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Cognitive Training for Jobseekers: Evidence from a Randomized Experiment

Hélène Benghalem
University of Lausanne
and LIVES Center

Mirjam Bächli
University of Lausanne
LIVES Center and IZA@LISER

Doriana Tinello
University of Geneva
and LIVES Center

Sascha Zuber
University of Geneva
and LIVES Center

Mauro Cherubini
University of Lausanne

Damaris Aschwanden
LIVES Center and OST

Matthias Kliegel
University of Geneva
and LIVES Center

Rafael Lalive
University of Lausanne,
LIVES Center, CEPR
and IZA@LISER

Michele Pellizzari
University of Geneva,
LIVES Center, CEPR
and IZA@LISER

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Abstract

Cognition is likely to be important for job search, but its role is not yet well understood. We study an online field experiment with jobseekers registered at the Swiss public employment services. Participants were randomly assigned to an online cognitive training program designed to strengthen core cognitive abilities and transversal cognitive abilities relevant for job search. Combining administrative and survey data on employment and earnings, we find that access to cognitive training substantially increases employment rates and earnings while reducing reliance on transfer income. In a simple search model, these findings could arise when cognition improves search effectiveness leading to lower search effort but higher chances of employment.

JEL classification

J64, J62, C93

Keywords

unemployment, online job search, cognitive training

Corresponding author

Michele Pellizzari
michele.pellizzari@unige.ch

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1 Introduction

Effective job search requires individuals to process information, evaluate opportunities, and make sequential decisions under uncertainty. Job seekers must plan search strategies, allocate effort over time, tailor applications, and learn from feedback, all while maintaining motivation in the face of repeated rejection. These tasks require substantial cognitive abilities, which may deteriorate during the job search process, potentially delaying reemployment or leading to occupational downgrading. Cognitive abilities may therefore play an important role in shaping job search behavior and outcomes. Nevertheless, existing active labor market programs rarely target cognition, and when they do, such interventions are typically resource-intensive and costly. By contrast, the growing use of online job search platforms creates new opportunities for scalable and cost-effective cognitive interventions.

In this paper, we present the results of a novel online intervention designed to strengthen core elements of jobseekers' cognitive abilities in support of their job search and reemployment. Importantly, the program trained a broad range of cognitive functions thought to be central to planning and execution in contexts that require substantial self-regulation. The training consisted of a series of online exercises and was delivered in two weekly sessions of approximately 30 minutes for a total of 24 weeks.

To implement the intervention, we developed a dedicated cognitive training program and an integrated online job search platform J4U. The platform was designed to manage the treatment protocols of several hundred job seekers, including the delivery of a complex and staggered training schedule. In addition, the platform enables participants to search for jobs online and allows us to track their engagement during the intervention. Participants are also invited to complete short weekly surveys on their job search activities. We use these platform- and survey-generated data, linked by the Swiss Federal Statistical Office to rich administrative records on employment outcomes and earnings. This allows us to track participants for one year and to evaluate the effects of the intervention using high-quality data.

We implemented the intervention in collaboration with the public employment services (PES) of two French-speaking Swiss cantons: Neuchâtel and Vaud. All individuals registered with the PES in Neuchâtel in February 2021 and in Vaud in May 2022 were invited to participate; our main analytical sample additionally restricts to individuals

who were not employed and were receiving transfer income in the month before baseline. The intervention was offered on top of the standard counselling and training services provided by the employment offices, which remained unchanged throughout the study period. The entire intervention – including recruitment, treatment delivery, and survey administration – was conducted online. Participants could access both the training sessions and the J4U platform through their personal devices, such as smartphones, tablets, or computers. As a result, the intervention is easily scalable and adaptable to different contexts.

Our training targets specific types of cognitive abilities that have been documented to be useful in job search, such as category flexibility or time management (Diamond, 2013; Kliegel et al., 2002). We begin our empirical analysis by documenting that these abilities are correlated with occupational wages. Participants in the top quartile of the baseline distribution of these abilities were previously employed in occupations with substantially higher hourly wages than those in the bottom quartile.

Jobseekers without cognitive training exhibit declining cognitive task performance over time, whereas no such decline is observed among those offered training. The estimated effects are sizeable: cognitive training offsets roughly a 0.15 standard deviation decline in cognitive abilities.

Turning to labor market outcomes, we find that job seekers offered cognitive training are more likely to be employed. The increase in employment rates persist throughout the follow-up period and reaches about 10 percentage points in the six months following the end of the six-month training period, accompanied by a reduction in reliance on transfers, primarily unemployment insurance benefits. Effects on total labor market earnings are similarly strong. Earnings conditional on employment are also higher among job seekers offered training, albeit not statistically different from zero.

These effects are large relative to what is typically found in interventions aimed at improving job seekers' employment outcomes, especially given the intention-to-treat (ITT) nature of our estimates (Kircher, 2020). Job seekers who were offered cognitive training started, on average, 4–5 weeks of training, and those who did not find employment during the six-month intervention period started more than six weeks on average. Relative to other studies, this represents substantial take-up and likely contributes to the large magnitude of the estimated effects (Abel et al., 2019; Berger et al., 2022, 2025; Katz et al.,

2022; Sorrenti et al., 2024).

We also explore heterogeneity in treatment effects. Employment impacts are particularly large for job seekers with low baseline cognitive functioning, as well as for those aged 45 and older and for individuals who have been unemployed for more than nine months at baseline. Earnings effects closely mirror this pattern. In addition, earnings conditional on employment increase significantly among participants aged 45 and older and among those with longer unemployment durations. By contrast, impacts are small or absent for job seekers with high baseline cognitive functioning, for those younger than 45, and for individuals unemployed for less than nine months. Overall, the training appears most effective for individuals with low or declining cognitive functioning.

In the final part of the paper, we combine a simple theoretical framework with information on job search activities from the weekly surveys to interpret our main findings. We show that, relative to the control group, treated job seekers exhibit a higher conversion rate from interviews to job offers. This greater effectiveness translates into higher job-finding rates despite potentially lower search effort among treated job seekers, who submit slightly fewer applications and spend somewhat less time searching. A natural interpretation is that job seekers use the additional cognitive abilities generated by the training to reduce search effort while still achieving higher job-finding rates, a behavior that is fully consistent with optimizing behavior.

We also present possible alternative explanations. For instance, rather than enhancing cognitive abilities per se, the intervention may improve participants' performance on tasks that are directly valued by recruiters, or it may simply increase engagement with online activities, including job search. We present suggestive empirical evidence that is more consistent with our proposed interpretation than with these alternative explanations.

Our paper contributes to several strands of literature in both economics and psychology. A growing body of research in psychology documents that unemployment has adverse psychological and cognitive effects. This literature examines a range of cognitive functions that are critical for job search, but largely stops short of linking impairments in cognition to actual labor market outcomes (Fryer and Warr, 1984; Mani et al., 2013; Vélez-Coto et al., 2021).

A related literature in economics studies cognitive, psychological, and behavioral dimensions of job search. For example, Abel et al. (2019) show that plan-making increases

employment among young job seekers by 26% without affecting time spent searching. Similarly large earnings gains – between 12 and 34 percent – are documented by Katz et al. (2022) in randomized evaluations of US sectoral training programs that combine occupational and soft-skills training for low-wage workers. Berger et al. (2022) integrate a self-control training into programs for the long-term unemployed and find positive effects on application quality but no effect on job finding. Using observational data, Caliendo et al. (2015) document that individuals with a more internal locus of control tend to find jobs more quickly. Drawing on evidence from a laboratory experiment, Falk et al. (2006) highlight the role of self-confidence in search decisions, with potential relevance for job search behavior. Finally, Cohen et al. (2025) study skill depreciation during unemployment and find little evidence of systematic decline. Building on this literature, we develop an online intervention that targets a broad set of cognitive abilities, selected and integrated on the basis of prior scientific evidence to address the cognitive and motivational challenges inherent in job search. To the best of our knowledge, this represents the most comprehensive effort to design such an intervention and to evaluate it in a real-world setting using a large population of participants. Interventions targeting non-cognitive skills are more established in other contexts, such as education, and typically also find large effects (Berger et al., 2025; Sorrenti et al., 2024).

More broadly, our intervention contributes to the literature on online active labour market policies (ALMPs), which leverage the low marginal cost of digital platforms to deliver personalized information and support jobseekers. These interventions aim to improve either the quantity or quality of search effort, or both, through scalable, information-based approaches (see Card et al. (2010) for a comprehensive review of ALMPs and Altmann et al. (2018); Gee (2018) as recent examples). While early evaluations of online job search showed mixed results and some skepticism about its value (Kroft and Pope, 2014; Kuhn and Skuterud, 2004), more recent evidence points to substantial benefits for unemployed individuals (Gürtzgen et al., 2021; Kuhn and Mansour, 2014). Our intervention builds on these insights by combining the advantages of digital delivery with platform content inspired by both labor market research and psychological processes. It demonstrates how new communication technologies can be used not only to disseminate labor market information efficiently, but also to target deeper cognitive barriers to successful job search.

The paper is organized as follows. Section 2 provides background on the cognitive training program. Section 3 describes the study design, and Section 4 presents the data used in the analysis. The main results are reported in Section 5. Section 6 discusses the interpretation of the findings, and Section 7 concludes.

2 Training Cognition

In this section, we discuss the details of our cognitive intervention. We first present its underlying principles and motivation (Section 2.1) and then describe its design and the practical implementation (Section 2.2).

2.1 Core cognitive abilities, transversal cognitive abilities and their role in job search

Job search is a complex, highly self-regulated activity (Van Hooft et al., 2021). Job seekers must identify relevant vacancies, assess whether positions match their skills and preferences, tailor applications, communicate with employers, prepare for interviews, and continuously adjust their strategies in response to feedback and setbacks. These tasks are typically planned and executed by the jobseeker alone, often under uncertainty and psychological stress. As a result, effective job search places substantial demands on cognitive abilities.

Job search and related labor-market outcomes draw on multiple aspects of cognition, including core cognitive abilities as well as broader transversal cognitive abilities such as reasoning, reading comprehension, fluency of ideas, and perceptual speed. Core cognitive abilities, as used here, refer to relatively basic cognitive processes that support evaluating progress, flexible problem solving, memory, and structuring and prioritizing activities. Some of these abilities overlap with executive functions, which support goal-directed behavior through processes such as working memory, inhibitory control, and cognitive flexibility (Miyake et al., 2000; Zelazo et al., 2008). These functions enable individuals to plan, focus attention, regulate impulses, adapt to changing environments, and are closely linked to activity in the prefrontal cortex and its connections to other brain regions (Anderson et al., 2008; Diamond, 2013). A large body of evidence in psychology and neuroscience shows that core cognitive abilities are critical for complex tasks involving

sequencing, trade-offs, and learning from feedback (Salthouse, 2005). They develop over the life course, show substantial inter-individual variability, and can be influenced by environmental conditions (Blair and Raver, 2012).

Transversal elements of cognition underpin the ability to learn from new information, communicate effectively and generate ideas. Core cognitive abilities determine when and how cognitive resources are used. Transversal cognitive abilities extend these capacities across different contexts and translate them into concrete behaviors. For example, inductive reasoning helps individuals recognize patterns in new situations and use them to allocate time effectively or adjust their behavior when monitoring reveals insufficient progress. Together, they foster efficiency and adaptability in cognitive performance, which may strengthen jobseekers' resilience and persistence in the context of unemployment.

For prime-age workers, core cognitive abilities are typically well developed (Ferguson et al., 2021), supporting efficient information processing, planning, and adaptive decision-making during job search. However, these capabilities may weaken when individuals remain unemployed for extended periods. Reduced exposure to cognitively demanding tasks, fewer opportunities to engage in structured problem solving, and lower feedback intensity may weaken working memory, attention control, and cognitive flexibility over time. Evidence from cognitive psychology suggests that core cognitive abilities are sensitive to the frequency of use and environmental stimulation, and may decline in the absence of regular engagement (Stern, 2009). Relatedly, stress experienced during job search can impair cognitive tasks performance (Nwikwe, 2025). In the context of job search, such atrophy may translate into less structured search behavior, slower updating of strategies, and reduced ability to evaluate and target suitable job opportunities, ultimately lowering search effectiveness.

2.2 The design of the cognitive training

We designed a training program to enhance or maintain core cognitive abilities and transversal cognitive abilities that are known to be important in job search. We trained the following core cognitive abilities: memorization, category flexibility, time management, and monitoring. As we discussed in the previous section, these represent fundamental building blocks of cognition that shape learning efficiency and adaptability, and

Table 1: Trained cognitive abilities

Item	Definition	Role in job search (examples)
	Core cognitive abilities	
Memorization	Retaining and recalling information	Holding and recalling information during applications or interviews
Category flexibility	Switching attention between different tasks, mental rules, perspectives	Shifting between strategies and perspectives when setbacks occur
Time management	Structuring one's and others' time	Structuring and prioritizing activities across applications, training and interventions
Monitoring	Estimating and evaluating performance	Evaluating one's progress and adjusting strategies
	Transversal cognitive abilities	
Inductive reasoning	Deriving general rules from scattered information	Detecting patterns and drawing logical conclusions from incomplete information
Reading comprehension	Understanding written material	Understanding job postings, contracts or training material
Fluency of ideas	Generating multiple novel ideas	Generating multiple solutions or alternatives when facing obstacles
Perceptual speed	Speed at which one can process external stimuli, perceive similarities and differences	Rapidly processing and comparing job-related information

Note: This table lists the core cognitive abilities and transversal cognitive abilities that are trained by the intervention, with their definitions and a synthetic description of their role in the job search process.

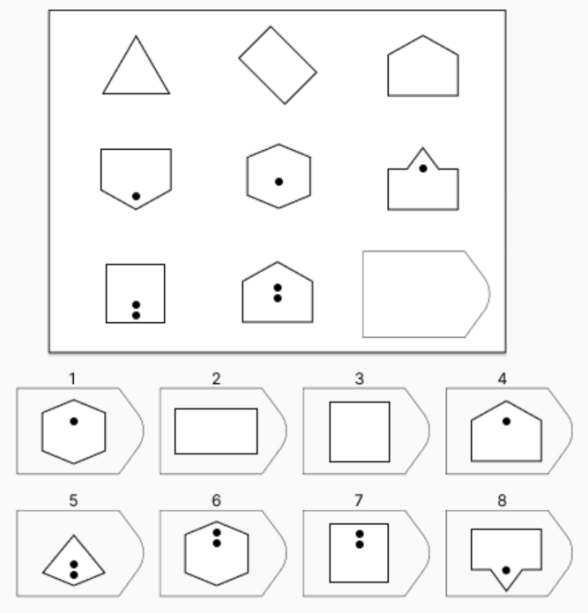
the training includes exercises designed to strengthen these underlying capacities. The trained transversal cognitive abilities are inductive reasoning, reading comprehension, fluency of ideas, and perceptual speed. These abilities are central to effective job search behavior, such as organizing applications, interpreting job requirements, and allocating effort over time, and the training therefore focuses on reinforcing these competencies in applied settings. Table 1 summarizes the definition of the trained cognitive abilities.

Beyond their importance in the job search process, we target these cognitive abilities because they have been shown to be malleable and responsive to targeted interventions (Mack et al., 2025; Willis and Schaie, 2009). Existing research shows that repeated practice of planning and monitoring tasks can strengthen transversal cognitive abilities such as time management. Similarly, structured exercises targeting flexibility and fluency can foster adaptive problem solving, while metacognitive strategies can improve cognitive performance, including memory and processing speed (Kliegel et al., 2017; Strobach and Karbach, 2021). Our intervention is grounded in this psychological literature, which not only documents the malleability of the cognitive abilities we target but also proposes

specific exercises to enhance them, many of which have been previously applied by our team (Kliegel et al., 2017).

As an illustration, Figure 1 shows an example exercise designed to train category flexibility. Category flexibility is a key cognitive function that may enable individuals to adapt their strategies in response to new information or setbacks, such as job application rejections. In this task, participants are presented with a 3×3 matrix of patterns with one cell missing. The goal is to identify the correct pattern to complete the matrix from the eight options displayed below.[1] The training sessions also included instructions on how to solve the various tasks. We used a large variety of other exercises to train core cognitive abilities (see Appendix Table E-2) and transversal cognitive abilities (Table E-3). Exercises were grouped into sessions such that, in any given week, job seekers practiced all targeted cognitive abilities. Appendix E provides a fuller description of the cognitive exercises and their structure.

Figure 1: Cognition training task



Note: This figure shows an example of the Raven Advanced Progressive Matrices Test to assess category flexibility. Source: aptitude-test-prep.com.

The training program was delivered in two batches of 12 weeks, for a total of 24 weeks. After the first batch, we suspended the training for 2 weeks to allow participants to respond to a midline survey and a similar survey was repeated after the end of the second batch (see Section 3.2 for more details about the surveys). Each training week,

[1]The correct answer is 6. From left to right, the dots move upward and the geometric shapes gain additional sides. From top to bottom, one dot is added at each row.

participants were invited to complete two sessions, each lasting approximately 30 minutes. While the sessions were designed to follow a specific sequence, participants received invitations to each new session regardless of prior completion, allowing them to continue even after missing earlier sessions.

New sessions were released every Monday and Thursday, and participants received invitations by email.[2] Session links remained active for three days, and once a session was started, participants had 24 hours to complete it.

We did not provide participants with individual feedback on their performance in the exercises. We did so to reduce the risk of confounding the measurement of training effects with motivational or expectation biases. The available evidence suggests that - while it can sometimes enhance engagement and learning by increasing motivation and self-monitoring - feedback can also create stress, discourage participants with lower scores, or lead to strategic responding that compromises the validity of repeated measurements (Kluger and DeNisi, 1996). By withholding feedback, we aimed to reduce the extent to which performance changes were driven by such evaluation-related factors rather than by changes in cognitive performance itself, which is particularly important in the sensitive context of unemployment, where self-confidence may already be fragile.

Participation was incentivized via a lottery. Participants gained a lottery token for each completed training session. After the 24 weeks of training, one token was randomly selected to receive a single prize of 2'000 CHF (about 2'100 USD).[3]

3 Study Design

In this section, we describe the design and implementation of the study. We first outline the recruitment process and the randomization into treatment arms (Section 3.1), and then describe the surveys and skill assessments that participants were asked to complete (Section 3.2; Appendix F provides the experimental protocol).

[2] In the first invitation letter, the trainings were described as "brain trainings," with the stated purpose "to support and encourage you in your job search." Subsequent weekly messages referred to "your J4U training," accompanied by the motivational phrase "each training brings you closer to your final goal: boosting your performance!"

[3] Lottery tokens could also be accumulated by completing other activities that were available to participants in all treatment arms, including those without cognitive training. For instance, participants earned tokens by completing surveys, both at registration and during the treatment period.

3.1 Recruitment, randomization and treatment arms

We designed and implemented our study in close collaboration with the public employment offices (PES) of the Swiss cantons of Neuchâtel and Vaud, both located in the French-speaking part of Switzerland and adjacent to one another. Neuchâtel is a small canton, with approximately 180,000 residents, and has traditionally been an important hub of the Swiss watchmaking industry. At the time of recruitment in February 2021, the unemployment rate was 5.3%, compared to 3.7% at the national level.[4] Vaud, with approximately 800,000 residents, is the third-largest canton in Switzerland after Zurich and Bern. Its industrial structure is more diversified than that of Neuchâtel. In May 2022, when recruitment began in Vaud, the register-based unemployment rate was 3.1%, compared to 2.1% at the national level. Vaud is home to two large universities—the University of Lausanne and the Swiss Federal Institute of Technology (EPFL)—whereas Neuchâtel has one cantonal university (the University of Neuchâtel). Accordingly, the share of tertiary graduates is higher in Vaud than in Neuchâtel (40% versus 32% in 2019).

The recruitment process began with an email invitation sent by the PES to all registered job seekers. In Neuchâtel, invitation emails were sent on Monday, February 15, 2021. In Vaud, the larger number of registered job seekers required splitting them randomly into four groups. Invitation emails were sent on May 9, May 30, June 20, and August 22, 2022.[5] The email included a brief description of the project and a link to register. Up to three reminder emails were sent.

Invited jobseekers were randomly assigned to the treatment arms and the links in their emails were treatment-specific, redirecting them to a version fo the platform with features adapted to their treatment.[6] After creating a user account, participants were required to complete a consent form which presented all treatment arms and also indicated that participants would be randomly allocated to treatments. Participants then completed the baseline survey and watched a short video explaining the specific intervention to which

[4]Cantonal unemployment rates are based on administrative data, computed as the ratio of individuals registered at public employment offices to the sum of registered employed individuals in the social security records and registered unemployed. The Swiss Federal Statistical Office also reports unemployment rates based on ILO definitions, but these are not available at the cantonal level. In 2021, the ILO unemployment rate in Switzerland was 5.1%, compared to an administrative rate of 3%.

[5]As we discuss in Section 4, the timing of the email dispatch seems to matter, which is why our sample is not fully balanced by treatment group along the main demographics. We account for these sample imbalances using control variables.

[6]We informed the PES staff about the nature of the study, but they could neither see nor influence assignment of their clients to treatment.

they had been assigned. See Section 3.2 below for more details about the surveys.

The overall study consists of three treatment arms and a control group. The first treatment arm, which we label COG for notational convenience, consists of the cognitive training described in Section 2 and it is the primary focus of our analysis. In addition to the training, participants in this arm had access to an online job search platform specifically developed for this study. The platform's standard interface offered typical job search functionalities: users could select an occupation of interest and browse available vacancies within that occupation. Vacancy listings were drawn from Job-Room, the official Swiss job search platform of the Public Employment Services.

The second treatment arm, labelled "Jobs for You" or J4U, provides occupation recommendations designed in a similar way to Bächli et al. (2025) (see also Section D in the Appendix for further details). Unlike the standard interface available to the COG and control groups, participants in this arm had access to an enhanced version of the platform that presented occupation suggestions tailored to their individual skill profiles as measured in the baseline survey. Results for this intervention are reported in the Appendix, Figure A-2.

A third treatment arm combines the cognitive treatment (COG) and the occupational recommendations (J4U), and is labelled COG+J4U. Participants assigned to this arm received access to the cognitive training as well as to the personalized occupation recommendations through the enhanced interface of the job search platform.

Finally, we assign a random subset of participants to a control group, labelled CONT. Participants in this group followed the same enrollment procedure as those in the treatment arms, including completion of the baseline survey and skill assessment. However, unlike participants in the other groups, they were only granted access to the standard job search interface, identical to that available in the COG arm.

In our main empirical analysis, we combine both groups receiving cognitive training into a single group, denoted "Any COG". We do so to increase statistical power and because the J4U intervention does not appear to have detectable effects on our main outcomes of interest, on average. Accordingly, our main causal analysis compares individuals receiving any form of cognitive training to the control group in the standard experimental framework. For descriptive analyses aimed at understanding differences between receiving and not receiving cognitive training more broadly, we additionally combine the control

and J4U groups into a single category, labeled "No COG".

Table 2: Recruitment and randomization

	Any COG		Any non-COG		
	COG	COG+J4U	J4U	CONT	Total
# jobseekers contacted	7,432	7,436	7,449	7,455	29,772
# participants	378	385	380	404	1,547
Participation rate	5.1%	5.2%	5.1%	5.4%	5.2%
# valid observations[a]	263	273	286	285	1,107

- See Section 4 for a more detailed description of the samples used for the empirical analyses.

[a] Participants who were not employed and receiving unemployment benefits at baseline and who could be matched to the social security records.

Table 2 provides information on the recruitment process. The response rate was around 5.2% overall, with only small variations across treatment groups, yielding a total sample of 1,547 participants.[7] As discussed in greater detail in Section 4, our main outcomes of interest (employment and earnings) are derived from administrative social security records matched to participants' identifiers. However, a small number of participants could not be matched to the administrative data, mainly due to reporting errors in identifiers or because they may have left the country. In the table, we report as valid observations the number of participants who could be successfully matched to the administrative data and were included in our main estimation sample.

3.2 Surveys and skill assessment

All participants complete an online baseline survey at the time of registration. The survey includes questions on socio-demographic characteristics, previous and targeted jobs, and job search behavior. It also measures socio-emotional outcomes, such as motivation, feelings of hopelessness, procrastination in job search, and general well-being. Importantly, the survey incorporates a skill assessment designed to provide baseline measures of the cognitive abilities targeted by the intervention. In addition to the eight cognitive abilities listed in Table 1, the assessment measures four additional items: adaptability,

[7]The response rate was 8% in the canton of Neuchâtel and 4.4% in Vaud. We believe that the difference in response rates is due to the different phases of the COVID-19 pandemic. In February 2021, some restrictions were still in place and individuals were spending a larger share of their time online. By early 2022, most restrictions had been lifted, and individuals were presumably less attentive to their emails and less engaged with online activities.

self-control, tolerance, and leadership. Following established practice, we classify these items as psychosocial skills They are not targeted by the cognitive training but they are used, together with the other cognitive measures, to tailor occupation recommendations in the J4U treatment.[8] Aschwanden et al. (2026) discusses in detail the scientific foundations, structure, design and implementation of the assessment.

After the baseline, the skill assessment was repeated twice during the treatment period: in the 13th week after registration (midline) and at the end of the treatment, in the 27th week after registration (endline). On each occasion, participants were given two weeks to complete the assessment, which was accompanied by a short questionnaire on job search activities and outcomes. These intervals were chosen for both theoretical and practical reasons. From a cognitive training perspective, three months represents a reasonable time frame to capture initial gains and short-term changes in cognitive and psychosocial functions, while six months allows us to examine whether such changes are maintained, amplified, or diminished over time.

In addition to the baseline, midline, and endline surveys, participants were invited to complete short weekly surveys on their job search activities. These surveys collected information on the number of applications submitted, interview invitations received, and job offers obtained. Invitations to complete the weekly surveys were sent by email on Mondays. To facilitate the practical implementation of the treatment and survey administration, we divided participants into cohorts based on the dates on which they completed the baseline survey. For example, in Neuchâtel, those completing the questionnaire in the week of February 15th-21st (Monday to Sunday) start their treatments the following Monday 22nd. In total, there are 4 cohorts of participants in Neuchâtel and 16 in Vaud.

[8]Bächli et al. (2024) describe how these skills were selected. In short, we use O*NET], a database containing a rich information, including job and worker characteristics. We first restricted our selection to the O*NET categories Abilities, Skills, and Work Styles, which capture occupation-related attributes closely tied to individual workers rather than to the work environment or job-specific tasks. Second, we focused on items that are broadly relevant across occupations, excluding those with importance levels below the median. Third, to ensure sufficient variation across occupations, we selected items with high dispersion based on the eigenvalues from a principal component analysis. Finally, for practical implementation reasons, we limited our selection to items that could be measured through a small number of questions and tasks, allowing participants to complete the assessment within a reasonable time frame. Although the O*NET taxonomy uses different terminology than the psychology literature, the selected O*NET items closely correspond in their underlying definitions to the constructs we classify as core cognitive abilities, transversal cognitive abilities, and psychosocial skills.

4 Data and Summary Statistics

For our empirical analysis, we merge data from the various surveys administered to participants – the baseline, midline, and endline surveys, as well as the weekly surveys – with administrative data from both the unemployment registry and social security records. From the unemployment registry, we observe the dates of registration as job seekers at the Public Employment Office and the duration of unemployment spells. The social security records provide information on spells of income receipt, including both labor earnings and transfer income (such as unemployment benefits).[9] For each spell, we observe the start and end dates, as well as the amount of income received. Using these data, we classify an individual as employed in a given month if labor earnings are recorded in that month.

In addition, we have detailed information about the participants' activities in the COG trainings. In particular, we observe which COG trainings participants started, which ones they completed as well as the scores they achieved. From the job search platform, we also observe log-in and log-out times and can track all activities performed on the platform.

In our empirical analysis, we restrict the sample to participants who completed the baseline questionnaire within four weeks of the initial invitation and who could be successfully matched to the administrative datasets. We further restrict the sample to individuals who, according to the social security data, were not employed in the month preceding the baseline questionnaire and were receiving some form of transfer income. The final sample consists of 823 individuals (see also Table 2).

Table 3 shows descriptive statistics of the control group (CONT) and the "Any COG" group.[10] Consistent with the random allocation, most of the variables are balanced across groups. The most notable exception is gender, with a substantially lower share of female participants in the control group. About half of the participants are married. Over 50%

[9]For the individuals in our sample, transfer income is essentially only unemployment benefits. The correlation between the amount received in unemployment benefits and in total transfer is 0.9356. The remaining transfers come from various social assistance programs.

[10]Table A-9 compares the study population to registered job seekers around the time we recruited participants for the study, i.e. February 2021 for job seekers in Neuchatel, and May 2022 for job seekers in Vaud. The table also compares the study sample to residents of these two cantons, aged 18 to 65 in December 2021. Job seekers in the study sample are somewhat older than both reference populations. Table A-1 in the appendix presents descriptive statistics for this sample by each treatment group separately.

of the individuals in our sample have completed tertiary education, either academic or vocational. This relatively high share suggests positive selection of high skilled jobseekers into the study, a pattern that is evident when comparing our sample to the population of jobseekers in Table A-9. The average age at baseline in the sample is around 44 years, with about 34% of participants aged between 35 and 49 and about 33% aged 50 or older. At the time of study enrollment, our participants had been unemployed for an average of about 11 months, but the distribution is highly skewed, with a median of 8 months and about 20% of participants having been unemployed for less than 3 months at the launch of the intervention.

Table 3 also reports composite indices of the cognitive abilities measured at baseline. These indices are constructed separately for core cognitive abilities, transversal cognitive abilities, and psychosocial skills, and are computed as the sum of the standardized scores for each item, with normalization to mean zero and variance one in the full sample. Reassuringly, the means of these indices do not differ significantly between the control and "Any COG" groups in any of the three cases.

The bottom rows report information on participants' prior work experience. Approximately three quarters of participants have at least four years of work experience prior to the baseline unemployment spell. Labor earnings of control-group participants in the quarter prior to baseline are relatively low, averaging CHF 595, and somewhat higher, around CHF 2,150, in the preceding quarter. Employment levels prior to the study are also low: in the quarter immediately preceding baseline, only 10% of the control group participants are employed, while their employment reaches 32% two quarters before study enrollment. These patterns are in line with the target population, as all participants are selected to be out of employment in the month before baseline.

Table 3 highlights the richness of our control variables at baseline. Although the study participants could not select into treatment, the randomization protocol generated some imbalances in observable characteristics across arms; conditioning on such pre-study outcomes, such as earnings and employment history, is a standard strategy to improve precision and reduce sensitivity to these chance imbalances (Heckman and Robb, 1986; Heckman et al., 1998).

In Figure 2, we present evidence supporting the relevance of the cognitive abilities targeted by our intervention for labor market outcomes. The figure plots mean log hourly

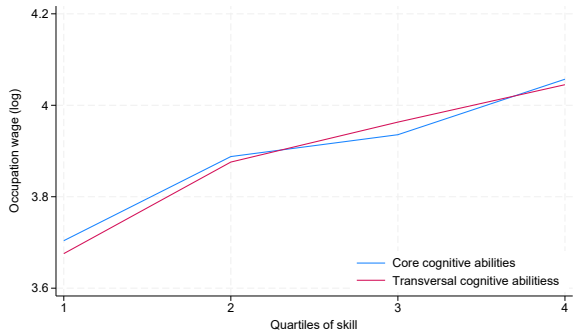
Table 3: Descriptive statistics

	Control		Any COG[a]			
	Mean	(s.e.)	Mean	(s.e.)	Δ[b]	(s.e.)
1=female	0.418	(0.029)	0.483	(0.022)	0.065	(0.036)
1=married	0.477	(0.030)	0.481	(0.022)	0.004	(0.037)
1=tertiary education[c]	0.533	(0.030)	0.580	(0.021)	0.047	(0.036)
1=age $\in [35, 49]$	0.393	(0.029)	0.412	(0.021)	0.019	(0.036)
1=age ≥ 50	0.340	(0.028)	0.319	(0.020)	-0.021	(0.035)
Core cognitive abilities[d]	-0.069	(0.060)	0.035	(0.043)	0.104	(0.074)
Transversal cognitive abilities[e]	-0.025	(0.059)	0.042	(0.045)	0.067	(0.074)
Psychosocial skills[f]	0.031	(0.060)	0.020	(0.042)	-0.011	(0.074)
Nr. of target occupations[g]	2.751	(0.102)	2.703	(0.072)	-0.048	(0.125)
Baseline unemployment[h]	11.431	(0.552)	10.796	(0.388)	-0.635	(0.674)
Work experience before baseline:						
1=experience $>$ 4 years[i]	0.747	(0.026)	0.765	(0.018)	0.018	(0.032)
Earnings, -1 quarter[l]	594.9	(87.1)	638.7	(89.5)	43.8	(124.9)
Earnings, -2 quarters[l]	2148.2	(250.2)	2099.8	(207.5)	-48.4	(325.1)
1=employed, -1 quarter[m]	0.103	(0.013)	0.086	(0.009)	-0.017	(0.015)
1=employed, -2 quarters[m]	0.324	(0.025)	0.271	(0.017)	-0.053	(0.030)
Participants	285		536		821	

[a] The "Any COG" group combines all the treatment groups that have access to the cognitive treatment, that is the COG and the COG+J4U groups.
[b] Difference between the mean of "Any COG" and Control.
[c] The dummy is equal to one for any participant whose highest achieved educational qualification is a tertiary degree, either academic or vocational.
[d] This is the sum of the baseline measurements on the core cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.
[e] This is the sum of the baseline measurements on the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.
[f] This is the sum of the baseline measurements on the psychosocial skills that we consider (adaptability, self-control, tolerance, and leadership), standardized to have mean zero and variance equal to one in the entire sample.
[g] Number of occupations in which the participant is looking for jobs, self-reported at registration with the PES.
[h] Months spent as a registered job seeker on the day finishing the baseline survey.
[i] The dummy equals one if the participant has more than 4 years of work experience before the unemployment spell.
[l] Average earnings over 1-3/4-6 months before baseline.
[m] Average of binary month-by-month employment indicators over over 1-3/4-6 months before baseline.

wages in job seekers' pre-unemployment occupations by quartiles of the composite indices of core cognitive abilities and transversal cognitive abilities, both measured at baseline. Because individual-level wage data are not available, we proxy hourly wages using occupation-level earnings of full-time workers (Oesch et al., 2025). Job seekers with higher baseline core cognitive abilities were previously employed in substantially better-paid occupations: those in the top quartile of the core cognitive abilities index earned about 40%

Figure 2: Core cognitive abilities and transversal cognitive abilities



Note: This figure shows the (log) average hourly wage paid in the jobseeker's occupation prior to entering unemployment, by quartiles of the core cognitive abilities index and quartiles of the transversal cognitive abilities index.

more than those in the bottom quartile. A similar positive gradient emerges for transversal cognitive abilities, which are likewise strongly correlated with occupational wages.[11] This evidence supports the idea that our training, by targeting cognitive abilities that are relevant for labor market outcomes, may indeed improve the employment prospects of treated participants.

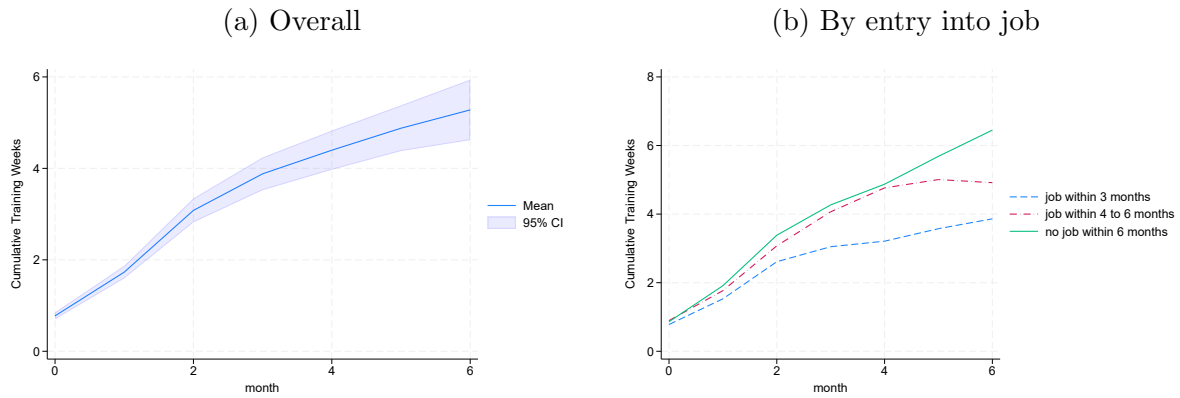
Before concluding this section, we provide evidence on participation in or take-up of the cognitive training. We define participation as starting at least one COG session during a reference week. Figure 3 shows the cumulative number of weeks in which participants started at least one cognitive training session against the number of months since study enrollment.[12] Panel A shows that training weeks are high in the first month of training, around 1.7 weeks out of the roughly four weeks that are offered, and usage increases substantially also over the two following months to reach a level of around 4 weeks in months two to three. Thereafter, training intensity decreases and cumulative weeks of training increase more slowly, rising by around 1.4 weeks, from about 3.9 to 5.3 weeks, over the remaining months. Overall, participants start trainings in around 5.3 weeks of the total 24 weeks.[13]

[11] We also estimate multivariate regressions controlling for university education. The associations between occupational wages and both core cognitive abilities and transversal cognitive abilities remain positive and statistically significant when education is included. Moreover, core cognitive abilities and transversal cognitive abilities each exhibit a significant partial correlation with pre-unemployment wages, conditional on the other skill index (and education), indicating that the two indices are distinctly and complementarily associated with wages.

[12] Cumulative weeks of training remain unchanged for individuals who do not participate in training in a week.

[13] In the appendix, we report the distribution of training intensity. About 45% of all participants attempt training in three weeks or more, while around 25% attempt training during 9 weeks or more

Figure 3: Cumulative number of COG training weeks



Note: The figure shows the cumulative number of weeks in which participants started at least one COG training against the number of months since study enrollment. Panel a shows the actual number of training weeks started. Panel b displays the cumulative training weeks separately by the timing of job entry, distinguishing participants based on how long it took them to find a job.

One reason behind the decline in observed training intensity is selective attrition due to job finding. To illustrate this issue, panel B of Figure 3 plots cumulative training weeks by the time participants start their first employment spell. All participants accumulate training at about the same rate in the months 0-1 after baseline, when most participants are still out of a job. Participants who find a job within 0–3 months accumulate training rapidly at the beginning, but their trajectories flatten as they are entering employment. A similar but more gradual pattern emerges for those finding jobs within 4–6 months, whose training intensity only weakens after the period 4-6 months after start. In contrast, participants who do not find a job within 6 months, our observation window, display a steeper and more sustained accumulation of training, ultimately exceeding six training weeks on average.

Overall, training participation in our study appears to be limited. However, recent evidence from the psychology literature suggests that high training dosage is not a prerequisite for achieving meaningful cognitive improvements. Rodas et al. (2024), examining working-memory training programs, find no systematic relationship between training intensity or duration and program effectiveness. Likewise, Liang et al. (2025), in a systematic review of cognitive-training modalities for individuals with cognitive impairment, show that lower-intensity interventions perform comparably to more intensive ones.

(Figure A-1).

5 Empirical Results

In this section, we first outline the empirical specification (Section 5.1) and provide evidence that our intervention affected cognitive abilities (Section 5.2). Then, we present our main results in Section 5.3. Our primary pre-registered outcome is job finding, and we also examine effects on earnings and transfer income. In addition, we explore heterogeneity of the treatment effects across various individual characteristics in Section 5.4.[14]

5.1 Empirical strategy

We estimate treatment effects using the following regression specification:

$$y_{i,m} = \alpha_{0,m} + \alpha_{1,m}[Any\ COG]_i + \beta X_i + \epsilon_{im}. \tag{1}$$

Here, $[Any\ COG]_i$ is an indicator variable equal to 1 if participant i belongs to a treatment group that received cognitive training (COG or COG+J4U). Unless otherwise specified, the omitted category is the control group. In some specifications, however, we combine the two groups without access to cognitive training (control and J4U) into a single comparison group "No COG". The index m denotes months relative to study enrollment, and the parameters $\alpha_{0,m}$ are month fixed effects. The coefficients of primary interest are $\alpha_{1,m}$, which capture the intention-to-treat (ITT) effect of offering cognitive training on outcomes measured m months after baseline. The vector X_i denotes a set of individual characteristics. Standard errors are clustered at the individual level.

The main outcomes ($y_{i,m}$) that we consider are the following: a dummy indicator for employment: $y_{i,m} = 1$ if participant i is employed in month m and zero otherwise; labor earnings of participant i in month m, with earnings set to zero in months of non-employment; a dummy indicator for government transfer receipt: $y_{i,m} = 1$ if participant i receives any government transfer in month m and zero otherwise; the amount of government transfers received by participant i in month m, set to zero in months with no transfer receipt. In Section 5.2, we consider additional outcomes that are not observed in every month m. We therefore modify the specification in equation 1 accordingly with details provided in that section.

[14] Our pre-registered study plan is available at `www.socialscienceregistry.org/trials/4036`.

As noted above, the treatment groups are not perfectly balanced. Our preferred specification therefore includes controls for all baseline characteristics to account for potential imbalances. In addition, we control for employment, earnings, and transfer histories over the six months preceding baseline. Accordingly, X_i denotes the vector of control variables reported in Table 3, augmented with enrollment cohort dummies and indicators for the 1-digit ISCO classification of previous occupation.[15]

In addition to the monthly estimates reported in the main figures, in the main tables we also present average effects for two horizons $h \in \{S, M\}$, the short term and the mid term. This distinction allows us to assess whether treatment effects persist over time or whether the control group catches up. Specifically, the model reads as follows

$$y_{i,m} = \alpha_h + \delta_h[\text{Any COG}]_i + X_i'\beta_h + \varepsilon_{i,m}, \qquad m \in \mathcal{M}_h, \tag{2}$$

where $\mathcal{M}_S = \{1, \ldots, 6\}$ and $\mathcal{M}_M = \{7, \ldots, 12\}$. In our main analysis, we focus on intention-to-treat (ITT) effects. We adopt this approach because ITT estimates are often the most relevant from a policy perspective, and because there is no clear measure of compliance in our setting.

5.2 Effects on cognitive abilities and socio-emotional outcomes

Before presenting the main results, we examine how the COG training affected cognitive functioning using skill measures from the midline and endline surveys relative to baseline. Figure 4 reports changes in the composite skill indices for participants who received cognitive training (Any COG including COG and COG+J4U) and those who did not (No COG including Control and J4U). We use changes from baseline to midline for participants who respond to the midline survey (all participants complete the baseline survey). For participants who respond to the endline survey, we use changes from baseline to endline.[16] As there are six months between baseline and endline, but only

[15]The administrative data contain information on previous occupation for approximately 95% of job seekers in our sample. For cases with missing administrative information, we update previous occupation using responses from the baseline survey.

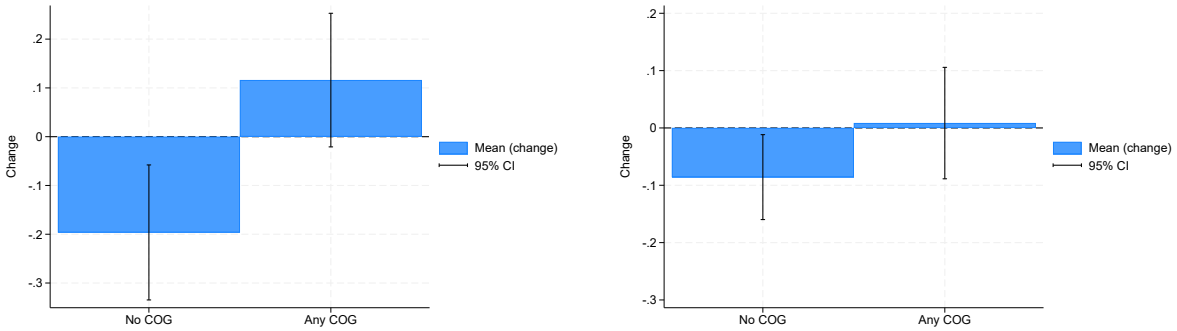
[16]We analyze potential response selectivity in Table A-8 in the Appendix. Older job seekers and job seekers who were already unemployed during the six months prior to the study were over-represented among those who complete the midline or endline assessments. Response rates were lower among participants offered cognitive training, and for those who were employed at the midline or endline dates, see Table A-3.

three months between baseline and midline, we divide the baseline-to-endline change by two. Accordingly, the reported changes should be interpreted as effects associated with approximately three months of access to the COG training.

Figure 4: Training effects between baseline, midline, and endline

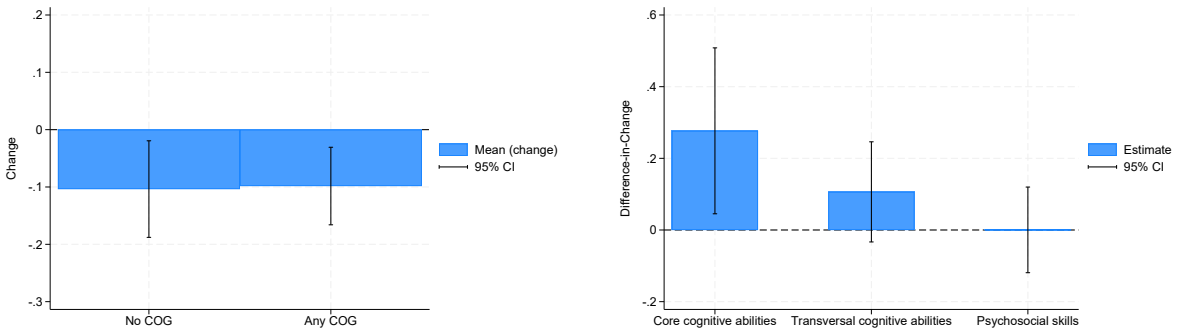
(a) Core cognitive abilities

(b) Transversal cognitive abilities



(c) Psychosocial skills

(d) Difference-in-change



Note: This figure shows the change from baseline to midline or endline in the composite indices of core cognitive abilities, transversal cognitive abilities and psychosocial skills for participants without cognitive training (No COG: Control and J4U) and those who received cognitive training (Any COG: COG and COG+J4U). Difference-in-Change reports the change in outcomes for those with COG compared to No COG. The figure reports 95% confidence intervals.

Figure 4a shows that core cognitive abilities decline among participants without cognitive training by approximately 0.20 standard deviations, suggesting that prolonged job search without reemployment may reduce cognitive abilities. In contrast, participants with access to cognitive training do not exhibit such a decline and instead display a slight increase, although this change is not statistically significant. Thus, the training does not appear to raise cognitive abilities but rather to prevent the deterioration. A similar pattern emerges for transversal cognitive abilities in Figure 4b: these decline by around 0.09 standard deviations in the absence of training, whereas no such decline is observed among participants with access to the training. By contrast, psychosocial skills—which are not targeted by the intervention—decline in both groups (Figure 4c).

Figure 4d compares changes between the "Any COG" and "No COG" groups and shows that participants assigned to cognitive training exhibit significantly stronger improvements in core cognitive abilities relative to the No COG group, with effect sizes of approximately 0.25 standard deviations ($p < 0.05$). Estimated gains in transversal cognitive abilities are smaller, at around 0.15 standard deviations, and are not statistically significantly different from zero.[17] For psychosocial skills, estimated changes are similar for participants with and without cognitive training, and treatment effects are not statistically significant.

Table 4 complements and extends the results in Figure 4 by estimating treatment effects using a regression specification similar to equation 1, adapted to account for the fact that changes in cognitive abilities are observed at most twice per participant. The regression specification is:

$$\Delta y_{i,s} = \alpha_0 + \alpha_1 [Any\ COG]_i + \beta X_i + \epsilon_{i,s}. \tag{3}$$

Here, $\Delta y_{i,s}$ denotes the change in the outcome variable between the baseline and the midline ($s = m$) or between the baseline and the endline surveys ($s = e$). The remaining variables retain the same interpretation as in equation 1, except for the set of control variables, where the cohort dummies are replaced by a single indicator for participants in Neuchâtel versus Vaud.[18] Consistent with Figure 4a, we include the J4U group in the omitted category, together with the control group (CONT).

The outcome variables we consider in Panel A of Table 4 include the indices of core cognitive abilities, transversal cognitive abilities, and psychosocial skills. We also construct a composite index that combines core cognitive abilities and transversal cognitive abilities, as both are directly targeted by the COG training. In addition, we examine several socio-emotional outcomes recorded in the surveys, namely hopelessness, motivation, procrastination, and well-being in Panel B.

Consistent with Figure 4, the estimates in Panel A of Table 4 show positive and statistically significant effects of training on core cognitive abilities, while the effect on

[17] Improvements in transversal cognitive abilities are significantly different from zero when considering all participants in cognitive training, rather than only those who were not employed and on transfers before the baseline month (results are available upon request).

[18] The cohorts are entirely separated between Neuchâtel and Vaud, so the cohort dummies incorporate cantonal effects.

transversal cognitive abilities is positive but not statistically significantly different from zero. The effect on the index combining both types of abilities is positive and statistically significant. Because the specification controls for baseline unemployment duration, the estimated constant captures the predicted change for a jobseeker, not exposed to the COG training, who has just entered unemployment, i.e., with zero months of baseline duration; for these new entrants, cognitive abilities decline by an economically meaningful, though not always statistically significant, 0.14 to 0.19 standard deviations. The table also reports coefficients on baseline unemployment duration, which are systematically negative: individuals observed later in their unemployment spell exhibit a more negative subsequent change in cognitive abilities, potentially reflecting fatigue, discouragement, or other time-varying factors affecting performance. Relative to these patterns, the estimated treatment effects, that range between 0.10 and 0.28 in standard deviations, are sizable and suggest that the training induces meaningful improvements in core cognitive abilities.

Table 4 also examines potential spillover effects of the COG training on a range of socio-emotional outcomes, including hopelessness in job search, motivation, procrastination, and a general subjective well-being index. Additional details on the construction and measurement of the socio-emotional outcomes are provided in Appendix B. The training could influence these outcomes through increased exposure to online activities, and improvements along these dimensions could, in turn, affect job finding. However, the estimates in Panel B of Table 4 show no detectable within-person changes, with coefficients close to zero and imprecisely estimated.[19] This pattern confirms the targeted nature of our intervention that specifically affects cognitive performance rather than broader behavioral or psychological outcomes.

The findings in this section should be considered as exploratory and interpreted with caution, primarily due to selective attrition. Although survey invitations are sent to all participants, those who find employment become significantly less likely to respond (Table A-3 in the Appendix). This form of selective attrition would bias against finding significant gains in cognition for the "Any COG" group relative to the "No COG" group. Moreover, the estimated effects may reflect familiarity with the tasks ("teaching to the test") instead of genuine improvements in underlying cognitive functioning. Our design

[19]Figure B-1 presents descriptive patterns for the four socio-emotional indices.

Table 4: Effects of cognitive training on cognition and socio-emotional outcomes

	Panel A: Cognitive abilities and psychosocial skills			
	Core cog.[a,o]	Transv. cog.[b,o]	Combined cog.[c,o]	Psychosocial sk.[d,o]
Any COG[e]	0.277**	0.106	0.171**	0.000
	(0.118)	(0.071)	(0.076)	(0.061)
Baseline unemployment[f]	-0.018***	-0.003	-0.007**	-0.003
	(0.005)	(0.003)	(0.003)	(0.005)
Constant	-0.143	-0.194	-0.211	-0.318*
	(0.238)	(0.158)	(0.169)	(0.163)
Mean (CONT & J4U)[g]	0.035	-0.014	0.005	0.007
Observations[h]	381	381	381	381
	Panel B: Other socio-emotional outcomes			
	Hopelessness[i,o]	Motivation[l,o]	Procrastination[m,o]	Well-being[n,o]
Any COG[e]	0.075	0.051	-0.018	-0.088
	(0.083)	(0.088)	(0.064)	(0.084)
Baseline unemployment[f]	-0.003	-0.001	0.003	-0.003
	(0.004)	(0.005)	(0.004)	(0.005)
Constant	-0.075	-0.072	0.139	0.081
	(0.224)	(0.179)	(0.140)	(0.223)
Mean (CONT & J4U)[g]	0.043	0.045	0.025	-0.018
Observations[h]	381	381	381	381

- All specifications control for age, gender, education, marital status, migration background, baseline unemployment duration, and prior earnings, as well as cantonal dummies and dummies for the previous occupation.

[a] This is the change from baseline to midline/endline in the sum of the measurements on the core cognitive abilities listed in Table 1.

[b] This is the change from baseline to midline/endline in the sum of the measurements on the transversal cognitive abilities listed in Table 1.

[c] This is the change from baseline to midline/endline in the sum of the measurements on the core cognitive abilities and the transversal cognitive abilities listed in Table 1.

[d] This is the change from baseline to midline/endline in the sum of the measurements on the the psychosocial skills that we consider (adaptability, self-control, tolerance, and leadership).

[e] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes both the control group CONT and the J4U group.

[f] Months spent as a registered job seeker on the day finishing the baseline survey.

[g] Mean of the outcome variable for the No COG group (CONT and J4U).

[h] Number of participants.

[i] Indicator based on the Beck Hopelessness Scale (Beck et al., 1974). A higher score indicates higher hopelessness.

[l] Indicator of motivation in job search inspired by the Intrinsic Motivation Inventory (Deci et al., 1994). A higher score indicates higher motivation.

[m] Indicator based on the Pure Procrastination Scale (Rebetez et al., 2014). A higher score indicates higher tendency to procrastinate.

[n] Short Depression-Happiness Scale (SDHS) (Joseph et al., 2004). Higher scores indicate a greater frequency of positive thoughts and lower frequency of negative thoughts.

[o] For ease of interpretation, the indicator is standardized to have mean zero and standard deviation of 1 in the entire sample. See Appendix B for more details.

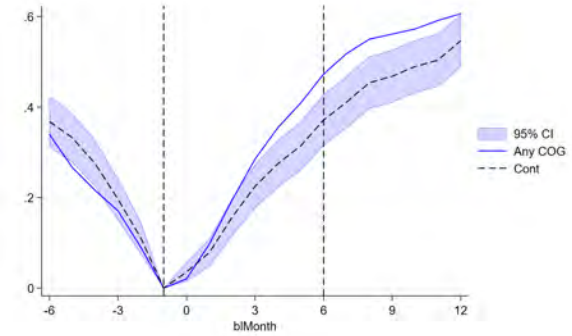
cannot fully disentangle these channels. On the one hand, participants were not provided with solutions to specific exercises but rather trained in general problem-solving strategies, which should, in principle, transfer beyond the exact tasks used for measurement. On the other hand, repeated exposure to similar formats may mechanically improve performance even in the absence of deeper skill acquisition.

5.3 Main results

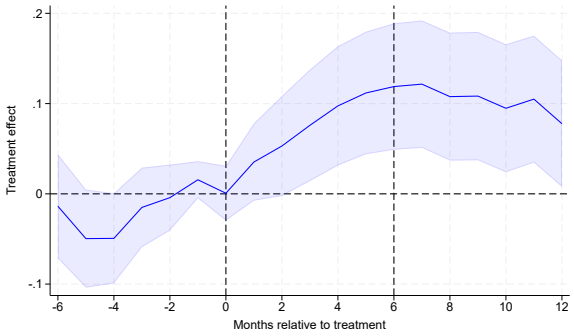
In this section, we present the main results of the intervention. Figure 5 shows comparisons of employment and earnings between the "Any COG" and the control groups. The top panels consider employment as the outcome variable, while the lower panels focus on earnings. The vertical bar at month 0 indicates study enrollment, while the vertical bar at month 6 corresponds to the end of the COG training. Our data allow us to follow participants' labor market outcomes for an additional six months, up to month 12 after enrollment.

Figure 5: Cognitive training effects on employment and earnings

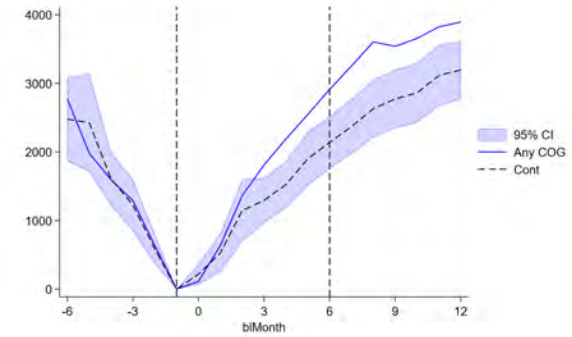
(a) Employment - *Levels*



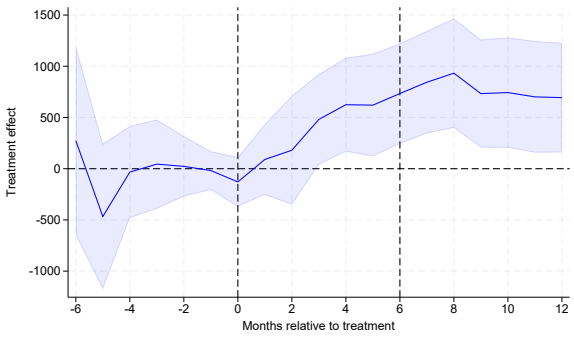
(b) Employment - *Treatment Effects*



(c) Earnings - *Levels*



(d) Earnings - *Treatment Effects*



Note: This figure reports the share of participants who are employed (Panels a and b) and their average labor earnings, with earnings set to zero in months without employment (Panels c and d). Panels labeled "Levels" display raw outcomes, while panels labeled "Treatment Effects" present the estimated effects of cognitive training (the coefficients $\alpha_{1,m}$ from equation 1).

Figure 5a shows that (unconditional) employment levels are similar across the two groups prior to treatment, although the Any COG group starts from a slightly lower baseline. Shortly after the intervention begins, these trends reverse. Figure 5b presents the estimated monthly treatment effects based on equation 1. Consistent with the patterns in the unconditional levels, the effects increase over the six-month intervention period and become statistically significant after the third month. Toward the end of the observation window, the treatment effect declines and is only marginally significant by month twelve.

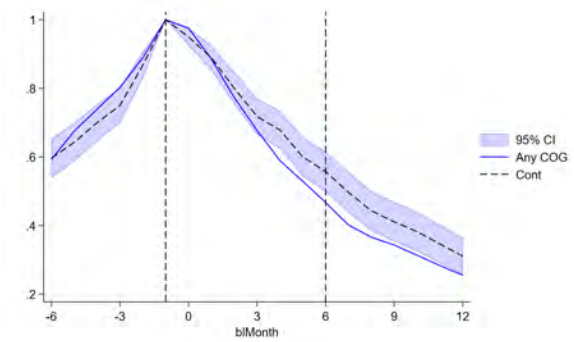
Figure 5c depicts the evolution of labor earnings, where individuals without labor income are assigned zero earnings, so that the sample covers the full study population. Both groups exhibit a similar decline in earnings prior to study enrollment, consistent with the "Ashenfelter dip" documented in the program evaluation literature (Ashenfelter, 1978), and, by construction, report zero earnings in the month preceding the start of the cognitive training. Figure 5d shows that earnings trajectories diverge markedly thereafter. The "Any COG" group exhibits statistically significantly higher earnings from the third month after study enrollment onward. The magnitude of the effects is sizeable. Around six month after enrollment, approximately 50% of participants in the Any COG group are employed, compared to about 38% in the control group—a statistically significant difference of more than 10 percentage points, which declines to roughly 8 percentage points by month 12. The effects on earnings are of comparable magnitude. At month 6, average earnings in the Any COG group are slightly above 3,500 CHF, compared to about 2,900 CHF in the control group—a statistically significant difference of approximately 600–700 CHF. This gap fluctuates somewhat over time but remains of similar magnitude at month 12.

Beyond employment and earnings, our data also allow us to examine the effects of the COG training on transfers, mainly unemployment benefits. We analyze these outcomes in Figure 6. The figure is structured similarly to Figure 5: the top panels focus on transfer receipt and the bottom panels on transfer amounts; the left panels display levels, while the right panels report treatment effects estimated using the specification in equation 1. Consistent with the effects on employment, panels (a) and (b) show that participants in the Any COG group are less likely to receive transfers. At month 6, about 47% of the Any COG group receives transfers, compared to about 55% in the control group, a difference

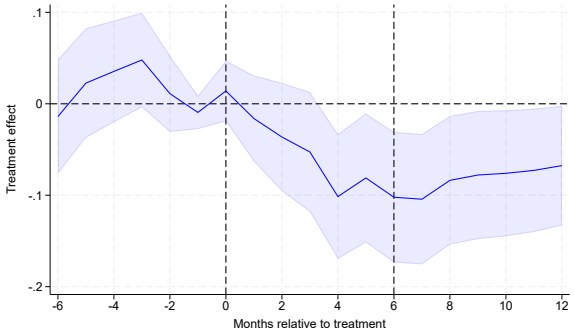
of roughly 8 percentage points or about 15% relative to the control group level. Toward the end of the observation period, the gap in transfer receipt and amount between the treated and control groups narrows. Panels (c) and (d) show that transfer amounts diverge substantially after study enrollment. At month 6, the Any COG group receives, on average, about CHF 2,200 in transfers, compared to approximately CHF 2,700 in the control group. The gap narrows somewhat thereafter but remains visible: around month 8, treated participants receive roughly CHF 690 less than control group participants, whose average transfers amount to about CHF 1,810 at that point—approximately 38% lower.

Figure 6: Cognitive training effects on transfer receipt and amount

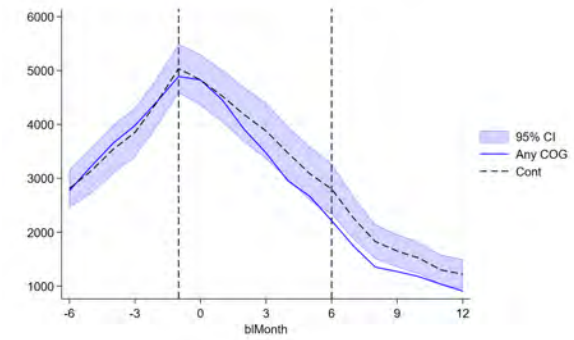
(a) Transfer Receipt - *Levels*



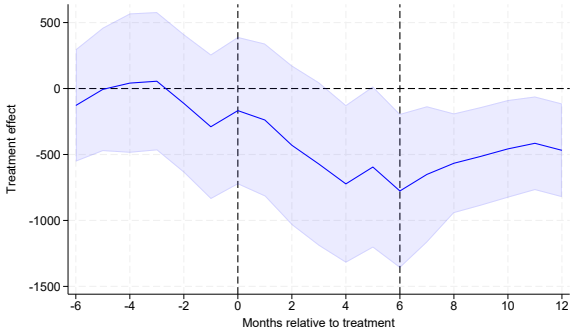
(b) Transfer Receipt - *Treatment Effects*



(c) Transfer Amount - *Levels*



(d) Transfer Amount - *Treatment Effects*



Note: This figure reports the share of participants receiving transfers (Panels a and b) and their average transfer amounts in CHF, setting the amount to zero in months without transfers (Panels c and d). Panels labeled "Levels" report raw levels, while panels labeled "Treatment Effects" present the estimated effects of cognitive training (the coefficients $\alpha_{1,m}$ from equation 1).

Table 5 summarizes the results presented in Figures 5 and 6 and reports estimates of the treatment effects for the short run (during the intervention) and the long run (after it ends). As discussed in Section 5.1, these estimates are derived from equation 1: the short-run effect is computed as the average of $\alpha_{1,m}$ for $m \in [1, 6]$, and the long-run effect for $m \in [7, 12]$. Panel A presents the short-run results. Participants with access to cognitive training are 7.7 percentage points more likely to be employed, relative to a

Table 5: Short-Term and Mid-Term Effects

	Employed[a]	Earnings[b]	Earnings> 0[c]	On Transfer[d]	Transfer Amount[e]
			Panel A: Short-term (months 1 to 6)		
Any COG[f]	0.077***	461.170**	74.406	-0.063**	-580.170**
	(0.025)	(185.451)	(319.177)	(0.027)	(275.769)
Mean (CONT)[g]	0.234	1400.896	5988.829	0.711	3723.882
Observations[h]	4926	4926	1367	4926	4926
			Panel B: Mid-term (months 7 to 12)		
Any COG[f]	0.085***	671.422***	270.960	-0.064**	-413.601***
	(0.032)	(248.125)	(254.944)	(0.030)	(153.459)
Mean (CONT)	0.478	2801.152	5855.709	0.399	1641.355
R-squared	0.061	0.076	0.243	0.056	0.100
Observations	4926	4926	2637	4926	4926

- This table reports intention-to-treat estimates of the effects of cognitive training. All specifications control for age, gender, education, marital status, baseline unemployment duration, and prior earnings, as well as cohort dummies and dummies for the previous occupation. Standard errors are clustered at the individual level.

[a] Dummy equal to 1 if the individual is employed in a given month.

[b] Monthly earnings in CHF, set to zero if the individual is not employed.

[c] Earnings in CHF conditional on employment.

[d] Dummy equal to 1 if the individual receives transfer income (e.g., unemployment insurance or other transfers).

[e] Amount of transfer income in CHF.

[f] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes only the control group CONT.

[g] Mean of the outcome variable for the control group.

[h] Number of participant-month observations.

control group employment rate of 23 percent. Earnings also increase by about CHF 461, which corresponds to almost one third of the control group mean of CHF 1,401. The effect on earnings appears to be driven primarily by higher employment levels rather than by higher earnings conditional on employment, as indicated by the results in the third column of Panel A, where we restrict the sample to employed participants and use their earnings as the dependent variable.

Transfer receipt declines by 6.3 percentage points in the "Any COG" group relative to a control group mean of 71%. Correspondingly, transfer income decreases by more than CHF 580, representing a reduction of nearly 16% relative to the control group average.

Panel B of Table 5 reports the effects for the mid term. Recall that the COG training ceases after month 6, so these effects arise during a period in which no treatment is provided. Interestingly, the treatment effects remain positive and, in some cases, are

even somewhat larger than in the short term. Employment is higher by 8.5 percentage points relative to the control group, compared to a short-run effect of 7.7 percentage points. Earnings also remain elevated, with an increase of about CHF 671, exceeding the short-run gain of CHF 461. Transfer receipt declines by 6.4 percentage points, while transfer amounts decrease by CHF 414, a smaller reduction than in the short run. Overall, these results suggest that the effects of cognitive training on employment and earnings persist beyond the intervention period and may even strengthen somewhat, while the reduction in transfer amounts diminishes over time.

We complement the main results presented in this section with two robustness checks reported in Appendix A. The first addresses the imperfect balance of observable characteristics across treatment groups. Although treatment assignment was randomized, observable characteristics are not perfectly balanced between the treatment and control groups (see Table 3). Table A-4 examines the sensitivity of the main estimated effects to alternative sets of controls. For brevity, we restrict this exercise only to employment as an outcome variable. In the short term (Panel A), the specification without controls (column 1) yields a short-run effect of 6.7 percentage points. Adding socio-demographic controls (column 2) increases the estimate slightly to 7.2 percentage points, while including skill indices (column 3) leaves it largely unchanged. Incorporating labor market controls (column 4) further increases the estimate. Overall, the short-run effects are stable and, if anything, slightly larger once observable differences are accounted for. This pattern is consistent with the chance imbalances documented in Table 3 depressing the unadjusted estimate; we report it as a robustness check on our preferred, covariate-adjusted specification.

In the mid term (Panel B), the pattern is similar but somewhat less stable. The baseline estimate is 8.7 percentage points, declines when socio-demographic and skill controls are added, and increases again once labor market controls are included. The fully specified estimate is close to the unadjusted difference, indicating limited overall sensitivity to the inclusion of controls despite some variation across specifications.

Table A-4 also shows that cognitive abilities are positively associated with subsequent employment outcomes, particularly core cognitive abilities in the mid term. A one-standard-deviation increase in core cognitive abilities is associated with a 3.6 percentage point higher employment probability, decreasing slightly to 3.2 percentage points

in the specification with the full set of controls. This comparison provides a useful benchmark for interpreting the magnitude of the treatment effects: the effect of cognitive training is comparable to that associated with a two-standard-deviation difference in core cognitive abilities in the cross-section.

Table A-5 presents an additional robustness check demonstrating that our main findings are robust to alternative definitions of the treatment and control groups. In the baseline specification, we pool together the two treatment arms that offered access to cognitive training; for comparison, these results are reported in Panel A. For brevity, we report results only for the mid term (months 7 to 12). Panels B and C disaggregate the pooled treatment group into its two components, the COG and COG+J4U groups. Panel D instead expands the control group to include participants in the J4U intervention, who received occupation recommendations through the platform but no cognitive training. Across specifications, coefficient magnitudes vary somewhat; however, the qualitative conclusions remain unchanged.

5.4 Heterogeneity analysis

In this section, we investigate heterogeneity in the treatment effects of the COG training across different subgroups of participants. For brevity, we focus on employment, earnings, and earnings conditional on employment, and we restrict the analysis to the mid term (months 7–12 after baseline). We consider three dimensions of heterogeneity: baseline cognitive abilities, age, and unemployment duration at baseline. For ease of interpretation, we discretize each dimension into two subgroups. Results are reported in Table 6.

Baseline cognitive abilities. We start by exploring the effects of cognitive training by the baseline level of cognitive abilities. This analysis can be informative about the nature of the cognitive training and in particular whether it is complementary to baseline ability, as is common with other training programs, or whether it mainly prevents cognitive decline, as suggested by the findings in Figure 4. Baseline cognitive abilities is defined as the sum of the composite scores for core cognitive abilities and transferable cognitive abilities measured at baseline. We split the population at the mean of this normalized index (which is similar to the median).

Results are reported in Panel A of Table 6 (see also Figure A-3 in the Appendix).

While the mid-term effect on earnings is positive and statistically significant for both groups, this pattern appears to be driven primarily by higher employment among participants with low baseline cognitive abilities, and mainly by higher earnings conditional on employment for those with higher cognitive abilities at baseline.

One possible explanation is that cognitive training generates different types of skill gains depending on job seekers' baseline levels of cognition. Table A-6 in the Appendix reports estimates of the impact of training on cognitive outcomes by initial ability. The results indicate that both high- and low-cognition job seekers experience improvements in measured cognitive abilities, but along different dimensions: for job seekers with high baseline cognition, training significantly improves core cognitive abilities (0.395 SD), with no significant effect on transversal cognitive abilities; for those with low baseline cognition, training significantly improves transversal cognitive abilities (0.249 SD) and the combined index (0.273 SD), with a positive but not statistically significant effect on core cognitive abilities.

This evidence indicates that the intervention improves cognitive functioning – as measured by our survey instruments – for job seekers with both high and low baseline cognition, albeit along different dimensions. Gains in cognitive ability translate into increases in employment for individuals with initially low cognitive skills. For this group, even modest increases in cognitive functioning may relax binding constraints in job search or workplace performance, thereby raising employment and earnings. In contrast, for job seekers with high baseline cognition, increases in cognitive ability appear to translate mainly into earnings gains, presumably via an increase in the reservation wage.

Age. Cognitive training has primarily been used in gerontology as a means of supporting cognition among older individuals, typically beyond retirement age. Here, we examine the extent to which our intervention improves job search outcomes for both younger and older job seekers. Panel B of Table 6 reports mid-term effects for participants below and above the age of 45 (the median age in the sample is 43.5 years).

The effects of cognitive training differ markedly by age group. For participants younger than 45, estimated impacts are small and imprecisely estimated across all outcomes. Employment increases by 4.4 percentage points, but this effect is not statistically significant, and there are no meaningful effects on earnings, either unconditional or conditional on employment. Overall, the intervention appears to have limited measurable

impact for younger job seekers.

In contrast, participants aged 45 and older experience substantial and statistically significant gains. Employment rises by 13.2 percentage points, and earnings increase sharply, by CHF 1,424 unconditionally and CHF 1,623 conditional on employment, both statistically significant. These results suggest that cognitive training is particularly effective for older job seekers, generating meaningful improvements in both employment and earnings.

Baseline unemployment duration. Long-term unemployment is an important risk factor for reduced re-employment prospects in many advanced economies (Mueller and Spinnewijn, 2025; Zuchuat et al., 2023). We examine the extent to which the effects of training vary with unemployment duration at baseline. Panel C of Table 6 reports mid-term effects for job seekers who, at the start of the training, have been unemployed for less than nine months versus those unemployed for more than nine months (the median unemployment duration is 7.4 months).

The effects of cognitive training differ substantially between these two groups. For job seekers with shorter unemployment spells (less than nine months), there is a statistically significant effect on employment of about 10 percentage points. The effect on earnings, however, is imprecisely estimated. This likely reflects offsetting forces: on the one hand, higher employment tends to increase earnings, while on the other hand, earnings conditional on employment appear to decrease for the "Any COG" group, although this difference is not statistically significant.

In contrast, for job seekers who have been unemployed for nine months or longer, cognitive training generates sizeable and statistically significant improvements. Employment increases by 9.6 percentage points, accompanied by an increase in earnings of CHF 885. Overall, these results suggest that cognitive training is particularly effective in raising both employment and earnings among the long-term unemployed, for whom constraints to re-employment may be more binding. While employment effects are also present for the short-term unemployed, corresponding effects on earnings are not.

Table 6: Heterogeneity Results: Mid-Term Impacts

	Employed[a]	Earnings[b]	Earnings> 0[c]	Employed[a]	Earnings[b]	Earnings> 0[c]
	Panel A: Baseline Cognitive abilities[d]					
	Low			*High*		
Any COG[e]	0.130***	743.745**	-101.935	0.044	668.355*	686.475**
	(0.045)	(338.027)	(388.452)	(0.044)	(349.069)	(321.494)
Mean (CONT)[f]	0.403	2360.440	5854.946	0.560	3277.250	5856.304
Observations[g]	2454	2454	1164	2472	2472	1473
	Panel B: Age[h]					
	Younger than 45 years			*45 years or older*		
Any COG[e]	0.044	16.910	-366.405	0.132***	1423.508***	1623.023***
	(0.045)	(316.830)	(267.499)	(0.046)	(382.793)	(502.526)
Mean (CONT)[f]	0.580	3300.426	5685.882	0.373	2284.047	6129.711
Observations[g]	2544	2544	1563	2382	2382	1074
	Panel C: Baseline Unemployment[i]					
	Less than 9 months			*9 months or longer*		
Any COG[e]	0.101**	506.047	-301.928	0.096**	885.758**	656.288
	(0.044)	(343.777)	(338.977)	(0.046)	(353.636)	(434.872)
Mean (CONT)[f]	0.487	3131.734	6428.296	0.469	2468.242	5257.356
Observations[g]	2598	2598	1414	2322	2322	1223

- The reported treatment effects are means of the effects over months 7 to 12 since baseline. All specifications control for age, gender, education, marital status, migration background, baseline unemployment duration, and prior earnings, as well ascohort dummies and dummies for the previous occupation. Standard errors are clustered at the individual level.

[a] Dummy equal to 1 if the individual is employed in a given month.

[b] Monthly earnings in CHF, set to zero if the individual is not employed.

[c] Earnings in CHF conditional on employment.

[d] Baseline cognitive abilities is measured as the sum of the baseline measurements on the core cognitive abilities and the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample. The Low/High group consists of participants with baseline cognitive abilities below/above the mean.

[e] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups.

[f] Mean of the outcome variable for the control group (CONT).

[g] Number of participant-month observations.

[h] Age is measured at baseline.

[i] Baseline unemployment is the number of months the participant has been registered with the employment office at the time of registering for the intervention.

6 Possible Mechanisms

In this section, we outline a simple theoretical framework to guide the interpretation of the treatment effects discussed in Section 5 (Section 6.1). We then present empirical evidence on how participants adjusted their search effort and how these adjustments translated into callbacks, interviews, and job offers (Section 6.2). Finally, we conclude with a brief discussion of possible alternative mechanisms (Section 6.3).

6.1 Framework

Following the standard search & matching literature, we define the job-finding rate for a generic jobseeker i as follows (Pissarides, 2017):

$$\lambda_i = A(a_i, \sigma_i)\, C(a_i)\, [1 - F(R(a_i))]. \tag{4}$$

Here, a_i denotes the jobseeker's ability or productivity, σ_i denotes search effort, and $R(\cdot)$ is the reservation wage, which we assume to be increasing in ability.[20] $F(\cdot)$ is the cumulative distribution function of wage offers in the economy, so that $[1 - F(R(a_i))]$ represents the probability that a wage offer exceeds the jobseeker's reservation wage.

The arrival rate of job offers is composed of two elements: the arrival rate of interviews, $A(\cdot)$, and the conversion rate of interviews into job offers, $C(\cdot)$. We assume that search effort affects positively only the arrival rate of interviews ($A_2(a_i, \sigma_i) > 0$), while productivity has a positive effect on both the arrival rate of interviews and the conversion rate ($A_1(a_i, \sigma_i) > 0$ and $C_1(a_i) > 0$).[21] The underlying idea is that, during interviews, employers obtain signals about the jobseeker's productivity and are therefore more likely to extend an offer to workers with higher ability. It also seems reasonable to assume that the cross-derivative of $A(\cdot)$ is positive: $A_{12}(a_i, \sigma_i) > 0$, so search and ability are complements. The same amount of effort yields more interviews when delivered by a person of higher ability.

Search effort is endogenously chosen by jobseekers by equating marginal benefits and marginal costs:

$$A_2(a_i, \sigma_i)\, C(a_i)\, [1 - F(R(a_i))] = k, \tag{5}$$

where k denotes the marginal utility cost of effort.[22]

We postulate that the intervention increases jobseekers' ability or productivity, or limits its cognitive decline during unemployment. In both cases, treated jobseekers are assumed, other things equal, to have higher a_i. Under this assumption, our simple theoretical framework predicts ambiguous effects on job finding. Higher productivity increases both the arrival rate of interviews and the conversion rate of interviews into job offers. At

[20] In what follows, we use the terms ability and productivity interchangeably.

[21] We adopt the common notation of using subscripts to denote partial derivatives with respect to function arguments, according to their ordering.

[22] Equation 5 can be rationalized by a simple utility function in which jobseekers value expected income and dislike exerting effort: $U = \lambda_i w - k\sigma_i$, where the wage w is normalized to one.

the same time, it raises the reservation wage, which tends to reduce job finding because a larger share of offers would be below the reservation wage and thus unacceptable. Moreover, whether search effort increases or decreases when ability increases is also ambiguous.Implicitly differentiating equation 5 with respect to a_i, and assuming $A_{22}(a_i, \sigma_i) < 0$, it is easy to show that

$$\frac{d\sigma_i}{da_i} = -\frac{A_2}{A_{22}} \left[\frac{A_{12}}{A_2} + \frac{C_1(a_i)}{C(a_i)} - \frac{f(R(a_i))\, R_1(a_i)}{1 - F(R(a_i))} \right] \tag{6}$$

whose sign is ambiguous and depends on whether the effect of ability on the reservation wage dominates the combined effects of ability on the conversion rate and the complementarity term (A_{12}/A_2).

6.2 Some evidence on search behavior

Ability is notoriously difficult to observe, and our data are no exception. We do, however, observe a range of job search activities and outcomes that can be naturally mapped to the objects in the theoretical framework described above.

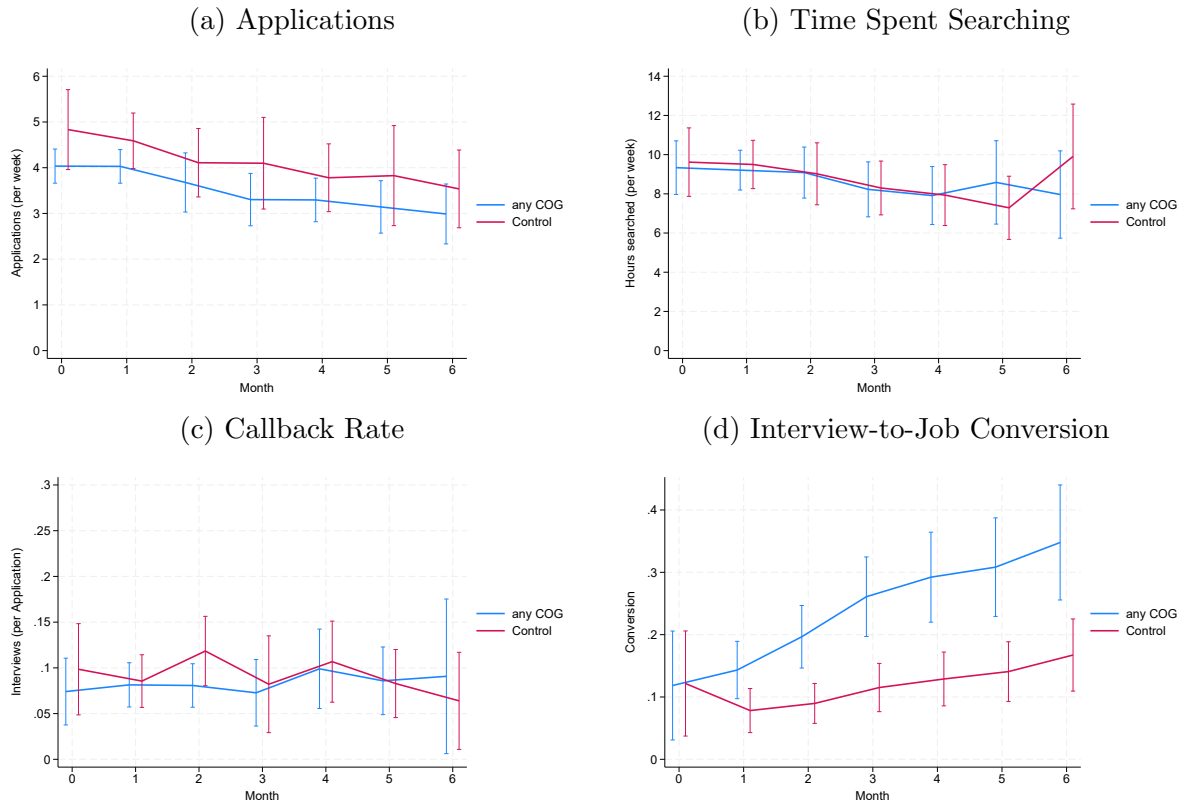
In the weekly surveys administered to participants, we collected detailed information on their job search behavior. In particular, respondents reported the number of applications they submitted, the number of interviews to which they were invited, and the amount of time they spent searching for jobs. Response rates to the surveys drop substantially when participants find jobs and, because of this dynamic selection, the results in this section need to interpreted with caution and should be considered as suggestive evidence of the underlying mechanism that generates the main effects reported in Section 5.[23]

In the following analyses, we now contrast jobseekers who were offered training (with higher ability) to jobseekers who were not offered training. Figure 7 perform the comparison for four variables: the number of applications per week (panel a), time spent searching per week (panel b), the callback rate, defined as interview invitations per ap-

[23]Table A-2 in the Appendix provides information on the response rate in the interview. Around 80% of the job seekers in the control group provide at least one response to the item concerning the number of applications sent in that week, but this proportion is 13 percentage points lower in the group offered cognitive training. During the first month, the average response rate in a given week is 47 percent in control group, and this proportion is 4 percentage points lower in the treated group, and falls by 6 percentage points per month. However, conditional on ever responding, as we do in the job search analysis, there is no differential response rate among treated and control job seekers.

plication (panel c), and the interview-to-job conversion rate, defined as the inverse of the number of interviews required to secure a job (panel d).

Figure 7: Job Search Inputs and Outcomes



Note: This figure shows raw sample means with 95% confidence intervals of the indicated variables, that are self-reported by participants in the weekly surveys (which we aggregate by month). Panel a shows the number of applications sent per week by participants in the "Any COG" and Control groups. Panel b shows the average hours spent searching for a job per week. Panel c shows the callback rate, and Panel d shows the conversion rate from interviews to job offers.

Panels a and b show that jobseekers who were offered cognitive training submitted slightly fewer applications – approximately one fewer application every two weeks – and devoted a similar amount of time to job search. Despite the lack of statistical significance, we interpret this evidence as suggesting that cognitive training did not increase job search effort.

Panel c of Figure 7 further shows that treated jobseekers exhibit callback rates that are very similar to those of jobseekers in the control group. While the differences shown in the other panels are small and statistically insignificant, panel d reveals economically large and statistically significant differences in the conversion rate of interviews into job offers, especially toward the end of the study period. Among treated participants, the conversion rate reaches approximately 0.35 – corresponding to about 3 interviews per job

– compared with roughly 0.17, or about six interviews per job, among control jobseekers. This represents a sizable improvement in post-interview success.

Our simple theoretical framework provides a rationalization for the patterns observed in Figure 7. The interview-to-job offer conversion rate shown in panel (d) provides information on $C(a_i)$ and is consistent with higher cognitive ability in the treated group, particularly after a sufficiently long exposure to the treatment. The slight reduction in applications and search time in panels a and b is consistent with equation (5): higher ability raises the conversion rate, which increases the marginal benefit of search effort, but the accompanying rise in the reservation wage works in the opposite direction, and the two effects may also interact through A_{12}. Of course, as shown in Figure 5, job finding rates ultimately rose for treated jobseekers, so the positive effects of higher a_i on both the interview arrival rate and the conversion rate were not fully offset by the higher reservation wage or the modest reduction in effort.

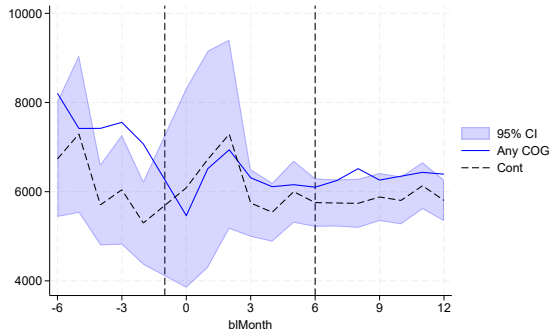
This mechanism is also consistent with the evidence presented in Figure 8, which examines the effect of the COG training on earnings among participants who found a job within 12 months since the start of the intervention. The figure follows the same structure as Figure 5, with unconditional earnings levels reported separately for the "Any COG" and control (CONT) groups in Panel (a), and treatment effects by month estimated using equation 1 in Panel (b).

The results show only small and statistically insignificant differences in earnings, along with a modest positive treatment effect that is likewise not statistically significant. Although these findings should be interpreted with caution due to endogenous selection into employment, they are consistent with a limited effect of the COG training on reservation wages. Given the small magnitude of this effect, it is plausible that its impact on job finding rates is dominated by improvements in interview arrival and conversion rates.

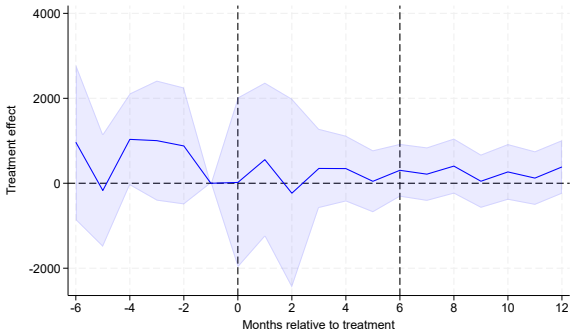
These patterns are consistent with cognitive training affecting the quality rather than the quantity of job search interactions. Improved cognitive abilities may translate into more effective behavior in interviews, such as better stress management, clearer articulation of skills, and greater adaptability to unexpected questions.

Figure 8: Cognitive training effects on worker earnings

(a) Levels



(b) Treatment Effects



Note: Panel a reports the raw levels of earnings for participants who found jobs, separately for the "Any COG" and control (CONT) group. Panel b) shows the corresponding treatment effect (the coefficients $\alpha_{1,m}$ from equation 1.

6.3 Alternative explanations

The empirical evidence in Figures 7 and 8 appear to be broadly consistent with a mechanism underlying our main findings that can be easily rationalized within the simple theoretical framework that we present in Section 6.1.

Nevertheless, alternative mechanisms are possible. For example, cognitive training may improve labor market outcomes not only by enhancing general cognitive abilities, but also by developing more task-specific skills through exercises that resemble those used by employers to screen candidates for cognitively demanding jobs. One way to assess this interpretation is to compare treatment effects across occupations with different cognitive requirements.

To this end, we classify job seekers according to the cognitive demands of their pre-unemployment occupations using O*NET descriptors. We construct a measure of occupational cognitive intensity based on the relative importance of cognitive versus physical and sensory skills, and split occupations at the median.[24] Although many participants subsequently transition into different occupations, prior occupation remains a useful proxy for the type of work environment individuals are likely to re-enter.[25]

Results, reported in Table A-7 in the Appendix, indicate substantial gains in both employment and earnings for both groups, although the timing and underlying mechanisms differ somewhat. Among participants from occupations with low cognitive demands, em-

[24]Interestingly, the cognitive requirements of prior occupations and baseline cognitive performance are only weakly correlated (correlation coefficient 0.08), suggesting that individual cognitive abilities and occupational demands do not align closely in our sample.

[25]This analysis is exploratory and was not pre-registered.

ployment increases by 9.3 percentage points and earnings rise by CHF 660 following the training period, indicating sizeable medium-term gains. Participants from occupations with high cognitive demands also experience strong and persistent effects, with employment increasing by 11.1 percentage points and earnings by CHF 1,010. These findings suggest that the training does not merely enhance narrow interview-related skills, but more broadly supports job seekers in improving their labor market prospects.

7 Conclusion

This paper examines whether providing jobseekers' with access to cognitive trainings can enhance their labor market outcomes. We implemented a novel, fully online randomized intervention designed to strengthen four core cognitive abilities and four transversal cognitive abilities central to self-regulated job search.

We find that, compared to the control group, the participants who were offered the training returned to employment more rapidly, relied less on transfer income and experience higher earnings. These effects are large in magnitude, substantially larger than those typically found in other interventions designed to support job seekers but in line with the large effects documented for interventions in the cognitive domain. Importantly, the treatment effects that we find materialize during the intervention phase and persist through the end of our twelve-month follow-up window, i.e., for up to six months after the cognitive training is no longer offered.

To explore the mechanisms underlying these effects, we further document that the intervention improved performance on our core cognitive task battery, which could indicate a genuine improvement in underlying cognitive ability. Consistent with this evidence, data on job search behavior suggest that the effects are driven primarily by increased search effectiveness rather than greater search intensity. Treated individuals submit slightly fewer applications and spend a similar amount of time searching, yet require fewer interviews to secure a job offer.

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SUPPLEMENTARY APPENDICES

A Additional empirical results

Table A-1: Full table of descriptive statistics

	Control		J4U		COG		COG+J4U	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
1=female	0.418	(0.029)	0.455	(0.029)	0.498	(0.031)	0.469	(0.030)
1=married	0.477	(0.030)	0.444	(0.029)	0.460	(0.031)	0.502	(0.030)
1=tertiary education[a]	0.533	(0.030)	0.503	(0.030)	0.570	(0.031)	0.590	(0.030)
1=age $\in [35, 49]$	0.393	(0.029)	0.364	(0.028)	0.422	(0.031)	0.403	(0.030)
1=age ≥ 50	0.340	(0.028)	0.371	(0.029)	0.308	(0.029)	0.330	(0.029)
Core cognitive abilities[b]	-0.069	(0.060)	-0.040	(0.061)	0.097	(0.058)	-0.024	(0.062)
Transversal cognitive abilities[c]	-0.025	(0.059)	0.043	(0.059)	0.103	(0.064)	-0.017	(0.062)
Psychosocial skills[d]	0.031	(0.060)	-0.094	(0.056)	0.089	(0.064)	-0.047	(0.055)
Nr. of target occupations[e]	2.751	(0.102)	2.664	(0.092)	2.635	(0.098)	2.769	(0.106)
Baseline unemployment[f]	11.431	(0.552)	11.106	(0.559)	9.898	(0.582)	11.662	(0.511)
Work experience before baseline:								
1=experience $>$ 4 years[g]	0.747	(0.026)	0.689	(0.027)	0.802	(0.025)	0.729	(0.027)
Earnings, -1 quarter[h]	594.9	(87.1)	607.0	(140.1)	736.6	(148.1)	544.4	(102.7)
Earnings, -2 quarters[h]	2148.2	(250.2)	1852.3	(264.6)	2328.8	(314.8)	1879.2	(271.9)
1=employed, -1 quarter[i]	0.103	(0.013)	0.070	(0.011)	0.090	(0.012)	0.083	(0.012)
1=employed, -2 quarters[i]	0.324	(0.025)	0.241	(0.023)	0.293	(0.025)	0.250	(0.024)
Observations	285		286		263		273	

Notes: This table reports descriptive statistics separately for all four treatment arms. Characteristics are measured at or before baseline.

[a] The dummy is equal to one for any participant whose highest achieved educational qualification is a tertiary degree, either academic or vocational.

[b] The sum of the baseline measurements on the core cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[c] The sum of the baseline measurements on the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[d] The sum of the baseline measurements on the psychosocial skills that we consider (adaptability, self-control, tolerance, and leadership), standardized to have mean zero and variance equal to one in the entire sample.

[e] Number of occupations in which the participant is looking for jobs, self-reported at registration with the PES.

[f] Weeks spent as a registered job seeker on the day finishing the baseline survey.

[g] The dummy equals one if the participant has more than 4 years of work experience before the unemployment spell.

[h] Average earnings over 1–3/4–6 months before baseline.

[i] Average of binary month-by-month employment indicators over 1–3/4–6 months before baseline.

Table A-2: Response Rate in Weekly Job Search Survey

	Resp. Rate[a]	Ever Resp.[b]	Cond. Rate[c]
anyCOG[d]	-0.042**	-0.128***	-0.009
	(0.019)	(0.030)	(0.021)
employed[e]	-0.092***		-0.119***
	(0.016)		(0.021)
month[f]	-0.060***		-0.086***
	(0.003)		(0.003)
Constant	0.467***	0.800***	0.627***
	(0.018)	(0.023)	(0.019)
Observations[g]	21,150	846	15,200

Notes: This table reports OLS estimates of the determinants of survey response to the weekly questionnaire on job search activities. Standard errors are clustered at the individual level.

[a] Probability of responding to the (weekly) survey in a given week.

[b] Probability of having responded to at least one survey during the study period. Estimated at the individual level.

[c] Probability of responding to the (weekly) survey in a given week, conditional on having responded at least once.

[d] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes only the control group CONT.

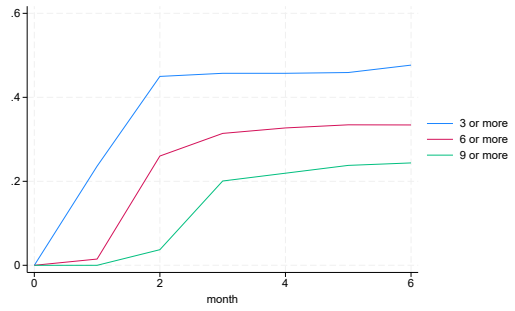
[e] Dummy equal to 1 if the individual is employed in a given week.

[f] Month relative to study enrollment (continuous control for elapsed time).

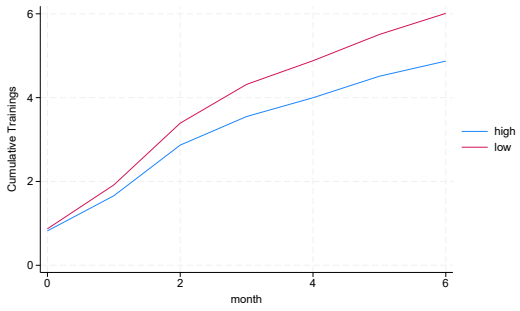
[g] Number of participant-week observations for columns (a) and (c); number of participants for column (b).

Figure A-1: Cumulative number of COG training weeks by subgroups

(a) Distribution by take-up categories



(b) Distribution by cognitive demand



Note: Panel a shows the distribution of the cumulative number of weeks of training attempted, i.e. the share of participants who trained for more than 3, 6, or 9 weeks over the study period. Panel b shows the cumulative training weeks separately for job seekers with high and low cognitive demands in their previous occupation.

Table A-3: Response Rate in Midline and Endline Survey

	Midline Resp.[a]	Endline Resp.[b]	Endline | Midline[c]
anyCOG[d]	-0.030	-0.032	0.013
	(0.024)	(0.020)	(0.066)
Employed before wave[e]	-0.107***	-0.107***	-0.165**
	(0.027)	(0.019)	(0.072)
Constant	0.243***	0.193***	0.533***
	(0.019)	(0.018)	(0.048)
Observations[f]	1,107	1,107	231

Notes: This table reports OLS estimates of the determinants of survey response to the midline and endline skill assessment. Standard errors are robust to heteroskedasticity.

[a] Probability of responding to the midline survey, administered in week 13.

[b] Probability of responding to the endline survey, administered in week 27.

[c] Probability of responding to the endline survey, conditional on having responded to the midline survey.

[d] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes the control group CONT and the J4U group.

[e] Dummy equal to 1 if the individual found employment before the relevant survey wave: before month 3 for column (a), before month 6 for columns (b) and (c).

[f] Number of participants for columns (a) and (b); number of midline respondents for column (c).

Table A-4: Cognitive Training Effects on Employment: Sensitivity to Covariates

	Panel A: Short-term (months 1 to 6)			
	[1]	[2]	[3]	[4]
Any COG[a]	0.067***	0.072***	0.071***	0.077***
	(0.025)	(0.025)	(0.025)	(0.025)
Core cognitive abilities[b]	-	-	0.009	0.004
			(0.015)	(0.014)
Transversal cognitive abilities[c]	-	-	0.004	0.005
			(0.014)	(0.014)
Psychosocial skills[d]	-	-	-0.001	-0.003
			(0.013)	(0.013)
Socio-demographic controls[e]	No	Yes	Yes	Yes
Labor market controls[f]	No	No	No	Yes
Mean (CONT)[g]	0.234	0.234	0.234	0.234
Observations[h]	4926	4926	4926	4926
	Panel B: Mid-term (months 7 to 12)			
Any COG[a]	0.087***	0.083***	0.080**	0.090***
	(0.032)	(0.032)	(0.032)	(0.032)
Core cognitive abilities[b]	-	-	0.036**	0.032*
			(0.018)	(0.018)
Transversal cognitive abilities[c]	-	-	0.004	0.005
			(0.017)	(0.017)
Psychosocial skills[d]	-	-	0.013	0.012
			(0.016)	(0.016)
Socio-demographic controls[e]	No	Yes	Yes	Yes
Labor market controls[f]	No	No	No	Yes
Mean (CONT)[g]	0.478	0.478	0.478	0.478
Observations[h]	4926	4926	4926	4926

[-] This table reports intention-to-treat estimates of the effect of cognitive training on employment. The outcome variable equals 1 if the individual is employed in a given month. Standard errors are clustered at the individual level.

[a] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes only the control group CONT.

[b] This is the sum of the baseline measurements on the core cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[c] This is the sum of the baseline measurements on the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[d] This is the sum of the baseline measurements on the psychosocial skills that we consider (adaptability, self-control, tolerance, and leadership), standardized to have mean zero and variance equal to one in the entire sample.

[e] The socio-demographic controls are age, gender, education, marital status, and cohort.

[f] The labor market controls are prior occupation (high-experience, high-skilled), the number of occupations searched, earnings and employment in the six months prior to baseline, and elapsed job search duration before baseline.

[g] Mean of the outcome variable for the control group.

[h] Number of participant-month observations.

Table A-5: Robustness to Alternative Definitions of Treatment and Control Groups

	Employed[a]	Earnings[b]	Earnings> 0[c]	On Transfer[d]	Transfer Amount[e]
	Panel A: Any COG vs Control Group (Baseline)				
Any COG[f]	0.085***	671.422***	270.960	-0.064**	-413.601***
	(0.032)	(248.125)	(254.944)	(0.030)	(153.459)
Mean (CONT)	0.478	2801.152	5855.709	0.399	1641.355
R-squared	0.061	0.076	0.243	0.056	0.100
Observations	4926	4926	2637	4926	4926
	Panel B: COG vs Control Group				
COG[i]	0.071*	439.063	34.674	-0.056	-525.423***
	(0.037)	(290.192)	(300.640)	(0.035)	(175.532)
Mean (CONT)	0.478	2801.152	5855.709	0.399	1641.355
R-squared	0.063	0.095	0.259	0.054	0.093
Observations	3288	3288	1691	3288	3288
	Panel C: COG+J4U vs Control Group				
COG + J4U[l]	0.092**	850.501***	512.217*	-0.069**	-292.985*
	(0.037)	(299.462)	(302.206)	(0.034)	(175.864)
Mean (CONT)	0.478	2801.152	5855.709	0.399	1641.355
R-squared	0.069	0.084	0.265	0.069	0.135
Observations	3348	3348	1764	3348	3348
	Panel D: Any COG vs Not COG				
Any COG[f]	0.060**	625.441***	413.795**	-0.048**	-386.738***
	(0.026)	(206.774)	(209.465)	(0.024)	(129.655)
Mean (CONT & J4U)[m]	0.499	2867.369	5748.160	0.384	1614.092
R-squared	0.053	0.068	0.233	0.056	0.109
Observations	6642	6642	3528	6642	6642

- The reported treatment effects are means of the effects over months 7 to 12 since baseline. All specifications control for age, gender, education, marital status, migration background, baseline unemployment duration, and prior earnings, as well as cohort dummies and dummies for the previous occupation. Standard errors are clustered at the individual level.

[a] Dummy equal to 1 if the individual is employed in a given month.

[b] Monthly earnings in CHF, set to zero if the individual is not employed.

[c] Earnings in CHF conditional on employment.

[d] Dummy equal to 1 if the individual receives transfer income (e.g., unemployment insurance or other transfers).

[e] Amount of transfer income in CHF.

[f] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups.

[g] Mean of the outcome variable for the control group (CONT).

[h] Number of participant-month observations.

[i] Dummy indicator for participants in the COG group.

[l] Dummy indicator for participants in the group receiving both the COG and the J4U treatment (COG+J4U).

[m] Mean of the outcome variable for the participants who do not receive the COG treatment, i.e. those in the control CONT and J4U groups.

Table A-6: Effects of Cognitive Training on Cognition and Other Outcomes

	Core cog. ab. [a]	Transv. cog. ab.[b]	Combined[c]	Core cog. ab.[a]	Transv. cog. ab.[b]	Combined[c]
	Panel A: Baseline Cognitive Abilities[d]					
	Low			*High*		
Any COG[e]	0.192	0.249**	0.273**	0.395**	-0.029	0.085
	(0.152)	(0.116)	(0.123)	(0.168)	(0.086)	(0.094)
Constant	-0.038	-0.205	-0.191	0.005	-0.136	-0.119
	(0.347)	(0.293)	(0.321)	(0.355)	(0.187)	(0.195)
R-squared	-0.007	-0.022	-0.025	0.043	-0.005	-0.005
Observations[f]	162	162	162	219	219	219
Panel B: Age[g]						
	Younger than 45 years			*45 years or older*		
Any COG[e]	0.092	0.245*	0.241*	0.371**	0.015	0.117
	(0.223)	(0.131)	(0.133)	(0.143)	(0.082)	(0.091)
Constant	0.160	-0.151	-0.088	0.238	-0.044	0.028
	(0.405)	(0.299)	(0.311)	(0.278)	(0.164)	(0.180)
R-squared	-0.035	-0.006	0.005	0.058	-0.026	-0.011
Observations[f]	129	129	129	252	252	252
Panel C: Baseline Unemployment[h]						
	Less than 9 months			*9 months or longer*		
Any COG[e]	0.348**	0.096	0.182	0.224	0.109	0.158
	(0.176)	(0.110)	(0.116)	(0.142)	(0.092)	(0.099)
Constant	-0.284	-0.199	-0.255	0.143	-0.110	-0.057
	(0.324)	(0.245)	(0.254)	(0.362)	(0.188)	(0.208)
R-squared	0.071	-0.000	0.033	0.092	-0.021	0.013
Observations[f]	185	185	185	196	196	196

- This table reports estimates of the effects of cognitive training on cognition. The dependent variable is the change in the outcome between midline and baseline, or endline and baseline. Standard errors are clustered by individual. Control variables are the same as in the main estimates, except we replace recruitment cohorts by a dummy indicating participants in Neuchâtel vs Vaud.

[a] This is the change from baseline to midline/endline in the sum of the measurements on the core cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample at baseline and midline/endline.

[b] This is the change from baseline to midline/endline in the sum of the measurements on the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample at baseline and midline/endline.

[c] This is the change from baseline to midline/endline in the sum of the measurements on the core cognitive abilities and the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample at baseline and midline/endline.

[d] Baseline cognitive abilities is measured as the sum of the baseline measurements on the core cognitive abilities and the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample. The Low/High group consists of participants with baseline cognitive abilities below/above the mean.

[e] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category includes both the control group CONT and the J4U group.

[f] Number of participants.

[g] Age is measured at baseline.

[h] Baseline unemployment is the number of months the participant has been registered with the employment office at the time of registering for the intervention.

Table A-7: Results by Cognitive Intensity of Occupations

	Employed[a]	Earnings[b]	Earnings> 0[c]	Employed[a]	Earnings[b]	Earnings> 0[c]
	Cognitive intensity of the previous occupation[d]					
	Low			*High*		
Any COG[e]	0.093*	660.468*	73.800	0.111***	1010.423***	543.682
	(0.048)	(350.486)	(421.773)	(0.043)	(347.498)	(357.977)
Mean (CONT)[f]	0.473	2586.933	5467.836	0.482	2966.141	6148.695
Observations[g]	2100	2100	1071	2826	2826	1566

- The reported treatment effects are means of the effects over months 7 to 12 since baseline. All specifications control for age, gender, education, marital status, migration background, baseline unemployment duration, and prior earnings, as well as cohort dummies and dummies for the previous occupation. Standard errors are clustered at the individual level.

[a] Dummy equal to 1 if the individual is employed in a given month.

[b] Monthly earnings in CHF, set to zero if the individual is not employed.

[c] Earnings in CHF conditional on employment.

[d] Cognitive intensity of participants' previous occupations is based on O*NET data on physical, sensory, and cognitive ability and skill requirements of occupations. For each occupation, we calculate the average physical, sensory, and cognitive requirements, and define cognitive intensity as the ratio of cognitive requirements to the sum of physical and sensory requirements. We then split the sample at the median of this distribution, classifying occupations above the median as high demands and those below as low demands.

[e] Dummy indicator for participants in the "Any COG" group, which includes the COG and the COG+J4U groups. The excluded category is the control group CONT.

[f] Mean of the outcome variable for the control group (CONT).

[g] Number of participant-month observations.

Table A-8: Baseline Characteristics by Responder Status

	Baseline		Midline		Endline	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
1=female	0.458	(0.015)	0.459	(0.033)	0.453	(0.041)
1=married	0.471	(0.015)	0.489	(0.033)	0.507	(0.041)
1=tertiary education[a]	0.548	(0.015)	0.545	(0.033)	0.587	(0.040)
1=age $\in [35, 49]$	0.395	(0.015)	0.364	(0.032)	0.353	(0.039)
1=age ≥ 50	0.338	(0.014)	0.506	(0.033)	0.513	(0.041)
Core cognitive abilities[b]	-0.011	(0.030)	0.084	(0.060)	0.080	(0.072)
Transversal cognitive abilities[c]	0.025	(0.030)	0.116	(0.061)	0.206	(0.072)
Psychosocial skills[d]	-0.007	(0.029)	-0.073	(0.061)	-0.066	(0.074)
Nr. of target occupations[e]	2.706	(0.050)	2.957	(0.110)	2.813	(0.137)
Baseline unemployment[f]	11.040	(0.276)	11.386	(0.684)	12.457	(0.854)
Work experience before baseline:						
1=experience $>$ 4 years[g]	0.741	(0.013)	0.818	(0.025)	0.847	(0.030)
Earnings, -1 quarter[h]	619.2	(60.7)	651.1	(161.2)	809.5	(264.3)
Earnings, -2 quarters[h]	2048.3	(137.5)	2494.5	(316.8)	2759.3	(526.6)
1=employed, -1 quarter[i]	0.086	(0.006)	0.076	(0.013)	0.073	(0.016)
1=employed, -2 quarters[i]	0.277	(0.012)	0.297	(0.026)	0.242	(0.030)
Participants	1,107		231		150	

- This table reports baseline characteristics for all participants in our sample (Baseline), for those who responded to the midline survey (Midline), and for those who responded to the endline survey (Endline). Midline and endline respondents are those who contribute to the estimates in Table 4. Characteristics are measured at or before baseline.

[a] The dummy is equal to one for any participant whose highest achieved educational qualification is a tertiary degree, either academic or vocational.

[b] The sum of the baseline measurements on the core cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[c] The sum of the baseline measurements on the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample.

[d] The sum of the baseline measurements on the psychosocial skills that we consider (adaptability, self-control, tolerance, and leadership), standardized to have mean zero and variance equal to one in the entire sample.

[e] Number of occupations in which the participant is looking for jobs, self-reported at registration with the PES.

[f] Weeks spent as a registered job seeker on the day finishing the baseline survey.

[g] The dummy equals one if the participant has more than 4 years of work experience before the unemployment spell.

[h] Average earnings over 1–3/4–6 months before baseline.

[i] Average of binary month-by-month employment indicators over 1–3/4–6 months before baseline.

Table A-9: Representativeness of the study sample

	Study sample		Job seekers		General pop.	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
1=female	0.460	(0.017)	0.475	(0.003)	0.498	(0.001)
1=married	0.480	(0.017)	0.407	(0.003)	0.451	(0.001)
1=tertiary education[a]	0.564	(0.017)	0.214	(0.002)	–	
Age (years)	43.933	(0.384)	41.333	(0.066)	41.252	(0.016)
1=age $\in [35, 49]$	0.406	(0.017)	0.375	(0.003)	0.330	(0.001)
1=age ≥ 50	0.326	(0.016)	0.287	(0.002)	0.318	(0.001)
Baseline unemployment[b]	11.017	(0.318)	9.900	(0.078)	–	
Observations	821		33,196		652,688	

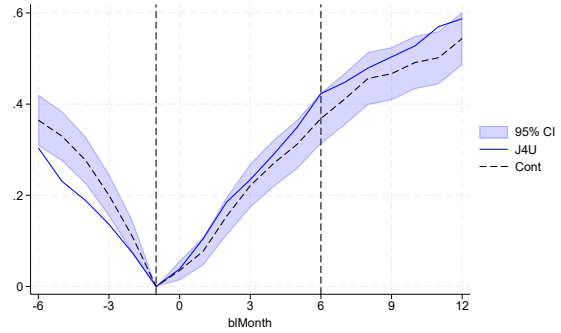
- This table compares baseline characteristics of the study sample with a reference population of job seekers registered in February 2021 in the canton of Neuchâtel, or May 2022 in the canton of Vaud (job seekers), and with the general population aged 18 to 65 years living in the two regions in December 2021 (General pop.). Characteristics are measured at or before baseline. Dashes indicate that the variable is not available for the reference population.

[a] The dummy is equal to one for any participant whose highest achieved educational qualification is a tertiary degree, either academic or vocational.

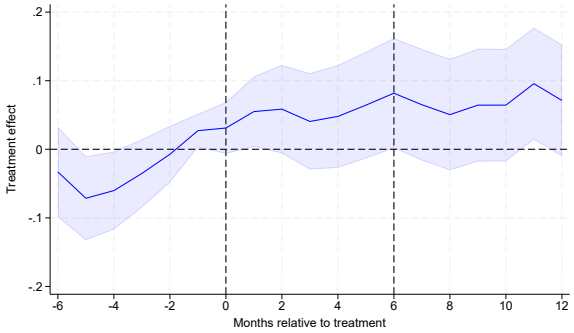
[b] Weeks spent as a registered job seeker on the day finishing the baseline survey.

Figure A-2: Occupational Recommendations (J4U), Employment and Earnings

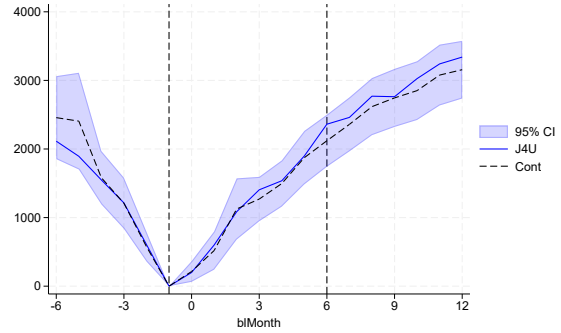
(a) Employment - Levels



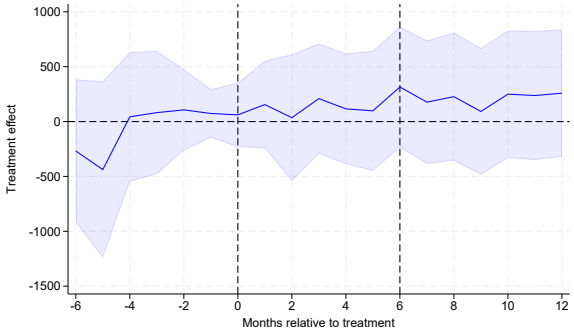
(b) Employment - Treatment Effects



(c) Earnings - Levels



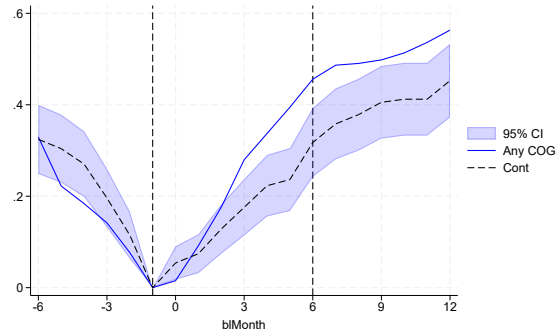
(d) Earnings - Treatment Effects



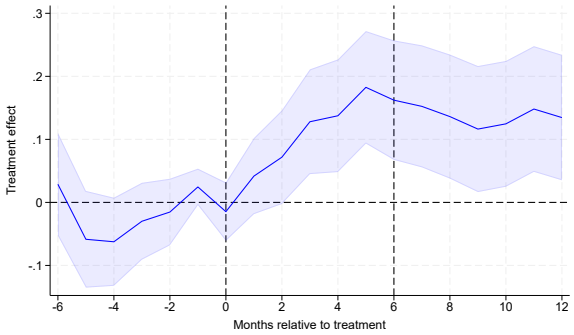
Note: This figure reports in Panel (a) the share of participants who are employed and in Panel (b) treatment effects of occupation recommendations (J4U) on employment. Panel (c) shows mean earnings and Panel (d) treatment effects of occupational recommendations (J4U) on earnings. Panels labelled "Levels" display raw outcomes, while panels labelled "Treatment Effects" present the estimated effects of occupation recommendations (J4U), i.e., the coefficients $\alpha_{1,m}$ from equation 1.

Figure A-3: Cognitive Training Effects on Employment by Initial Cognition

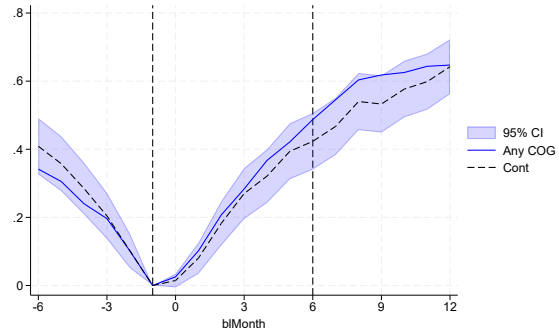
(a) Low Cognition - Levels



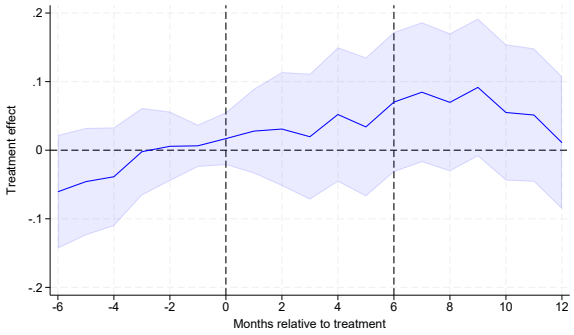
(b) Low Cognition - Treatment Effects



(c) High Cognition - Levels



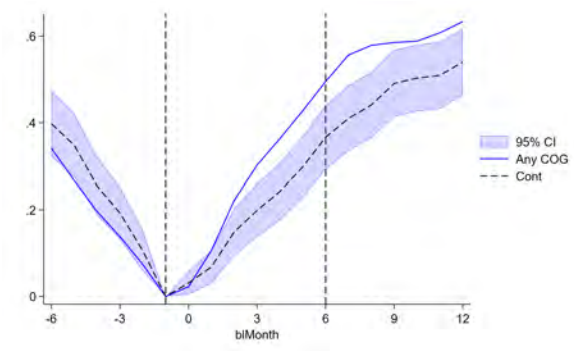
(d) High Cognition - Treatment Effects



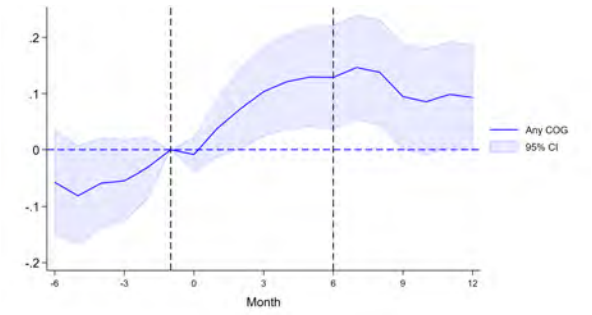
Note: This figure reports the share of participants who are employed, separately for participants with low and high baseline cognitive abilities. Panels a and b show results for participants with low baseline cognitive abilities; Panels c and d show results for participants with high baseline cognitive abilities. Panels labelled "Levels" display raw outcomes, while panels labelled "Treatment Effects" present the estimated effects of cognitive training (the coefficients $\alpha_{1,m}$ from equation 1). Baseline cognitive abilities is measured as the sum of the baseline measurements on the core cognitive abilities and the transversal cognitive abilities listed in Table 1, standardized to have mean zero and variance equal to one in the entire sample. The Low/High group consists of participants with baseline cognitive abilities below/above the mean.

Figure A-4: Cognitive Training Effects on Employment by Cognitive Intensity of Occupation

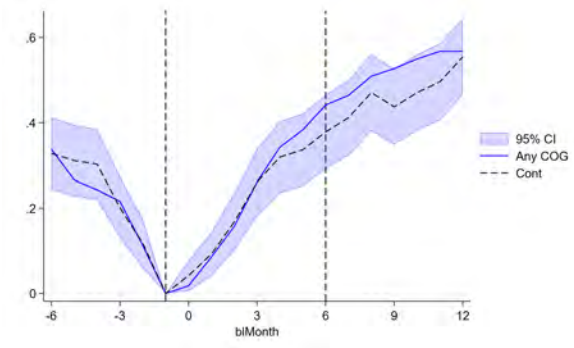
(a) High Demands - Levels



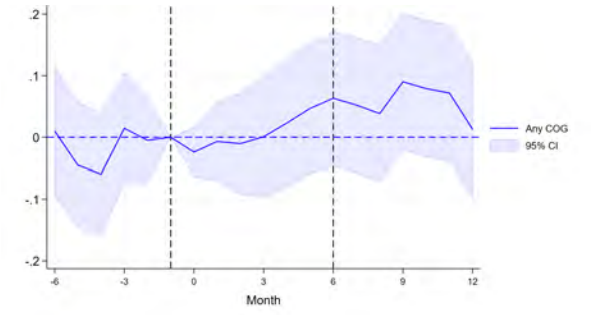
(b) High Demands - Treatment Effects



(c) Low Demands - Levels



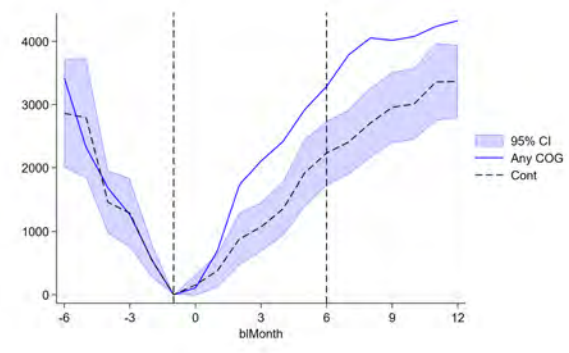
(d) Low Demands - Treatment Effects



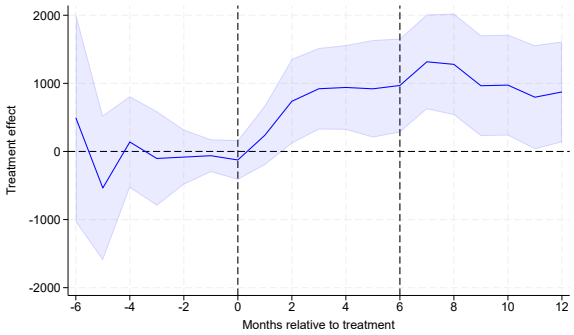
Note: This figure reports the share of participants who are employed, separately by the cognitive intensity of their previous occupation. Cognitive intensity is calculated using O*NET data on physical, sensory, and cognitive ability and skill requirements of occupations. For each occupation, we compute the average physical, sensory, and cognitive requirements, and define cognitive intensity as the ratio of cognitive requirements to the sum of physical and sensory requirements. The sample is split at the median: occupations above the median are classified as high demands, and those below as low demands. Panels labelled "Levels" display raw outcomes, while panels labelled "Treatment Effects" present the estimated effects of cognitive training (the coefficients $\alpha_{1,m}$ from equation 1). Panels a and b show high-demand occupations; Panels c and d show low-demand occupations.

Figure A-5: Cognitive Training Effects on Earnings by Cognitive Intensity of Occupation

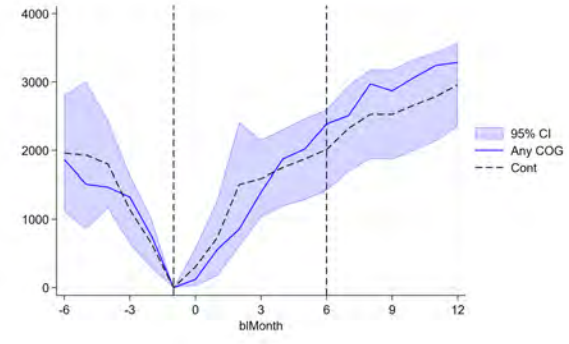
(a) High Demands - Levels



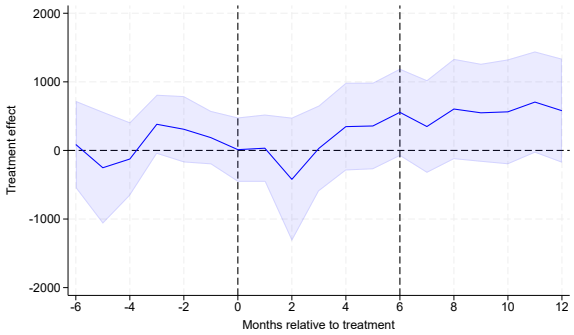
(b) High Demands - Treatment Effects



(c) Low Demands - Levels



(d) Low Demands - Treatment Effects



Note: This figure reports average labor earnings (set to zero in months without employment), separately by the cognitive intensity of participants' previous occupations. Cognitive intensity is calculated using O*NET data on physical, sensory, and cognitive ability and skill requirements of occupations. For each occupation, we compute the average physical, sensory, and cognitive requirements, and define cognitive intensity as the ratio of cognitive requirements to the sum of physical and sensory requirements. The sample is split at the median: occupations above the median are classified as high demands, and those below as low demands. Panels labelled "Levels" display raw outcomes, while panels labelled "Treatment Effects" present the estimated effects of cognitive training (the coefficients $\alpha_{1,m}$ from equation 1). Panels a and b show high-demand occupations; Panels c and d show low-demand occupations.

B Socio-Emotional Outcomes

The COG intervention may also influence job finding through changes in socio-emotional factors, including hopelessness, motivation, procrastination, and overall well-being. We measured these dimensions using selected items from standardized psychological scales at baseline and again in the midline and endline questionnaires. All socio-emotional measures are self-reported.

- **Hopelessness in job seeking.** To measure hopelessness in job seeking, we adapted three items from the Beck Hopelessness Scale (Beck et al., 1974), each reflecting one particular aspect: feeling about the future, loss of motivation, and expectations. The three items were rated on a 7-point scale, from 1 (strongly disagree) to 7 (strongly agree), yielding a total sum score between 3 and 21. A higher score indicates higher hopelessness.

- **Motivation in job search.** To measure motivation in job search, we used four items inspired by the Intrinsic Motivation Inventory (Deci et al., 1994), assessing participants' interest/enjoyment and value/usefulness in job search activities. These four items are scored on a 1-7 point scale, from 1 (does not match at all) to 7 (matches very strongly), yielding a total sum score between 4 and 28. A higher score indicates higher motivation.

- **Pure Procrastination Scale (short version).** To measure procrastination, which is defined by the avoidance of the implementation of an intention and the preference for behaviour or thoughts that distract from the aversiveness of the intention, we used four of the 11 items of The Pure Procrastination Scale (Rebetez et al., 2014). Two items assessed voluntary delay, and the two others assessed observed delay on a 5-point scale, ranging from 1 (rarely or not at all) to 5 (very often or always), yielding a total sum score between 4 and 20. A higher score indicates higher procrastination.

- **Well-being.** We assessed well-being using The Short Depression-Happiness Scale (SDHS) (Joseph et al., 2004). This test is a six-item bipolar self-report aiming to measure depression and happiness. It consists of three items asking about negative affect and cognitive states (reverse-scored) and three about positive affect. Respon-

dents are asked to think about how they have felt in the past seven days and to rate each item on a 4-point scale, from 0 (never) to 3 (often), yielding a total sum score between 0 and 18. Higher scores indicate a greater frequency of positive thoughts and feelings and a lower frequency of negative thoughts and feelings.

In the empirical analysis, all scores were standardized to have mean zero and variance one. Figure B-1 shows descriptive statistics comparing individuals offered COG training with those not offered the program.

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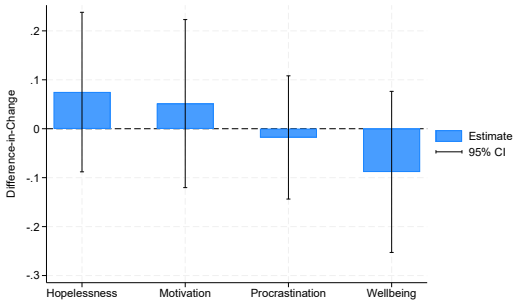
Deci, Edward L., Eghrari, Haleh, Patrick, Brian C., and Leone, Dean R. Facilitating internalization: the self-determination theory perspective. *Journal of Personality*, 62 (1):119–142, March 1994. ISSN 0022-3506. doi: 10.1111/j.1467-6494.1994.tb00797.x.

Joseph, Stephen, Linley, P. Alex, Harwood, Jake, Lewis, Christopher Alan, and McCollam, Patrick. Rapid assessment of well-being: The Short Depression-Happiness Scale (SDHS). *Psychology and Psychotherapy*, 77(Pt 4):463–478, December 2004. ISSN 1476-0835. doi: 10.1348/1476083042555406.

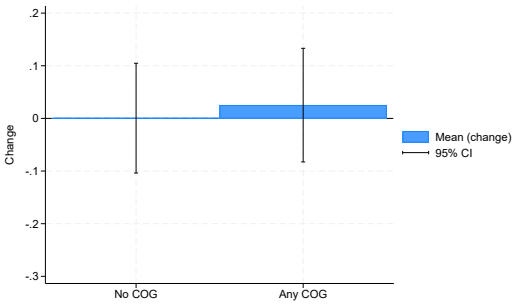
Rebetez, Marie My Lien, Rochat, Lucien, Gay, Philippe, and Van der Linden, Martial. Validation of a French version of the Pure Procrastination Scale (PPS). *Comprehensive Psychiatry*, 55(6):1442–1447, August 2014. ISSN 0010-440X. doi: 10.1016/j.comppsych.2014.04.024. URL `https://www.sciencedirect.com/science/article/pii/S0010440X14001114`.

Figure B-1: Additional Outcome Changes between Baseline, Midline, and Endline

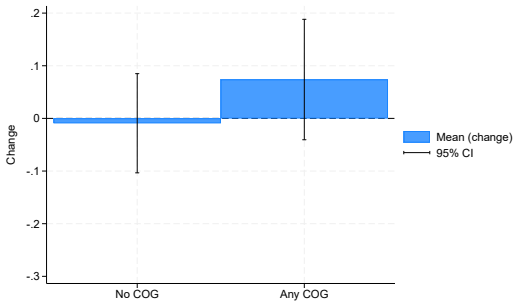
(a) Difference-in-Change



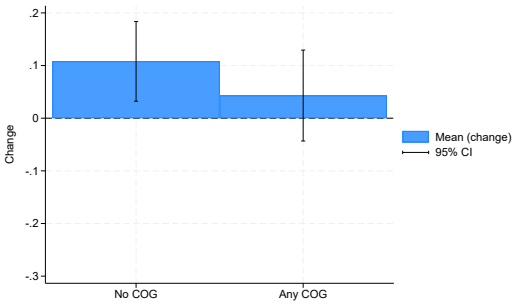
(b) Hopelessness



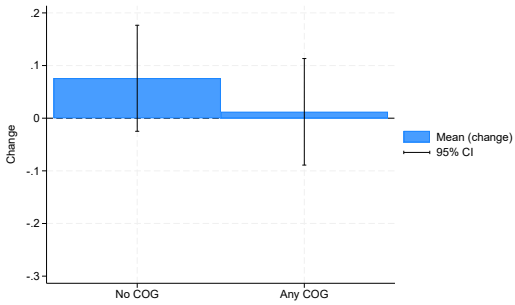
(c) Motivation



(d) Procrastination



(e) Well-being



Note: This figure shows the change from baseline to midline or endline for participants without cognitive training (No COG: Control and J4U) and those who received cognitive training (COG: COG and COG+J4U). Panel a reports the Difference-in-Change, i.e. the estimated change for the COG group relative to the No COG group, across all four outcomes jointly. Panels b, c, d, and e show the raw changes for each outcome separately. Hopelessness is measured using the Beck Hopelessness Scale (Beck et al., 1974). Motivation in job search is measured using the Intrinsic Motivation Inventory (Deci et al., 1994). Procrastination is measured using the Pure Procrastination Scale (Rebetez et al., 2014). Well-being is measured with the Short Depression-Happiness Scale (SDHS) (Joseph et al., 2004). The figure reports 95% confidence intervals.

C Measuring Cognitive Abilities and Psychosocial Skills

The O*NET database consists of a collection of many descriptors for all available occupations at a very granular level. The most recent version contains over 450 descriptors for over 1000 occupations. The descriptors are organised into six domains and various sub-domains. A full description of O*NET is available at this link.

When selecting the cognitive dimensions that we wanted to measure in the intervention, we focused on two domains in the O*NET framework: *Worker Characteristics* and *Worker Requirements*. These are the domains that contain individual traits that can be most obviously and naturally attributed to an individual worker rather than to the work environment or to a combination of the two. Within these two domains, we selected four of the seven sub-domains, following the O*NET taxonomy:

1. Abilities, which are part of the domain "worker Characteristics" and are defined as "Enduring attributes of the individual that influence performance";

2. Skills, which are part of the domain "Worker Requirements" and are separately classified as Basic Skills and Cross-Functional Skills. Basic Skills are defined as "Developed capacities that facilitate learning or the more rapid acquisition of knowledge." Cross-Functional Skills are "Developed capacities that facilitate the performance of activities that occur across jobs";

3. Work styles, which are also part of the domain "Worker Characteristics" and are defined as "Personal characteristics that can affect how well someone performs a job.".

The exclusion of the other domains and sub-domains was mostly guided by the intention to focus on cognitive abilities of the jobseekers but also by the availability of scientifically validated measurement instruments that could be implemented in a self-contained, self-administered and relatively short questionnaire. In order to guarantee the practical feasibility of the intervention, we pay careful attention to this latter criterion during every step of the process.

We proceeded by combining three criteria: First, we wanted to focus on items that tended to be important for many occupations. Every item in O*NET is associated with

an indicator of its importance to the occupation under consideration. This importance indicator ranges between 1 "Not Important" and 5 "Extremely Important". Second, we wanted to select items that could discriminate across occupations. In other words, we did not want to pick items that were equally highly important for all occupations. To do so, we performed a simple Principal Component Analysis (PCA) and computed the eigenvalues of the first component for each item. The third criterion was partially arbitrary. We plotted the average importance levels and eigenvalues of each item against each other on a diagram and selected the ones that tended to be in the upper right quadrant and that our team of psychologists considered that they could be measured in the context of an online questionnaire.

Figure C-1: Selection of O*NET items

Figure C-1 shows the diagrams that we used for this selection. The left panel shows the average importance levels and the PCA eigenvectors of all items in the sub-domains of Abilities and Skills, which we analysed jointly. The left panel does the same for Work Styles. The selected items are indicated in red and are also labelled. The non-selected items are in blue and, for improved readability, we add labels only to a small group of them.

Eventually, we selected the following O*NET 12 items. The category labels in paren-

theses follow the O*NET taxonomy.

- Core cognitive abilities:
  - Memorization (Ability): remembering information such as words, numbers, pictures, and procedures;
  - Category flexibility (Ability): generating or using different sets of rules for combining or grouping things in different ways;
  - Monitoring (Skill): monitoring and assessing the performance of yourself, other individuals, or organizations to make improvements or take corrective action;
  - Time management (Skill): managing one's own time and the time of others;
- Transversal cognitive abilities:
  - Inductive reasoning (Ability): combining pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events);
  - Reading comprehension (Skill): understanding written sentences and paragraphs in work-related documents;
  - Fluency of ideas (Ability): ability to come up with novel ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity);
  - Perceptual speed (Ability): ability to quickly and accurately compare similarities and differences among sets of letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other.
- Psychosocial skills:
  - Adaptability (Work style): being open to change (positive or negative) and to diversity in the workplace;
  - Tolerance to stress (Work style): accepting criticism and dealing calmly and effectively with high-stress situations;
  - Leadership (Work style): willingness to lead, take charge, and offer opinions and direction;

– Self-control (Work style): maintaining composure, keeping emotions in check, controlling anger, and avoiding aggressive behaviour, even in very difficult situations;

We measure participant's abilities and skills on numerical indices (Aschwanden et al., 2026). We then construct three composite indices used throughout the paper – core cognitive abilities, transversal cognitive abilities, and psychosocial skills – from the twelve items listed above. For each item, we compute a numeric score from the corresponding question or task in our baseline skill assessment. Two items require recoding so that higher values consistently indicate a higher level of the underlying ability or skill: Perceptual speed, which is measured via participants' response times, is recoded so that a lower (faster) response time maps into a higher value; and Tolerance to stress is recoded so that higher values indicate greater tolerance to stress.

Formally, let $x_{i,k}$ denote individual i's (recoded) score on item k, and let $\mathcal{K}_d$ denote the set of four items belonging to domain $d \in \{\text{CoreCogAb}, \text{TransCogAb}, \text{PsychSkills}\}$. We first standardize each item score in the full sample:

$$z_{i,k} = \frac{x_{i,k} - \bar{x}_k}{sd(x_k)}, \qquad k \in \mathcal{K}_d. \tag{C-1}$$

We then sum the standardized item scores within each domain,

$$\widetilde{d}_i = \sum_{k \in \mathcal{K}_d} z_{i,k}, \tag{C-2}$$

and standardize this sum once more to obtain the final composite index used throughout the paper,

$$d_i = \frac{\widetilde{d}_i - \bar{\widetilde{d}}}{sd(\widetilde{d})}, \qquad d \in \{\text{CoreCogAb}, \text{TransCogAb}, \text{PsychSkills}\}. \tag{C-3}$$

D Design of the Job for You platform

For participants assigned to the J4U treatment, the job search platform provided personalized occupation recommendations. These recommendations were based on two sources of worker-specific information: (i) the participant's measured skill profile in the baseline assessment and (ii) the skill requirements of her previous occupation, derived from O*NET data[D-1]. Occupation matching followed the procedure described in Bächli et al. (2024).

Each participant's skill profile was constructed as a weighted average of her measured skill profile and the skill profile associated with her previous occupation. Personalized occupation recommendations were then generated by calculating the Euclidean distance between the participant's weighted profile and the skill profiles of all occupations in O*NET. Occupations with the smallest distances were considered the best matches. The main difference relative to the recommendation algorithm used in Bächli et al. (2024) is that participants were allowed to adjust the relative weights assigned to the two profile components during the first few weeks of the study. We did this to support the participants' basic psychological need of autonomy and to boost their motivation towards their job search practice Ryan and Deci (2000).

Initially, after participants created their account and went through the baseline surveys, equal weights of 0.5 were assigned to the measured skill profile and the previous occupation profile. During the first three weeks, participants could modify these weights according to their preferences. After this adjustment period, the selected weighting scheme remained fixed for the rest of the study. We did this to allow participants to experiment with their preferred weighting scheme while at the same time converging to stable recommendations for the rest of the study. Experimentation allowed each participant to identify the set of weights providing job recommendations within their comfort zone.

Onboarding and interaction design. Participants who agreed to take part in the study were given access to the J4U online platform via an email invitation. As part of the account creation process, they were invited to take a baseline questionnaire that gathered data on individuals' job search activities, past and preferred occupations, and cognitive skills. These questionnaires covered the following skills: perceptual speed,

[D-1] See `https://www.onetonline.org/`, last retrieved August 2026.

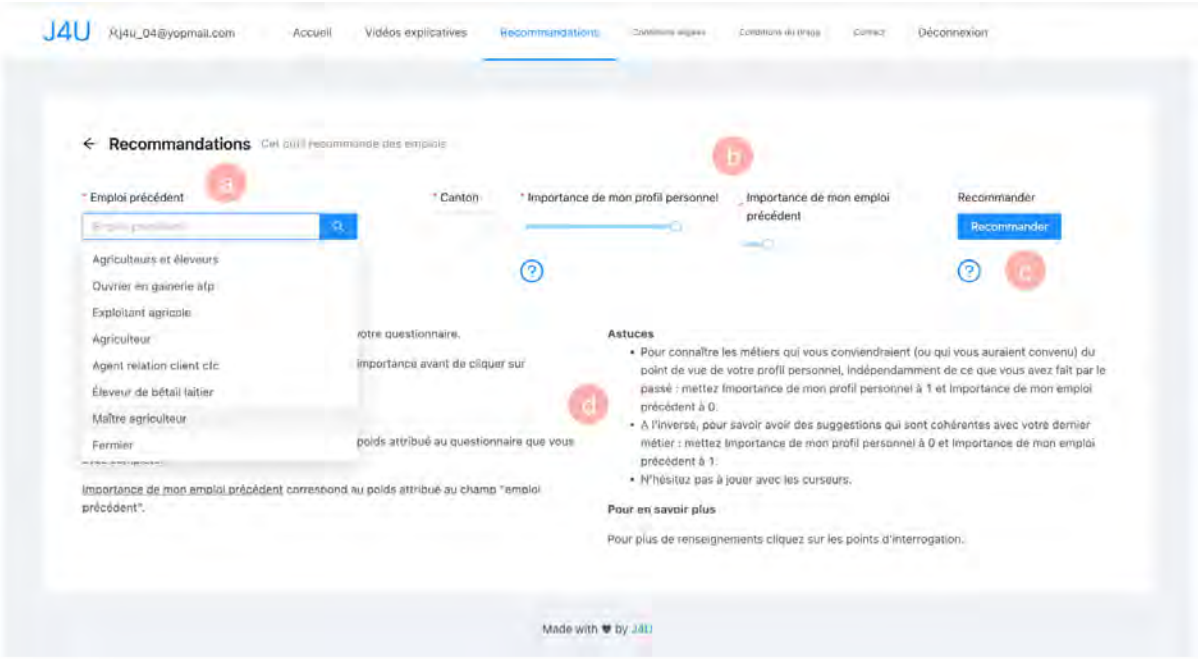


Figure D-1: This figure shows the job search page of the J4U platform: (a) Previous employment search field; (b) sliders to adjust the relative weight of the previous job and that of the personal profile; the sliders were interlocked in such a way that the sum of their output was always 1.0; (c) all controls of the UI had a tooltip to provide contextual information to the user; (d) tips and tricks on how to best use the sliders of the search interface.

adaptability/flexibility, stress tolerance, leadership, self-control, reading comprehension, time management, monitoring, concept fluency, memorization, inductive reasoning, and category flexibility. These constructs were measured through standardised questionnaires Aschwanden et al. (2026). After completing these questionnaires the participants were given access to the main recommended engine of the website, which allowed them to search for jobs (see Figure D-1).

After the query was executed, the platform displayed the ten occupations most closely matching the participant's profile. Then for each occupation, the system queried Job-Room[D-2], a Swiss database, hosting most of the job offers currently available in Switzerland. This service returned a list of currently available job vacancies (see Figure D-2). This service also acts as an aggregator, pulling job offers from other platforms (e.g., Indeed[D-3]). The number of vacancies associated with each occupation served as an indicator of labor market demand.

Clicking (or tapping) on the vacancies of each occupation caused the list to expand.

[D-2]See `https://www.job-room.ch/`, last retrieved August 2026.
[D-3]See `https://www.indeed.com/`, last retrieved August 2026.

The expanded view presented a short summary of each vacancy (see Figure D-3). Then, the user could decide whether to visualise the details of the offer, the location where the job had to be done, the employment rate, and how to apply. If Job-Room did not return any vacancy for a given occupation, the interface would show a warning to the user without modifying the ranking of the occupations. This was done to educate the user about alternative occupations they could potentially apply to even outside of the tool or using additional job search platforms. Furthermore job offers vary constantly, so it was important to educate the user to attempt the same queries regularly.

The detailed view of the offer showed important details for the offer that were instrumental for the job seeker to fully evaluate fit and relevance of the offer (see Figure D-4). To postulate to a specific offer the user could click on the link "Postulate on the external site" (detail (p) of Figure D-4), which opened a new navigation tab on the form to be filled to apply to the job offer. Additionally, the participants assigned to the J4U intervention could generate a certificate (i.e.. "Certificat", detail (p) of Figure D-4) that explains why the user's background and cognitive skills are relevant for the given position. This enables recruiters to better evaluate the fit for the position, potentially increasing the chances of the applicant of being considered for the post.

Development of the J4U platform. The Job for You (J4U) platform was developed following a user-centred design process (UCD): interactive systems should be developed from an understanding of their intended users, their objectives, their tasks and the context in which the technology will be used. ISO norms (cf. $9241-210$ International Organization for Standardization (2019)) describes UCD as a lifecycle approach in which user needs inform requirements, design solutions are produced and these solutions are repeatedly evaluated with users. Gould and Lewis (1985) foundational formulation similarly emphasises an early and continuous focus on users, empirical observation of use and iterative design.

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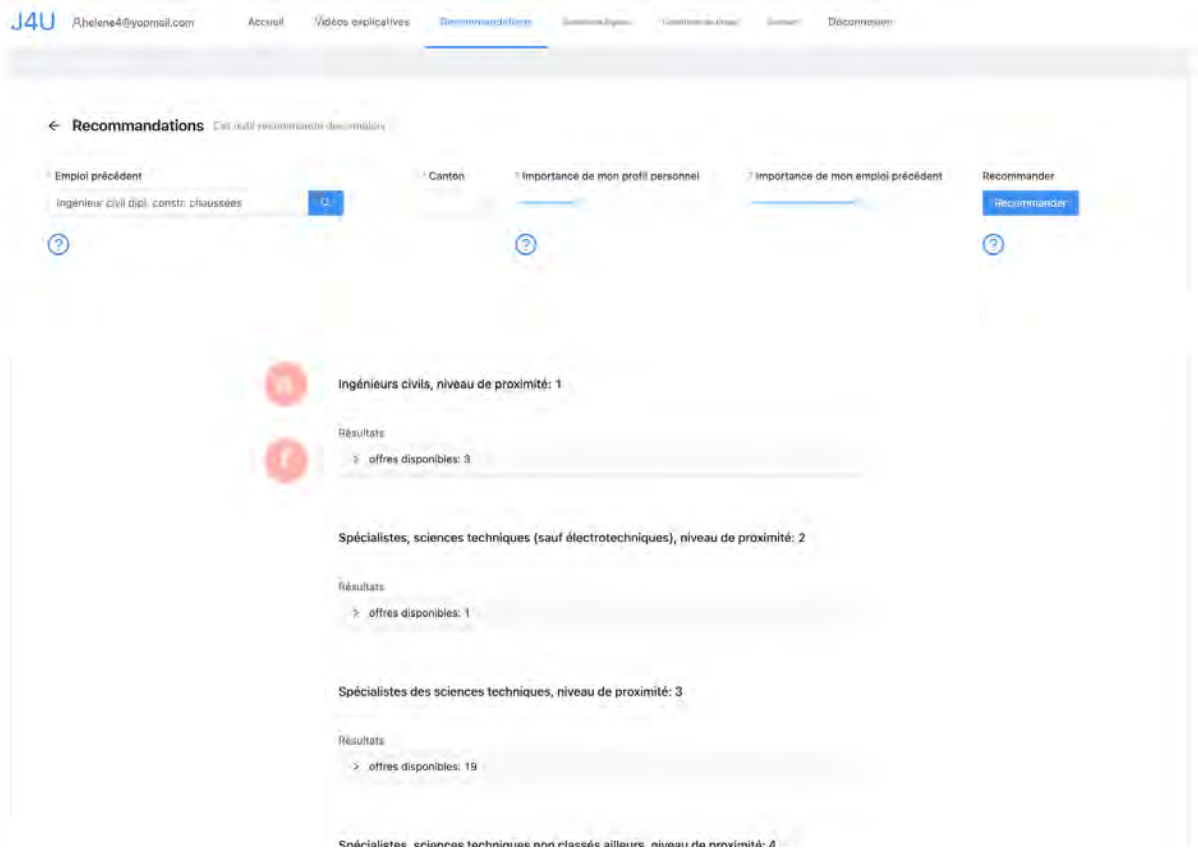

Figure D-2: This figure shows the collapsed query results. The 10 closest occupations to the participant's profile were ranked by decreasing order of proximity, following most search engines' design. For each occupation, the user could see: (e) the title of the occupation; (f) the number of available job vacancies currently in Job-Room. The list of vacancies was collapsed by default, and the user could unfold id by clicking on it.

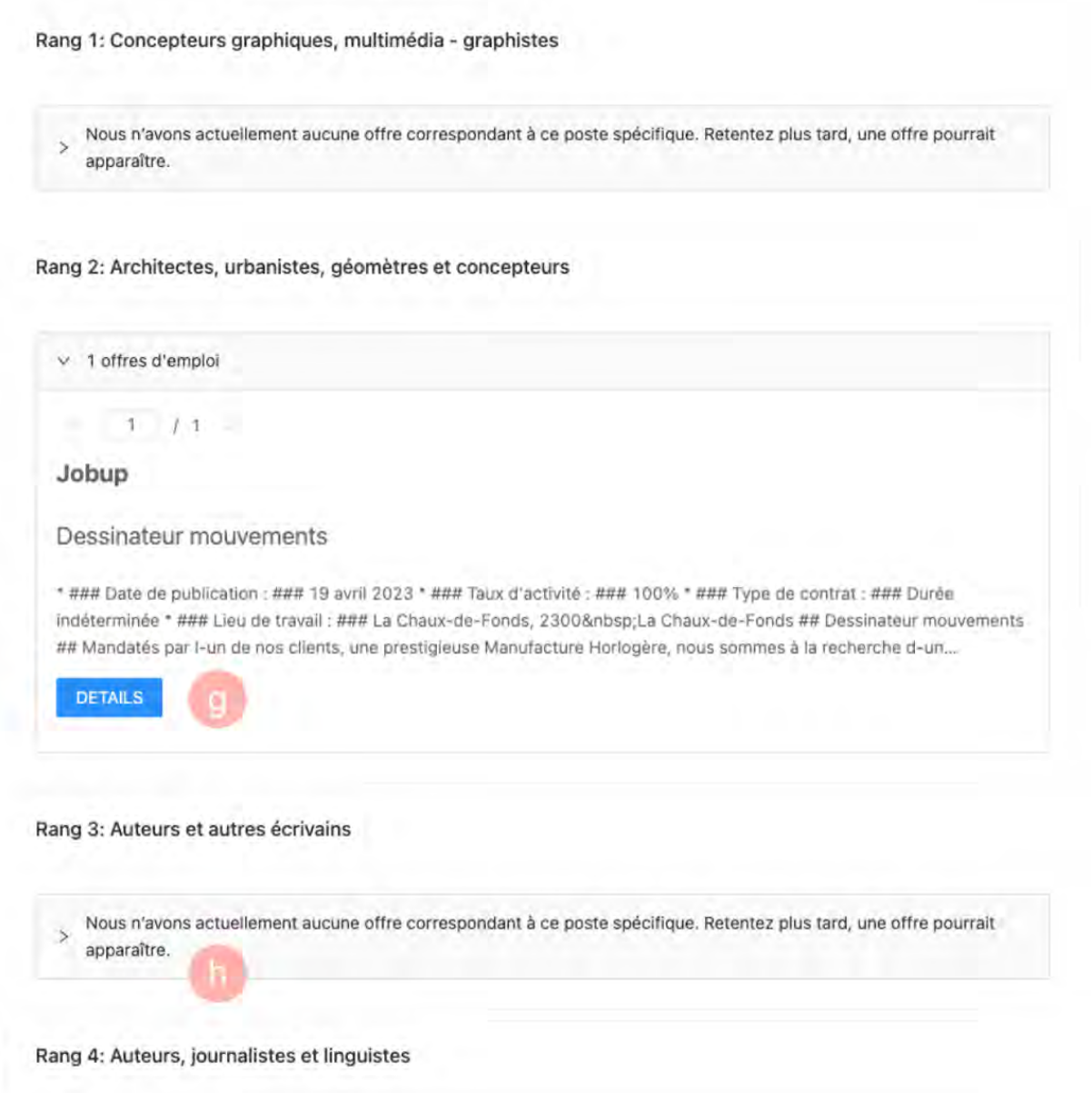

Figure D-3: This figure shows the expanded query results. For each vacancy the user could see a summary of the offer. Pressing the "Details" button (g) revealed all the details of the offer; A message inviting the user to try the same query again in the future (h) was displayed for occupations which did not return any vacancy in Job-Room.

Figure D-4: This figure shows the detailed view for each offer: (i) the recruiter contact information, if any; (l) the employment rate and the start date; (m) the date at which the offer was published (this roughly mapped to the probability the position had been filled); (n) the city where the job had to be done.

E The cognitive training

The cognitive training was administered with a frequency of two training sessions per week over a period of 24 weeks for a total of 48 training sessions. The sessions were made available on a dedicated online platform and participants received emails inviting them to join the platform on the day any new session was posted. The training sessions were posted on Mondays and Thursdays and the exact content varied by participants' cohort. Each session could normally be completed in less than 30 minutes and participants were given 3 days to do so. Once a participant started working on a session, she had 24 hours to complete it after which the session could no longer be accessed. Access to a new training session was unconditional on completing previous ones.

The training was designed on the basis of various validated measurement tools that have been developed by members of our team, such as the COTEL instrument by Kliegel et al. (2007) and the Geneva Space Cruiser by Zuber et al. (2022). The exercises train 8 cognitive domains as shown in Table 1.

Each training session contained four tasks, one for each of these cognitive domains. We grouped the tasks into three types – baseline-based, process-based and strategy tasks – that refer to how they relate to the baseline measurement at study enrollment.

1. In the **baseline-based** training, participants performed tasks very similar to the baseline assessment task (e.g., for Time management, they performed the Cruiser game at baseline, and trained on a Cruiser-like task).

2. In the **process-based** training, participants performed tasks relying on the same cognitive processes as the baseline assessment task (e.g., for Time management, they performed the Lexical Decision Task, a different task that also required attention to the passage of time).

3. In **strategy** training, participants learned strategies and techniques related to task performance, which ideally can be applied to everyday life.

Performance in baseline-based and process-based tasks is measured, whereas strategy tasks are simply meant to teach participants new strategies without measuring any outcome.

To make the training intervention more user-friendly and motivating, each session consisted of a mix of different task types, as in the example of Table E-1. Hence, there was limited repetition of exercises across sessions.

Table E-1: Example of training types combinations

Session 1		Session 2	
Cognitive domain	Exercise type	Cognitive domain	Exercise type
Reading comprehension	Baseline-based	Memorization	Strategy
Monitoring	Process-based	Inductive reasoning	Baseline-based
Fluency of ideas	Strategy	Perceptual speed	Baseline-based
Time management	Process-based	Cognitive flexibility	Process-based

Below, we propose a brief description of each exercise, organised by cognitive domain and type. In parenthesis next to each exercise, we indicate the training session (T1 to T12) and week sequence (A = first training of the week; B = second training of the week) in which the exercise was used. Each training session is used twice.

1. **Category flexibility**

   - **Baseline-based tasks**

     – **Matrices (T1B, T10B)**. Inspired by the Raven Standard Matrices Raven and Court (1996), this task exercises flexibility of reasoning. It contains 20 matrices, each composed of five images aligned in a row. The images are linked by a certain rule that participants need to guess. Based on such a rule, participants must select the image that completes the series among a several alternatives. Rules involve several possible characteristics such as colour, shape, number, and pattern. The first matrices are easier and are composed of one element. The number of elements and thus the difficulty of the matrices increases during the task. The measured outcome is the number of correct answers.

     – **Raven Standard Matrices (T4B; T7B)**. Similar to the Raven Standard Matrices, these tasks exercise the ability to switch from one form of reasoning to another and train participants to think about several possibilities at once. The task contains 6 matrices, each composed of 9 images arranged in a 3x3 square. The images are linked horizontally and vertically by a certain rule. Participants must guess the rule and use it to

select the image that completes the series among eight alternatives. Rules involve several characteristics such as shape, number, and pattern. The first matrices are easier to solve, and the difficulty increases during the tasks. The measured outcome is the number of correct answers.

- **Process-based tasks**
  - **WAIS Matrices (T3B, T9B)**. These tasks are inspired by the "Matrices" subtest of the popular WAIS-IV intelligence test (Wechsler, 1939) and train the ability to switch from one reasoning paradigm to another and to think about several possibilities at once. The task presents 8 matrices, each composed of five images aligned on a row, or 4 images arranged in a square. The images are linked by a certain rule. Participants must guess the rule and use it to select the image that completes the series among five alternatives. Rules involve several characteristics such as colour, shape, number, and pattern. The first matrices are easier to solve, and the difficulty increases during the tasks. The measured outcome is the number of correct answers.
  - **Matrices (T6B)**. This task is inspired by Waris et al. (2015) and it trains reasoning skills. The calculation of two or three 3x3 matrices is presented at the top of the screen. Participants must solve them by adding/subtracting the symbols in the matrices and selecting the correct answer from a group of five. The task begins with simple addition/subtraction of 2 matrices, and then continues with the calculation of 3 matrices. The measured outcome is the number of correct answers.
  - **Letter/Numbers Grids (T12B)**. A large square composed of 4 little squares is at the center of the screen. In one of these 4 little squares, there is a pair of characters. Each pair consists of a number and a letter. Participants must answer as quickly and correctly as possible according to 2 following rules: in the upper half of the large square, they must select the blue button if there is a consonant, and the red button if there is a vowel; in the lower half of the large square: they must select the blue button if there is an odd number, and the red button if there is an even number. The measured outcome is the number of correct answers.

- **Strategy-Based tasks**
  - **Matrices Resolution (T2B, T5B)**. These tasks teach participants strategies to solve matrices. Examples are shown to explain what rules can be applied for different matrices: detection of the symbol's orientation, movement, rotation (T2B), number, colour (T5B), and relations between the symbols. They must then practice these strategies by solving matrices.
  - **Matrices Resolution 2 (T8B)**. This task is similar to Matrices Resolution in T2B and T5B (see above), but it is focused on the detection of irrelevant elements, which must not be considered in the matrix resolution.
  - **How to solve matrices (T11B)**. This task teaches strategies to solve additions and subtractions of matrices (as in Matrices (T6B), see above). Participants must then practice these strategies by solving matrices.

2. **Reading comprehension**

- **Baseline-based tasks**
  - **Citations (T2A)**; **Proverbs (T5A, T8A)**. These tasks challenge verbal reasoning by comprehension of quotations and proverbs. Participants must choose from four proposed statements, the one that most closely approximates the meaning of the quotation. Only one correct answer is possible. The measured outcome is the number of correct answers.
  - **Idiotismes (T11A)**. This task challenges verbal reasoning by comprehension of figurative idioms. 24 idioms are presented, and participants must choose from four proposed statements the one that best corresponds to the figurative meaning of the idiom. Only one correct answer is possible. The measured outcome is the number of correct answers.
- **Process-based tasks**
  - **Word Category (T1A, T7A)**. Word Category is a vocabulary task that trains the level of proficiency in French. Six words are presented on the screen. In each trial, only 5 of them belong to the same semantic category. The participant must find the intruder. The measured outcome is the number of correct answers.

- **Analogies (T4A)**. This task challenges the ability to determine a word from an analogy. Several analogies with missing endings are presented. Participants must find a common characteristic between two objects/concepts in the sentences in order to complete them. There are 19 analogies, each of them has five optional answers, with only one correct answer. The measured outcome is the number of correct answers.
- **Paronyms (T10A)**. In paronyms, participants exercise their vocabulary comprehension. Thirty sentences with missing endings are presented. Participants must complete them using multiple-choice answers. The answer options always include a correct answer, a paronym (words that closely resemble each other in their spelling and form but have a different meaning) and an "I don't know" option. The measured outcome is the number of correct answers.

- **Strategy-based tasks**.
  - **Text Comprehension (T3A, T6A, T9A); Article (T12A)**. These tasks are designed to improve verbal comprehension of different types of texts (newspaper articles, novels, scientific articles). Several reading strategies are taught, such as relying on external cues, doing an exploratory first reading and working on microstructures.

3. **Monitoring**

- **Baseline-based tasks**
  - **Prediction on time management task (T3B, T6B, T9B, T12B)**. These monitoring tasks are based on the participant's ability to accurately assess her performance on the (baseline-based) time management tasks previously presented during the session. Before starting a time management task, the participant is asked to predict her performance on a scale. A monitoring score assessing the difference between the participant's predicted and actual performance is calculated at the end of each task. The closer the score is to 0, the more accurate the self-assessment is. Negative scores imply underestimation of one's performance, whereas positive scores imply overestimation. At the end of the time management task,

the monitoring score is shown and explained to the participant, reminding them of the importance of having good self-judgment skills in daily tasks.

- **Process-based tasks**
  - **Prediction on Time Management Task (T2B, T5B, T8B, T11B)**. Similarly to baseline-based tasks, process-based tasks calculate a monitoring score at the end of each process-based time management task, based on the difference between predicted and actual performance. The score is shown to the participant, explaining its significance and the importance of good self-judgment skills in everyday life.
- **Strategy-based tasks**
  - **D2 (T1B, T7B)**. This monitoring task is based on the popular D2-R test of attention. Its goal is to train focused attention and concentration. During the task, 10 blocks of 6 lines containing the letters "d" and "p" are displayed. Each letter has one or two bars above and/or below it. The participant must click as quickly as possible only on the letters "d" (target) with two strokes, either above and/or below. One or more targets can be identified per row and there is a time limit of 30 seconds per training block page. A total of 10 series are presented to the participants, challenging their capacity to remain focused and not get distracted. The measured outcome is the total number of correctly selected targets as well as the time or response.
  - **Stroop (T4B)** (Stroop, 1935). Similarly, to the D2 task, the Stroop monitoring task aims to improve the ability to stay focused and not be distracted. During the task, one fo the following word is displayed on the screen: yellow, blue, red, green or orange. The word can be written in the colour it indicates (correct) or in another colour (false). For each of the words, the participant must click as quickly as possible on the correct button or false button. Each question has a time limit of five seconds. The measured outcome is the total number of correctly assessed words.
  - **Inhibition (T10B)**. The inhibition task trains the ability to control one's

responses. During the task, a series of images are presented one after the other paired with two words describing the image and its opposite (e.g., an image of a sad smiley face with the words "happy" and "sad"). The participant's task is to click on the opposite word. A series of examples are shown, after which the task begins. The measured outcome is the total number of correctly chosen opposite words.

4. **Fluency of Ideas**

   - **Baseline-based tasks**
     - **C & Animals (T2B)**. This task challenges phonological and semantic verbal fluency. Participants have 60 seconds to write as many words as possible beginning with the letter C, and then 60 seconds to write as many words as possible belonging to the semantic category of animals. The measured outcome is the number of correct words written (spelling is not considered as long as the word is comprehensible.)
     - **L & Fruits (T5B)**. This task is similar to C & Animals (T2B, see above), but participants must find as many words as possible beginning with the letter L, and then belonging to the semantic category of fruits.
     - **M & Vegetables (T8B)**. This task is similar to C & Animals (T2B, see above), but participants must find as many words as possible beginning with the letter M, and then belonging to the semantic category of vegetables.
     - **N/Musical Instruments (T11B)**. This task is similar to C & Animals (T2B, see above), but participants must find as many words as possible beginning by the letter N, and then belonging to the semantic category of musical instruments.
   - **Process-based tasks**
     - **Antonyms (T1B)**. The aim of this task is to train verbal fluency by finding antonyms (words of the opposite meaning). In one minute, participants must write as many antonyms as possible for each given word. Five words are presented in total. The measured outcome is the number of correct words.

- **Synonyms (T4B)**. This task is similar to Antonyms (T1B), but participants must find synonyms of 5 adjectives.
- **Syllables (T7B)**. The aim of this task is to train verbal fluency by finding words of 5 letters that begin with the same syllable. Six syllables are presented, each for 40 seconds, and participants must write as many common nouns as possible that begin with the same syllable. The difficulty of the task increases during the task, as the starting syllables become less and less common in the French language. The measured outcome is the number of correct words.
- **Prefixes (T10B)**. This task is similar to Syllables (T7B), but participants must find as many words as possible beginning with the same prefix. Nine prefixes are presented, each for 60 seconds. The difficulty of the task also increases with prefixes less and less common in the French language. The measured outcome is the number of correct words.

• **Strategy-Based tasks**

- **Letter Grid (T3B)**. This task develops verbal fluency strategies by solving crosswords. There are two 7x7 grids. Each of them contains 6 hidden words of 6 letters. They can be arranged horizontally, vertically, or diagonally. Participants have 60 seconds per grid to find them as quickly as possible.
- **Syllables (T6B)**. This task enhances verbal fluency by teaching participants how to focus on finding words beginning with the same syllable while doing a phonological fluency task. Participants train this strategy in 3 exercises by finding as many words as possible beginning with the same syllable. Then, they can apply this new strategy in the last task in which they must find as many words as possible beginning with the letter M.
- **Rhymes (T9B)**. This task is similar to Syllables (T6B), but focuses on finding words that rhyme together. Participants train this strategy with two exercises of one minute.
- **Letter fluency + Time Management (T12B)**. This last strategy-based verbal fluency task combines the 3 strategies taught earlier: Letter

Grid (T3B), Syllables (T6B) and Rhymes (T9B).

5. **Memorization: Working memory**

   - **Baseline-based tasks**
     - **Letter Digit Span (T3A)**. A series of letters appear one after another at the centre of the screen. At the end of each series, participants must write the letters backwards. The first sequences are easier as the number of letters increases up to 7 elements. The measured outcome is the number of correct series.
     - **Letter-Number Digit Backward (T6A)**. This task is similar to Letter Digit Span (T3A) but mixes numbers and letters. The measured outcome is the number of correct series.
     - **Image Digit Span (T9A)**. This task is similar to Letter Digit Span (T3A) but it contains words associated with images instead of numbers. Furthermore, the number of elements in each series goes from 2 to only 4, instead of 7. The measured outcome is the number of correct answers.
   - **Process-based tasks**
     - **Letter-Number Digit Span (T2A)**. This task exercises working memory in association with an in-between task meant to challenge the phonological loop and, thus, the process of memorization. Full sequences of letters, numbers or both appear for 10 seconds on the screen (all the elements of the series are displayed together, not in a sequence). Participants must remember and replay them. The first sequences are easier to retain as the number of elements increases during the task (maximum of 7). To interfere with the process of memorization, participants are asked to solve some simple mathematical calculations after seeing the sequences and before replaying them. The measured outcome is the number of sequences correctly replayed.
     - **Memory Updating (T5A, T8A)**. This task exercises verbal working memory and updating. Two digits appear at the same time on the screen, for 3.5 seconds. Then, 3 operations (addition or subtraction) are performed on each of these two digits. Participants must perform them men-

tally and give the final result. The measured outcome is the number of correct answers.

  - **N-2 Back (T11A)**. This task is inspired by the N-back task of Kirchner (1958). N-back tasks train working memory and updating. Numbers are presented one after another on the screen. The task consists of indicating when the current number matches the one from 2 steps earlier in the sequence. There are 15 sequences in total with varying lengths ranging randomly from 3 to 9. The measured outcome is the number of correct answers.

- **Strategy-based tasks**
  - **Loci Strategy (T1A)**. A mnemotechnic strategy is taught during this task to improve working memory skills. First, the participant must memorize and replay in any order a shopping list of 5 items. Then a mnemotechnic strategy is explained (Loci Strategy), in which the participant learns to mentally associate each word of the list with a familiar place, smell, emotion or noise. Then 10 words are presented by audio for 2 minutes and 30 seconds, and the participant must apply the newly learned strategy to memorize and then recall the words.
  - **Chunking (T4A, T7A)**. In this task the chunking method is taught to improve participants' working memory. First, they must memorize a barcode of 13 numbers (T4A) or a menu (T7A). Then the chunking strategy is explained, in which participants learn how to mentally reorganize information (colour, semantic category) in order to reduce the size of the content to be memorized. Then 9 stimuli are presented, either by audio (T4A) or visually (T7A), and the participant must apply the newly learned strategy to memorize and then replay the stimuli.
  - **Memorize in order (T10A)**. This task teaches participants a strategy of mental imagery to improve their working memory, create mental images of objects, serve as an anchor and help them remember words by association of ideas. First, they must memorize a list of 10 shopping items. Then a strategy of mental imagery is explained, in which participants learn to create mental images of objects that serve as an anchor to help them

recover words by the association of ideas. They must then train this strategy with a list of 10 new words.

6. **Time management**

   - **Baseline-based tasks**
     - **Cruiser Game (T1B, 4B, 7B, 10B)**. The Cruiser game is a video game designed to train time management. The participant has to drive a spaceship while aiming at three goals: fire on meteorites, collect stars and remember to refuel the gas tank of the ship. Time management is trained by the need to regularly refuel the spaceship.
   - **Process-based tasks**
     - **Lexical Decision Task + Time Management (T3B)**. A series of words are presented to the participant who must indicate whether the words belong to the French language (click on a "word" button) or not (click on a "non-word" button). However, when the presented word is a fruit, the participant must click on the empty space. Before starting the task, the participant is asked to predict her performance in remembering to click on the empty space. The measured outcome is the number of correctly assessed words and non-words.
     - **Decision making + Birth Date (T6B)**. The participant is presented with a series of images depicting objects, fruits or animals. The participant must indicate if the shown image is that of an animal or not by clicking "yes" or "no". In some cases, the images are framed. Whenever the participant sees a framed picture of an animal, they have to write her date of birth in a blank space instead of clicking "yes"/"no". On the other hand, when the framed image is that of an object or a fruit, the participant must click "no". The measured outcome is the number of correct answers.
     - **Category Task +1,2,4 minutes (T9B)**. Pairs of words are displayed on the participant's screen, one by one. The first word of the pair is written in lowercase letters (e.g. "ring") while the second word appears in uppercase letters (e.g. "JEWELRY"). The participant must indicate whether two

words belong to the same category (e.g. fruits, colours, etc.). In parallel to this task, the participant needs to write down the time elapsed from the start of the task at 1, 2 and 4 minutes. The participant can rely on external cues to estimate the elapsed time (e.g. watch, cell phone, computer clock, etc.). Before beginning, the participant must predict her ability to remember to write the time elapsed. The measured outcome is the number of correct answers.

  - **Embedded in VF (T12B)**. This task is embedded in the Letter fluency and time management task (see T12B in Fluency of Ideas section). While having to solve crosswords, participants are instructed to type their date of birth instead of words for specific target words that either rhyme with straw or represent a synonym of calm. Before beginning the task, the participant must predict her ability to remember writing the date of birth. The measured outcome is the number of correctly typed-in dates of birth.

- **Strategy-based tasks**.
  - **If, then Strategy (T2B)**. During this task, two types of memory of intentions are explained to the participant: event-based and time-based. The participant is then taught the "If...Then" technique designed to improve performance in memory of intentions. The participant must use this technique during the following task which consists of reading a book excerpt in which certain words are written in blue or green. When the participant encounters a word in blue, she must remember it and report it on the following page. When the word is written in green, she must type in her date of birth. Before beginning the task, the participant must predict her ability to remember writing down her date of birth.
  - **Visualisation (T5B)**. This task teaches the visualisation technique in which the participant imagines accomplishing an intention in the future. A list of places and actions is shown to the participant before beginning the task. For each action, the participant must memorize the location and the associated action. In order to practice this technique, the participant is then presented with a task in which she is shown drawings of a city and must indicate as quickly as possible whether the character that appears on

the edges of the drawing is a woman or a man. From time to time, a yellow dot will appear in the drawing. When this happens, the participant must write the action that was associated with the place in the image. Before starting, the participant must predict her ability to remember writing the planned actions.

- **Flag Names + Birth Date (T8B)**. The current task practices the "If...then" technique. Different country flags are briefly displayed for 2.5 seconds on the screen, one by one. Then, a question with a new or already presented flag will be displayed. The participant must indicate as quickly as possible if the flag appeared in the initial list. There is one exception: when the Swiss flag is displayed, the participant must write her date of birth. Before starting, the participant must estimate her ability to remember writing down her date of birth.
- **Loci+Action (T11B)**. This task practices the Visualization technique. The context is that of a birthday party. A diagram of a house is displayed to the participant and people arrive at the house for the party. The main task is to indicate whether the person arriving is a child or an adult. Occasionally, a yellow light bulb appears in one of the rooms in the house. In that case, instead of indicating whether the character is a child or an adult, the participant must type one of several actions meant to be performed in that room (e.g. sleeping, eating, etc.). Before starting, the participant must predict her ability to remember the planned actions.

7. **Inductive reasoning**

- **Baseline-based tasks**
  - **Number Series (T1A, T4A, T7A, T10A)**. Eight series of numbers are presented. Each series contains 5 numbers that appear one after another. The objective is to find the rule that governs each series in order to infer what the 6th number will be. The rules are based on standard mathematical operations (additions, subtractions, multiplications and divisions). Each series can contain one or two independent operations. The task stops when the participant gives the wrong answer twice in a row.

The measured outcome is the number of correct answers.

- **Process-based tasks**
  - **Letter-Number Grids (T3A)**. The task presents the participant with twenty 4x4 grids containing letters and/or numbers organised according to certain rules. Each grid has a missing case marked with a question mark. The participant must find the rule underlying each grid and guess the content of the missing case. The measured outcome is the number of correct answers.
  - **Letter-Number-Figures Grids (T6A)**. This task is similar to the Letter-Number Grids task (T3A), presenting participants with grids containing figures in addition to letters and numbers. A total of 19 grids are shown, and the participant must complete each grid by guessing the content of the missing cases. The measured outcome is the number of correct answers.
  - **Verbal Syllogisms (T9A)**. A total of eight series of syllogisms are presented. Each series consists of two premises. Following the assertions of the premises presented, the participant must infer the logical conclusion between a series of very similar options. The outcome that is measured here is the total number of correct answers.
  - **Figures of points (T12A)**. This task consists of twelve series of figures made of points arranged in different shapes. Each series is constructed following specific underlying rules. Within each series, the number of points changes from one figure to another, and the participant's task is to infer the number of points that will appear in the last figure of the series. The arithmetical operations behind each rule can be additions, subtractions, multiplications and/or divisions. Each series can contain one or two independent operations. The measured outcome is the number of correct answers.
- **Strategy-based tasks**
  - **Letter-Number Sequence Resolution (T2A)**. The letter-number sequence resolution task trains the participant's reasoning skills by teaching

different reasoning techniques. The task begins first with a training exercise in which the participant must complete a letter-number sequence and infer the logical rules underlying it. The participant is then taught to detect regularities in the relationships between different patterns (letters, numbers or a mixture of the two). Three rules for solving inductive reasoning sequences are explained: repeating letters or numbers, skipping letters or numbers (following alphabetical or numerical order) and going in the reverse order of letters and numbers. The task ends with two exercises in which the participant must use these techniques to solve inductive reasoning problems.

  - **Code Resolution (T5A)**. Similar to the first letter-number sequence resolution task, the code resolution task also trains reasoning skills. However, instead of having to complete the ending of a letter-number sequence based on the first elements of the sequence, the participant must complete a code based on another code, previously shown to the participant.
  - **Code Resolution (T8A)**. The current task is similar to the previous code resolution task in that the participant must infer the rules underlying a code and use such rules to complete a new code. However, instead of having to complete the ending of a code, the participant must figure out the entire new code based on the rules of the previous ones.
  - **Sudoku (T11A)**. The sudoku task trains participants to solve 4x4 sudoku grids by first completing the rows, blocks, or columns that contain the fewest empty squares. The participant must manually solve a total of two sudoku grids using this strategy.

8. **Perceptual speed**

   - **Baseline-based tasks**
     - **Items Comparison (T2A, T8A)**. Two sets of numbers, letters, words, or sentences are presented on each page one after another. Participants must choose as quickly as possible whether the sets are identical or not. There are 37 items, each of them is presented for 5 seconds maximum. The measured outcomes are accuracy and reaction time.

- **Phrases Comparison (T5A)**. Two sets of words or phrases are presented on each page one after another. Participants must choose as quickly as possible whether the sets are identical or not. There are 30 items, each of them is presented for 5 seconds maximum. The measured outcomes are accuracy and reaction time.
- **Series of Icons Comparison (T11A)**. Two sets (each containing 4 icons) are presented on each page one after another. Participants must choose as quickly as possible whether the sets are identical or not. There are 50 items, each of them is presented for 5 seconds maximum. The measured outcomes are accuracy and reaction time.

- **Process-based tasks**
  - **Digit Symbol (T1A)**. This task is inspired by the "Digit symbol substitution" subtest of the WAIS-IV test (Wechsler, 1939). A target symbol is presented at the centre of the screen and nine symbols are shown under the target, each associated with a number. Participants must click as fast as possible on the number of the symbol corresponding to the target. There are 42 items, and each of them is presented for five seconds. The measured outcomes are accuracy and reaction time.
  - **Picture Grids (T4A)**. Several grids containing 4x4 symbols are presented one after another. Participants must choose as quickly as possible whether they see a series of 4 identical symbols horizontally, vertically, or diagonally in each of these grids. There are grids and each of them is presented for five seconds. The measured outcomes are accuracy and reaction time.
  - **Polka Dots (T7A)**. Two sets of dots are presented on each page, one after another. Participants must choose as quickly as possible whether the two sets have the same number of dots, regardless of shape or colour. Participants generally do not have enough time to count the dots on the screen and must guess by simple eye-balling. Difficulty increases with the number of dots and the shape of the sets. There are 74 sets and each of them is presented for five seconds. The measured outcomes are accuracy and reaction time.

- **Decision Task Blue/Red (T10A)**. A red or blue square is presented on each page one after another. Participants must choose as quickly as possible whether the square is red or blue. There are 80 squares and each is shown for two seconds. The measured outcomes are accuracy and reaction time.

- **Strategy-based tasks**.
  - **Slapjack (T3A)**. Slapjack is a dynamic card game that practices reaction time. Cards are presented one after another. Participants must indicate as quickly as possible whether the card is a jack or not. There are 29 cards and each is shown for 5 seconds.
  - **Cards Game (T6A)**. Cards Game is similar to Slapjack with the addition of new stimuli (6-card, Ace and Queen). There are 79 cards and each is shown for 5 seconds.
  - **Decision Task Blue/Yellow (T9A)**. Decision Task Blue/Yellow is a reaction time task combined with general knowledge questions. Questions are presented one after another and the correct answers are always either blue or yellow. Participants must indicate the correct answer as quickly as possible by clicking on a yellow or a blue button. There are 35 questions and each of them is presented for 5 seconds.
  - **Dactylo (T12A)**. Dactylo is composed of two typing tasks enhancing perception speed. Each task lasts 2 minutes, during which participants must copy as many words, as accurately as possible from a list.

Table E-2: Overview of training sessions for core cognitive abilities: category flexibility, fluency of ideas, working memory and perceptual speed.

Training	Category flexibility	Fluency of ideas	Working memory	Perceptual speed
T1	Matrices (B)	Antonyms (B)	Loci Strategy (A)	Digit Symbol (A)
T2	Matrices Resolution (B)	C & Animals (B)	Letter-Number Digit Span (A)	Items Comparison (A)
T3	WAIS Matrices (B)	Letter Grid (B)	Letter Digit Span (A)	Slapjack (A)
T4	Raven Standard Matrices (B)	Synonyms (B)	Chunking (A)	Picture Grids (A)
T5	Matrices Resolution (B)	L & Fruits (B)	Memory Updating (A)	Phrases Comparison (A)
T6	Matrices (B)	Syllables (B)	Letter-Number Digit Backward (A)	Cards Game (A)
T7	Raven Standard Matrices (B)	Syllables (B)	Chunking (A)	Polka Dots (A)
T8	Matrices Resolution 2 (B)	M & Vegetables (B)	Memory Updating (A)	Items Comparison (A)
T9	WAIS Matrices (B)	Rhymes (B)	Image Digit Span (A)	Decision Task Blue/Yellow (A)
T10	Matrices (B)	Prefixes (B)	Memorize in order (A)	Decision Task Blue/Red (A)
T11	How to solve matrices (B)	N / Musical Instruments (B)	N-2 Back (A)	Series of Icons Comparison (A)
T12	Letter/Numbers Grids (B)	Letter fluency + Time Management(B)	–	Dactylo (A)

Notes: The column Training refers to the training weeks. (A) refers to the first training session within a week, (B) refers to the second session within a week.

Table E-3: Overview of training sessions for transversal cognitive abilities: reading comprehension, monitoring, time management and inductive reasoning.

Training	Reading comprehension	Monitoring	Time management	Inductive reasoning
T1	Word Category (A)	D2 (B)	Cruiser Game (B)	Number Series (A)
T2	Citations (A)	Prediction on Time Management Task (B)	If, then Strategy (B)	Letter-Number Sequence Resolution (A)
T3	Text Comprehension (A)	Prediction on Time Management Task (B)	Lexical Decision Task + Time Management (B)	Letter-Number Grids (A)
T4	Analogies (A)	Stroop (B)	Cruiser Game (B)	Number Series (A)
T5	Proverbs (A)	Prediction on Time Management Task (B)	Visualisation (B)	Code Resolution (A)
T6	Text Comprehension (A)	Prediction on Time Management Task (B)	Decision making + Birth Date (B)	Letter-Number-Figures Grids (A)
T7	Word Category (A)	D2 (B)	Cruiser Game (B)	Number Series (A)
T8	Proverbs (A)	Prediction on Time Management Task (B)	Flag Names + Birth Date (B)	Code Resolution (A)
T9	Text Comprehension (A)	Prediction on time management Task (B)	Category Task + 1,2,4 minutes (B)	Verbal Syllogisms (A)
T10	Paronyms (A)	Inhibition (B)	Cruiser Game (B)	Number Series (A)
T11	Idiotismes (A)	Prediction on Time Management Task (B)	Loci + Action (B)	Sudoku (A)
T12	Article (A)	Prediction on Time Management Task (B)	Embedded in VF (B)	Figures of points (A)

Notes: The column Training refers to the training weeks. (A) refers to the first training session within a week, (B) refers to the second session within a week.

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F Experimental Protocol

F-1 Study Overview

Pre-registration title: Cognitive Training for Jobseekers: Evidence from a Randomized Experiment (registered as *Improving Job Search: Matching, Cognition, and Nudges*, AEA RCT Registry AEARCTR-0004036).

Design: Four-arm individually randomized controlled trial (COG, J4U, COG+J4U, CONT), conducted entirely online in two waves across two French-speaking Swiss cantons.

Implementing partners: Public Employment Services (PES) of the cantons of Neuchâtel and Vaud, Switzerland.

Study period: The Neuchâtel wave began in February 2021 and the Vaud wave in May 2022. Participants were followed during a 24-week intervention period and for an additional six months using administrative records, yielding approximately one year of follow-up from enrollment.

F-2 Recruitment

The recruitment frame consisted of all individuals registered with the PES in Neuchâtel (February 2021) and Vaud (May 2022). Invitations were sent by email.

- Neuchâtel: one invitation wave (15 February 2021).
- Vaud: four invitation waves (9 May, 30 May, 20 June, and 22 August 2022).
- Up to three reminder emails were sent to non-responders.
- Invitations contained a brief project description and a registration link.

Overall, 29,772 jobseekers were contacted, of whom 1,547 registered (participation rate: 5.2%).

Participants were grouped into implementation cohorts according to the week in which they completed the baseline survey, allowing staggered treatment starts.

F-3 Eligibility Criteria

Invitation-stage eligibility Registered jobseekers with the PES in Neuchâtel or Vaud during the recruitment period.

Analytic sample Participants were included in the estimation sample if they

1. completed the baseline questionnaire within four weeks of the invitation,
2. could be linked to administrative records, and
3. were unemployed and receiving transfer income in the month before the baseline survey.

The final baseline estimation sample consisted of 821 participants, including participants assigned to CONT, COG and COG+J4U.

F-4 Randomization

Randomization was conducted at the individual level using treatment-specific registration links embedded in invitation emails. Participants were allocated approximately equally across four arms:

1. Control (CONT),
2. Cognitive Training (COG),
3. Jobs for You (J4U),
4. Cognitive Training + Jobs for You (COG+J4U).

Assignment could neither be observed nor influenced by PES staff.

F-5 Treatment Arms

Table F-1: Experimental treatment arms.

Arm	Description
CONT	Standard job-search interface only.
COG	Access to the cognitive training program together with the standard job-search interface.
J4U	Access to a personalized occupation recommendation system without cognitive training.
COG+J4U	Combination of cognitive training and personalized occupation recommendations.

The main analysis pools the COG and COG+J4U arms into an "Any COG" treatment indicator.

F-6 Enrollment and Consent

Enrollment proceeded as follows:

1. Participants clicked the treatment-specific invitation link.
2. They created an online account.
3. They completed an informed consent form describing all four treatment arms and explaining that assignment was random.
4. They completed the baseline survey.
5. They viewed a short video explaining their assigned intervention.

No deception was used.

F-7 Timeline

Table F-2: Study timeline.

Milestone	**Timing**
Baseline survey	Week 0
Training batch 1	Weeks 1–12
Training pause	Weeks 13–14
Midline survey	Week 13–14
Training batch 2	Weeks 15–26
Endline survey	Week 27–28
Administrative follow-up	Through month 12

Participants also completed weekly online job-search surveys throughout the intervention period.

F-8 Cognitive Training

Training consisted of 48 sessions delivered twice weekly over 24 weeks. Each session contained four exercises spanning eight cognitive domains. Exercises were grouped into

1. baseline-based tasks,
2. process-based tasks, and

3. strategy tasks.

Sessions lasted around 30 minutes. Participants received no individualized performance feedback.

F-9 Job for You (J4U)

The recommendation system combined

1. participants' measured skill profiles and
2. skill profiles from their previous occupations taken from O*NET.

Participants could adjust the weights assigned to these two components during the first three weeks after study enrollment. Occupations were ranked according to Euclidean distance from the participant's combined profile, and the ten closest occupations were displayed together with current vacancy counts.

F-10 Measurement Instruments

Baseline survey Collected demographic characteristics, employment history, job-search behavior, socio-emotional outcomes, and the skill assessment.

Skill assessments Administered at baseline, midline, and endline.

Socio-emotional outcomes Measured

- hopelessness,
- motivation,
- procrastination, and
- well-being.

Administered at baseline, midline, and endline.

Weekly surveys Collected information on

- job applications,
- interview invitations, and
- job offers.

F-11 Administrative Outcomes

Administrative records provided measures of

- monthly employment,
- labor earnings,
- transfer receipt, and
- transfer amounts.

Survey data were linked to administrative records through the Swiss Federal Statistical Office.

F-12 Incentives

Participants earned lottery tokens for each completed training session (COG arms), completed surveys (all participants) and using the job search platform (all participants). At the end of the intervention, one participant received a CHF 2,000 prize.

F-13 Ethics

The study was approved by the Ethics Committee of HEC Lausanne and preregistered in the AEA RCT Registry (AEARCTR-0004036). Funding was provided by the Swiss National Science Foundation and the NCCR LIVES.