.023)	0.111*** (0.030)
Risk tolerance	-0.021 (0.024)	-0.010 (0.030)
Competitiveness	0.115*** (0.026)	0.010 (0.027)
Extraversion	0.070*** (0.022)	0.042 (0.027)
Agreeableness	0.016 (0.022)	0.046 (0.030)
Conscientiousness	0.030 (0.021)	0.037 (0.028)
Stability	0.072*** (0.021)	0.170*** (0.030)
Openness	-0.004 (0.023)	0.009 (0.030)
Gender, age	✓	✓
Education level	✓	✓
Sector	✓	✓
Observations	1,843	1,732

[Back](#)

Gender differences in performance and well-being (experiment)

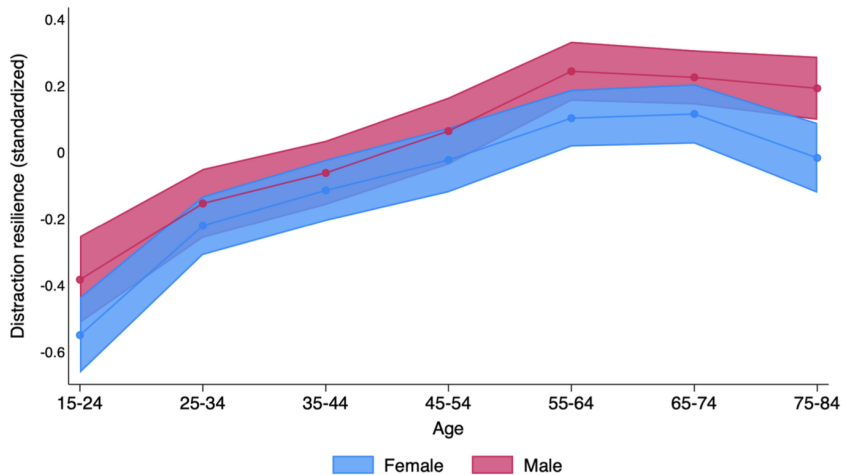
	(1) Total Earnings	(2) Nonogram Score	(3) Adding-numbers Solved	(4) Well- being
Female	0.156 (0.571)	3.103 (5.524)	-0.308 (0.192)	-0.432*** (0.134)
Aud	0.310 (0.358)	1.926 (3.552)	0.235* (0.124)	-0.032 (0.107)
TS	-0.996*** (0.355)	-2.671 (3.352)	-1.459*** (0.304)	-0.442*** (0.105)
Female×aud	-0.732 (0.484)	-6.235 (4.720)	-0.217 (0.183)	-0.110 (0.132)
Female×TS	-0.135 (0.502)	-1.660 (4.755)	0.063 (0.400)	-0.037 (0.136)
Constant	6.686*** (0.418)	73.503*** (4.005)	8.671*** (0.167)	4.228*** (0.111)
N	651	651	651	651

Controlled for task and individual fixed effects.

Gender differences in WTP (experiment)

	(1) Auditory	(2) Task-switching
Female	-4.441** (1.741)	-4.963*** (1.898)
Constant	11.150*** (1.587)	14.450*** (1.618)
N	217	217

Gender differences in distraction resilience (LISS panel)



[Back](#)

References

- Abrahamsson, S. (2024). Smartphone bans, student outcomes and mental health. *NHH Dept. of Economics Discussion Paper*(01).
- Adams-Prassl, A., Hara, K., Milland, K., & Callison-Burch, C. (2023). The gender wage gap in an online labor market: The cost of interruptions. *Review of Economics and Statistics*, 1–23.
- Buser, T., & Peter, N. (2012). Multitasking. *Experimental economics*, 15(4), 641–655.
- Coviello, D., Ichino, A., & Persico, N. (2010). *Don't spread yourself too thin: The impact of task juggling on workers' speed of job completion* (Tech. Rep.). National Bureau of Economic Research.
- Dean, J. T. (2024). Noise, cognitive function, and worker productivity. *American Economic Journal: Applied Economics*, 16(4), 322–360.
- Monsell, S. (2003). Task switching. *Trends in cognitive sciences*, 7(3), 134–140.
- Nagler, M., Rincke, J., & Winkler, E. (2023). High-pressure, high-paying jobs? *Review of Economics and Statistics*, 1–45.
- Szameitat, A. J., Hamaida, Y., Tulley, R. S., Saylik, R., & Otermans, P. C. (2015). “women