From Learning to Lasting: How Life-Long Development Shapes Sustainable Employability among Dutch Solo Self-Employed Workers

A Study of the ZEA

by

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A thesis submitted in partial fulfilment of the requirements for the degree of

Master in Strategic Management

Tilburg University

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Word count: 13130

In cooperation with:

TNO

Date: 12th of January, 2026

Management summary

The number of solo self-employed workers in the Netherlands has grown substantially in recent years. As this group lacks organisational support structures such as employer-provided training and social protection, their ability to be employed in a sustainable manner has become of interest to society. This study examines the role of Life-Long Development (LLD) in supporting Sustainable Employability (SE) among Dutch solo self-employed workers and investigates which factors encourage or hinder engagement in learning activities.

Using data from the 2025 wave of the Dutch Self-Employed Labour Survey (ZEA), this study analyses responses from over 5,000 solo self-employed workers. SE is examined through three dimensions: work ability, vitality, and employability. LLD is measured as engagement in formal, informal, and non-formal learning. In addition, the study examines the influence of financial situation, learning orientation, and cognitive load on participation in LLD.

The results show that LLD is positively associated with vitality, meaning that solo self-employed workers who engage more in learning activities report higher levels of energy, enthusiasm, and engagement with their work. No significant relationships were found between LLD and work ability or employability. This suggests that learning primarily contributes to psychological and motivational resources rather than directly improving perceived work capacity or job security.

With regard to the predictors of LLD, three important findings emerge. First, a better financial situation is associated with higher engagement in learning, indicating that financial stability enables solo self-employed workers to invest time and money in development activities. Second, learning orientation, which reflects the intrinsic motivation and confidence in one's ability to learn, predicts engagement in LLD, highlighting the importance of individual mindset in the absence of organisational learning structures. Third, cognitive load is positively associated with LLD, contrary to expectations. This suggests that cognitively demanding work may stimulate learning rather than hinder it, as solo self-employed workers may engage in learning to cope with complexity and maintain performance.

Taken together, the findings indicate that LLD supports SE among solo self-employed workers mainly by strengthening vitality. Learning appears to function as a source of motivation, resilience, and energy, rather than as a direct mechanism for improving labour market security.

From a practical and policy perspective, these results suggest that supporting LLD among solo self-employed workers requires more than simply offering training opportunities. Measures that reduce financial barriers to learning, encourage learning-oriented mindsets, and acknowledge the role of challenging work as a driver for development may be particularly effective. By supporting learning in this way, policymakers and intermediary

organisations can help sustain the vitality and long-term participation of solo self-employed workers in the labour market.

Preface

The past months were marked by the hard work on this study, and I would not have been able to achieve this alone. Therefore, I would like to express my deepest gratitude to all those who have supported and guided me throughout this challenging process.

First and foremost, I would like to express my gratitude towards my supervisor, Josette Dijkhuizen, for her support and guidance during this study. Additionally, a special thank you goes out to Hardy van de Ven from TNO for his help and valuable feedback.

Lastly, I want to thank my family and friends for their unwavering support throughout my studies.

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1 Introduction

1.1 Problem Indication

In research and practice, the Sustainable Employability (SE) of people is becoming an increasingly important topic. Today's labour market is characterised by rapid technological change and evolving skill demands (Ra et al., 2019). Therefore, the continuous development of skills and competencies becomes key to an individual's ability to continue to work in current roles or new roles. Within this context, Life-Long Development (LLD) emerges as an enabling factor that ensures that people are able to stay employed (Ministerie van Sociale Zaken en Werkgelegenheid). For employees in general, this proves to be important, but specifically for solo self-employed workers, the interplay between LLD and SE holds specific relevance: without the structural supports typical of larger organisations, their capacity to invest in their own learning and development may significantly influence their SE. In the Netherlands, the group of self-employed workers is especially large, with over 1.3 million people working in this type of employment (Centraal Bureau voor de Statistiek (CBS), 2025a). Therefore, the Netherlands provides a suitable context to study how LLD and SE are linked for self-employed workers.

SE is conceptualised by The Dutch Social and Economic Council (Sociaal-Economische Raad (SER)) as three intertwined dimensions: vitality, work ability, and employability. Moreover, van der Klink et al. (2016) defines SE as enabling people to contribute through work "now and in the future" while safeguarding health and welfare, maintaining the capacity to keep working over time. Building on this, the three dimensions of SE can be sketched as follows: vitality refers to being energetic, resilient, fit and preserving, which captures the motivational energy needed to sustain effort (Schaufeli and Bakker, 2004). Work ability reflects an individual's functional capacity to continue in their current job given the field's demands and their available resources (Ilmarinen et al., 2005; McGonagle et al., 2015; Tuomi et al., 1998). Employability denotes the capability to carry out a variety of tasks and responsibilities effectively, both now and in the future, within the current organisation or elsewhere (de Vries et al., 2001; van Vuuren et al., 2011).

The concept of LLD can be defined by three types of learning: formal, informal and non-formal. Drawing on Johnson and Majewska (2022), formal learning is organised and institutionalised and typically culminates in recognised qualifications or certification. Informal learning refers to everyday, unstructured learning embedded in work and life. It is highly contextual and frequently unintended or tacit and is done through doing, observing, imitating, or participating in communities and, as a result, does not lead to certifications (Johnson and Majewska, 2022). Moreover, non-formal learning blends elements of the formal and informal. It may be structured and can occur inside or outside educational institutions, but activities are carried on outside the

formal system and formal recognition is uncommon (Coombs and Ahmed, 1974; Johnson and Majewska, 2022).

The research from (van Vuuren et al., 2011) identified that LLD has a significant effect on work ability, employability and vitality. However, this research is limited to a specific context and employees only. In contrast, a broader scope of SE is of great importance, since solo self-employed workers are on themselves to ensure their SE.

Moreover, financial situation, learning orientation, and cognitive load are identified as antecedents of LLD, since there is plausibility that they shape how strongly people invest in LLD (Maslowski, 2019; van den Groenendaal et al., 2022; Dweck, 1986; Van de Walle et al., 2001; Sweller, 1988; Kiefl et al., 2024). The financial situation reflects the resource slack that is required for human-capital investment. Consistent with this mechanism, Maslowski (2019) documents financial costs as a salient barrier to participation in LLD. The implication is straightforward: when solo self-employed workers can more easily make ends meet, they are better able to fund courses and to step away from billable work, which should increase LLD participation. This interpretation is reinforced by van den Groenendaal et al. (2022), who shows that income stability enables career investments such as learning, thereby supporting career sustainability.

In addition, the learning orientation of the solo self-employed worker is expected to increase the participation in LLD (Van de Walle et al., 2001). Whereas employees often benefit from organisational infrastructures that facilitate and stimulate learning (Tynjälä, 2013), solo self-employed workers must take full responsibility for their own development. Because their careers typically depend on the continuous acquisition of new skills, proactive career planning, and the ability to adapt to rapidly changing market conditions, a strong learning orientation is particularly crucial for this group (van den Groenendaal et al., 2022).

Lastly, cognitive load affects LLD in various ways. The cognitive load theory of Sweller (1988) states that the brain has limited working memory, which limits the amount of information that a person can process. Therefore, this limits the learning a person can engage in at a certain moment. This affects LLD, since a high cognitive load from work could motivate entrepreneurs to engage in learning to lessen the strain of the work. On the contrary, high levels of cognitive load can hinder the engagement in learning, since no mental capacity is available to process the information and cognitive overload may hinder deliberate engagement in learning (LePine et al., 2005). For solo self-employed workers, cognitive load is particularly relevant because they often perform a wide range of cognitively demanding activities without the support of organisational structures (Kiefl et al., 2024).

For this research, the data of the ZEA (van Dam et al., 2025) will be explored. The ZEA is the Dutch Self-Employed Labour Survey (Zelfstandigen Enquête Arbeid). It is a recurring, nationally representative survey

of self-employed people (with and without employees) that tracks their working conditions, accidents, working hours, health, functioning, sustainable employability, and skills development. The survey is carried out jointly by Statistics Netherlands (CBS) and TNO, in collaboration with the Ministry of Social Affairs and Employment (SZW) (van Dam et al., 2025). The ZEA defines self-employed people as persons who perform work on their own account and at their own risk in their own business or practice. This may be a self-employed person without employees (in Dutch: zzp) or a self-employed person with employees (in Dutch: zmp). For this study, the focus will be on self-employed persons without employees and this group will be referred to as solo self-employed workers. The characteristics of these two sub-groups are consequential for the analysis of the result, since they can often differ significantly (Sociaal-Economische Raad van Vlaanderen (SERV) / Stichting Innovatie & Arbeid, 2025). To maintain a focused analysis, this research investigates solo self-employed workers to improve the clarity of the results.

1.2 Problem Statement

This research aims to bridge the gap in research about solo self-employed workers and their SE, LLD and how their financial situation, learning orientation and cognitive load influence LLD. The relationship between LLD and SE is justified by van Vuuren et al. (2011), but the context of this research remains with employees. Therefore, this research aims to explore this relationship with regard to solo self-employed workers. This specific focus is of interest since solo self-employed workers are subject to a different set of conditions during their work, which might influence this relationship. Moreover, the variables affecting LLD represent resources and motivation to which solo self-employed workers are subjected when engaging in LLD.

1.3 Research Questions

The presented problems and the gap that this represents in the literature leads to the following research question: *"To what extent does life-long development enhance sustainable employability among Dutch solo self-employed workers, and how do financial situation, learning orientation, and cognitive load predict participation in life-long development?"*

These relationships are depicted in a conceptual model illustrated in Figure 1

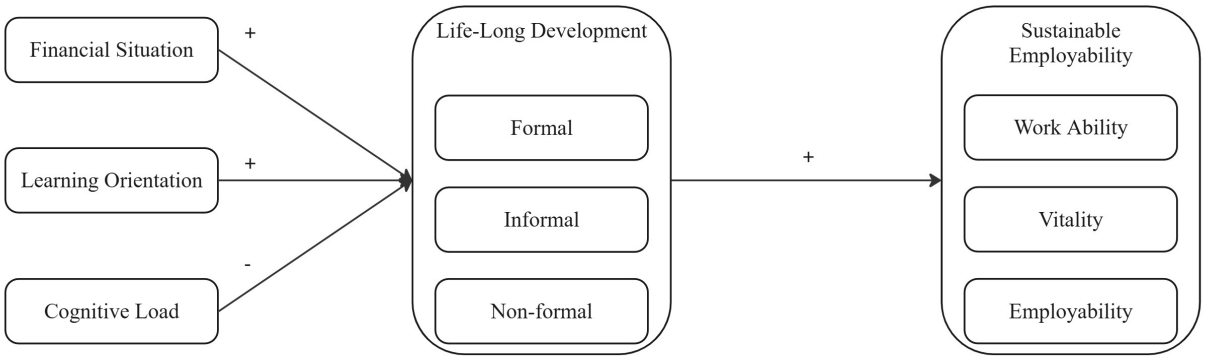

Figure 1: Conceptual Framework

In order to answer this main research question the following sub-research questions (SRQ) will be answered in this research:

1. What is the effect of the financial situation of a solo self-employed worker on life-long development (LLD)?
2. What is the effect of learning orientation of a solo self-employed worker on life-long development (LLD)?
3. What is the effect of cognitive load of a solo self-employed worker on life-long development (LLD)?
4. What is effect of life-long development (LLD) on Sustainable Employability (SE) among Dutch solo self-employed workers?

Moreover, it is important to note that the ZEA offers cross-sectional data, so no causality can be established. The mediating effect in the research model explores associations rather than causality. For the identification of causality, longitudinal studies or experiments that observe variables over time are required, allowing researchers to track changes and determine temporal order.

1.4 Thesis Structure

This study is structured as follows. The first chapter introduces the research context, problem statement, research objectives, and hypotheses. Chapter 2 outlines the literature review of this study, where the relevant literature regarding SE, LLD and the predictor financial situation, learning orientation and cognitive load. Chapter 3 outlines the research methodology, including the data source, sample, measurements, and analytical strategy. Chapter 4 presents the empirical findings, including descriptive statistics and the results of the regression and mediation analyses. Finally, Chapter 5 discusses the main findings in relation to existing literature,

reflects on theoretical and practical implications, addresses the study's limitations, and offers directions for future research.

2 Literature Review

This chapter reviews the existing body of literature relevant to the topic of this study. It begins by examining the landscape of solo self-employed workers in the Netherlands. Subsequently, the key dimensions of SE, namely work ability, vitality, and employability, are explored. The chapter then discusses the literature on LLD. Finally, the predictors examined in this study are addressed, starting with financial situation, followed by learning orientation, and concluding with cognitive load.

2.1 Solo Self-Employed Workers in the Netherlands

In the Netherlands, approximately 13% of the workforce consists of solo self-employed workers, and this proportion has shown a steady increase over the past decade (Centraal Bureau voor de Statistiek (CBS), 2025a). With this share, the Netherlands ranks among the countries with the highest proportion of solo self-employed workers in Europe (Organisation for Economic Co-operation and Development (OECD), 2021). According to Williams and McGuire (2010), the cultural context of a nation significantly influences entrepreneurial activity and innovation, which helps explain the Dutch situation. Moreover, Block et al. (2019) also highlight that culture impacts the engagement in part-time and full-time self-employment, further underlining culture importance. The Netherlands has a long-standing cultural emphasis on independence, self-reliance, and innovation; values that are reflected in the strong growth of its self-employed sector. Moreover, the Dutch government actively promotes entrepreneurship as a key driver of economic growth and competitiveness, providing supportive policies and institutional frameworks to encourage business creation and self-employment, further vouching for a fostering culture (Government of the Netherlands, 2014).

The group of solo self-employed workers consists of 1.3 million people (Centraal Bureau voor de Statistiek (CBS), 2025a) and various key differences among this group are worth highlighting. Regarding gender, most of the solo self-employed workers are men (62%) (Centraal Bureau voor de Statistiek (CBS), 2025b), while amongst employees this distribution is 50/50. However, the female share is gradually increasing: between 2014 and 2024 the number of female solo self-employed workers grew by around 101%, whereas male solo self-employed workers grew by 77% in the same period (KVK, 2024). Moreover, solo self-employed workers are relatively older than employees, 33,15% of the solo self-employed workers are 55 years or older (Ruts and Vogel, 2025). Additionally, this older age group also shows an increase in the number of solo self-employed workers, suggesting an ageing demographic. In contrast, the number of young solo self-employed workers (under 35) is also increasing, indicating a dual trend of ageing and rejuvenation within the group (Ruts and Vogel, 2025). Differences among the group also exist regarding the sector in which they operate, and this influences the type

of solo self-employed worker they are. The ZEA (van Dam et al., 2025) distinguished between seven sectors: agriculture, business services, healthcare, construction, commerce, recreation and other. By contrast, solo self-employment remains rare in sectors with more hierarchical or collective employment structures such as public administration, industry, and education. Each of these sectors is characterised by different types of solo self-employed workers. Next to the sector, differences also emerge concerning full-time vs. part-time employment as a self-employed worker. Approximately half work full-time, while others combine their business with part-time employment, study or care responsibilities (Ruts and Vogel, 2025). Lastly, solo self-employed workers differ in terms of educational levels and this influences their behaviour. The amount of highly educated solo self-employed workers is increasing (van Stel and van der Zwan, 2020), and this group shows a higher tendency to engage in learning (Maslowski, 2019), which highlights an important distinction for this research.

Given the size and economic relevance of this group, the SE of solo self-employed workers is of vital importance to the Dutch economy. Their ability to remain productive, healthy, and adaptable in changing market conditions directly affects national economic resilience. This resilience was particularly visible during recent economic crises, when self-employed workers demonstrated flexibility and innovation in maintaining their livelihoods, although many also faced heightened income insecurity and limited access to social protection (Bekker and Posthumus, 2010). Understanding the conditions that support their long-term employability is therefore essential for shaping inclusive and sustainable labour market policies in the Netherlands.

2.2 Sustainable Employability

The concept of Sustainable Employability (SE) has become increasingly relevant in the context of the rapidly changing dynamic labour market. In literature, the concept of SE has been explored and the most comprehensive definition of SE is provided by van der Klink et al. (2016). They define SE as enabling people to contribute through work "now and in the future" while safeguarding health and welfare, maintaining the capacity to keep working over time. While this definition is widely accepted, recent work has provided a critical note on the definition. Work from Fleuren et al. (2016) reflected on the definition of van der Klink et al. (2016) and proposes refining the concept by clearly distinguishing causes from outcomes and defining which aspects of the employment situation compose SE. In addition, Fleuren et al. (2016) emphasise that SE should be viewed as an individual characteristic influenced by factors at personal, job, and contextual levels, applicable to all individuals regardless of employment status, and explicitly incorporating its long-term nature. Complementary to this, research from De Lange et al. (2022) also vouches for the explicit inclusion of the temporal dimension of SE. These refinements show that while SE has been explored in literature, it has not yet reached saturation

and the further exploration of the topic in this study is relevant.

Building on the definition of van der Klink et al. (2016), for the purpose of this study the concept of SE is operationalised through the conceptualisation of the Sociaal-Economische Raad (SER), which defines SE as consisting of three dimensions: work ability, vitality and employability. Each of these dimensions will be highlighted in the following paragraphs.

2.2.1 Work Ability

Work ability is a core dimension of SE, and is defined as an individual's functional capacity to continue in their current job given the field's demands and their available resource (Ilmarinen et al., 2005; Tuomi et al., 1998). Ilmarinen (2009) further emphasises that work ability represents a dynamic balance between personal resources (health, functional capacities, education, competence, values) and work factors (work environment, organisation, managerial context). This view is echoed by Stuer et al. (2019), who identified perceived work ability as an indicator of career sustainability. In entrepreneurial and solo self-employed settings, these work factors additionally include high levels of autonomy, role multiplicity, uncertainty, and responsibility for strategic and financial outcomes (Cieślik and van Stel, 2024; Otto et al., 2020). Closely related to this definition is the Work Ability Index (WAI) (Tuomi et al., 1998), which is a self-assessment questionnaire that measures a workers work ability. The WAI operationalises Ilmarinen et al. (2005)'s definition of work ability into a quantifiable measure and assesses seven components: current work ability compared to lifetime best, work demands, diagnosed diseases, work impairment, sick leave, prognosis of future work ability, and mental resources. Building on this foundation, research from Tengland (2011) proposed a broader conceptualisation of work ability that extends beyond the health and job demands to include occupational competence, work-related virtues, and person–environment fit, thereby framing work ability as a holistic capacity to perform meaningful work within suitable conditions. This approach aligns with capability-based models of SE that stress the importance of value creation within work (Meerman et al., 2022; van der Klink et al., 2016). While the definition of Tengland (2011) provides insights into the conceptual and philosophical elements of work ability, the definition of Ilmarinen et al. (2005) is more suitable for empirical operationalisation (Jabeen et al., 2022).

The conceptualisation of work ability proposed by McGonagle et al. (2015) is particularly suitable for studying solo self-employed workers, as it frames work ability as a subjective, self-regulatory evaluation of one's capacity to meet work demands in a relatively short questionnaire that is widely accepted in literature. The measure for work ability in this study will therefore build on the conceptualisation of McGonagle et al. (2015).

Moreover, for solo self-employed workers, the construct of work ability is interesting, since research indicates

that they tend to have higher levels of work ability in comparison to employees (Saarni et al., 2008; Sewdas et al., 2018). These higher levels are mainly reflected in better self-rated work ability, stronger mental resources, and a closer alignment between personal skills and job demands, which are often facilitated by greater autonomy and task control in self-employment. This difference in work ability is contributed to various factors starting with the greater job control and autonomy that self-employed workers have (Saarni et al., 2008; Sewdas et al., 2018; Van der Torre and Dirven, 2016). Besides, Sewdas et al. (2018) suggest a 'healthy worker effect', where individuals with better baseline health and functional capacity are more likely to engage in self-employment. From a motivational perspective, intrinsic motivation and psychological ownership appear to sustain work ability among entrepreneurs, as their work is often perceived as more meaningful and self-directed (Saarni et al., 2008; Laitinen et al., 2020). These motivational resources help buffer the high demands associated with self-employed work (Laitinen et al., 2020).

2.2.2 Vitality

The second core dimension of SE is vitality. Vitality at work is strongly related to basic psychological needs, healthy lifestyle behaviour, balanced work styles and social capital, and is in turn associated with effective functioning and SE (van Scheppingen et al., 2015). The concept of work engagement can be considered to be part of vitality. While vitality refers to a broader scope of overall energy, health and resilience, work engagement is scoped on a work-specific level. Empirical evidence shows that vitality feeds into work engagement in the work context and that these two concepts are closely related (Op den Kamp, 2022). Leading work from Schaufeli and Bakker (2004) defined work engagement as being energetic, resilient, fit and preserving, which captures the motivational energy needed to sustain effort. This builds on the dimensions of vigour, dedication and absorption (Schaufeli et al., 2002; Bakker and Demerouti, 2008). Vigour refers to experiencing high levels of energy and psychological resilience, alongside a readiness to invest effort in one's tasks and persist when confronted with obstacles. Dedication reflects a strong sense of significance, passion, inspiration, and pride in one's work. Absorption denotes a state of deep immersion in work, in which time appears to pass rapidly and disengaging from one's tasks becomes difficult due to intense concentration and involvement (Schaufeli et al., 2002; Mazzetti et al., 2021; Lu et al., 2023). These dimensions of vitality are reflected in the scale to measure vitality developed by (Schaufeli et al., 2019).

For solo self-employed workers, vitality is a particularly salient SE dimension. Evidence on sustainable work performance highlights that vital workers are more likely to maintain health, well-being and productivity over time, which is crucial in contexts without organisational buffers (de Jonge and Peeters, 2019). Moreover, research

of Stephan et al. (2020) showed that solo self-employed workers have higher levels of vitality in comparison to wage-employees, emphasising that vitality is a relevant dimension of SE to explore in the context of this study. At the same time, solo self-employed workers face heightened uncertainty, more volatile income and can not rely on organisational structures for stability (van den Groenendaal et al., 2022; Cieślik and van Stel, 2024). In this context, the financial situation of the solo self-employed workers becomes important as a resource. Financial security reduces stress and uncertainty by enabling individuals to remain more energetic and invest in their work, while financial strain may undermine vitality by increasing psychological pressure, resulting in a loss spiral (Hobfoll, 2001). Furthermore, a learning goal orientation strengthens the positive effect of vitality on the performance of workers (Bakker and de Vries, 2020). A strong learning orientation reflects intrinsic motivation and confidence in an individual's ability to acquire new skills, which has been connected to better anticipating and managing challenges, feeling more positive, and functioning more effectively (Dweck, 1986; Van de Walle et al., 2001). Next to that, the cognitive load of an individual influences their vitality. This predictor is, however, more ambiguous. On the one hand, cognitively demanding work may enhance vitality when demands are perceived as challenging and meaningful, thereby stimulating engagement and learning (Crawford et al., 2010). On the other hand, a long period of high cognitive demand can deplete mental resources, leading to fatigue and reduced vitality (Bakker and Demerouti, 2007). This ambiguity will be further explored in subsection 2.6.

LLD is theorised to play a central mediating role in these relationships. Engagement in formal, informal, and non-formal learning enables individuals to update their skills, maintain competence, and enhance self-efficacy, all of which are essential for sustaining vitality (Kyndt et al., 2016; van der Heijden et al., 2016).

2.2.3 Employability

The last key dimension of SE is employability. The definition of employability is complex, since over time is has been used in various contexts, shifting from an economic purpose to broader definition of an individuals functional flexibility (Forrier and Sels, 2003). The research from Forrier and Sels (2003) prefer a strict definition of an individual's chance of a job in the internal and/or external labour market. Highlighting that context-related factors play an important role in determining an individual's employability. In line with this, de Vries et al. (2001) regard employability as consisting of the dimensions of individual capacities, willingness and knowledge, market awareness, resulting in employability being the relation between an individual's capacities and the capacities in demand on the labour market. Building on this, van Vuuren et al. (2011) defines employability as the capability to carry out a variety of tasks and responsibilities effectively, both now and in the future, within the current organisation or elsewhere. Similarly, Van Der Heijde and Van Der Heijden (2006) conceptualise

employability as a set of competences, including occupational expertise, anticipation and optimisation, personal flexibility, corporate sense, and balance. This competence-based approach further reinforces the importance of continuous learning and development as central mechanisms underpinning employability. Recent work from van Harten et al. (2021) identified three conceptual strands of employability: one focusing on personal strengths and resources that enhance employment potential, another emphasising individuals' self-perceived employment opportunities, and a third viewing employability in terms of job transitions as the realisation of employment potential.

These definitions all imply that individuals must engage in the development of their capacities to keep up with the dynamic environment in which they operate (van der Heijden et al., 2016). Moreover, task enrichment, task enlargement, career guidance and training were identified as important activities to stay employable (Forrier and Sels, 2003). Especially in the flexible and uncertain context of solo self-employed workers, learning enables individuals to update skills to adapt to changing job demands and remain attractive in de labour market (De Grip, 2004; Le et al., 2022) Thus, the engagement in LLD seems to have an effect on the employability of an individual and therefore on their SE (van Vuuren et al., 2011; Le et al., 2022).

The predictors of this study, financial situation, learning orientation, and cognitive load, are linked to employability through both direct and indirect effect through LLD. A favourable financial situation provides individuals with the resources and security needed to invest in learning and career development, since engagement in LLD requires time and financial resources (Becker, 1993; Grijpstra et al., 2019). Moreover, learning orientation reflects an individuals motivation and ability towards skill development and adaptability, which can foster proactive career behaviours and with that long-term employability (Van de Walle et al., 2001). Similarly to vitality, cognitive load can either hinder or stimulate employability depending on the context. While excessive cognitive load may impair learning capacity and performance, moderate cognitive challenges can foster skill development and learning, thereby contributing to an individual's employability (Paas et al., 2003).

2.3 Life-Long Development

A central element of this study is Life-Long Development (LLD). As previously introduced, learning activities influence the SE of individuals (Forrier and Sels, 2003; Bakker and de Vries, 2020). A widely used definition of LLD is the one developed by Kuijpers and Draaisma (2020), which defines LLD as the "Proactive development of qualities throughout life based on motives and possibilities, for a sustainable contribution to society, own work-environment, health, and happiness, for now and the future". This definition implies that LLD encompasses a broad context of learning activities. Consequently, research commonly distinguishes between three types of

learning: formal learning, non-formal learning, and informal learning (Pleijers and de Winden, 2014; van der Torre et al., 2025). Formal learning can be defined as acquiring knowledge and skills in a systematic and structured way within a learning-oriented environment, with the ultimate goal of obtaining recognised diplomas or certificates (van der Torre et al., 2025). In contrast, informal learning can be defined as all learning that takes place without formal planning or instruction. For example, by learning on the job through challenging tasks or from other people (Kyndt et al., 2016). The third category of non-formal is an intermediary form of learning that can be positioned between informal and formal learning. Non-formal learning refers to organised learning, but somewhat less structured and systematic than formal learning and is not aimed at obtaining a recognised diploma or certificate (van der Torre et al., 2025; Perin and Brčić, 2014). These different types of learning cater to different needs of the individual engaged in the learning. Formal learning provides more recognisable credentials and thus signals more clearly to the environment that an individual has engaged in learning in a certain area, but this type of learning tends to be more rigid and less responsive to the rapidly changing demands on the labour market (Manuti et al., 2015). Whereas informal learning fosters skills development in direct alignment with the daily tasks and enables individuals to quickly acquire new competences (Manuti et al., 2015; Cerasoli et al., 2018). Non-formal bridges the gap between these two types of learning, since it combines the structured approach of formal learning, but also allows for more flexibility and relevance to the workplace (Misko, 2008). These differences shape how workers navigate the LLD landscape and are essential to understand when analysing the workforce.

These three learning types serve different functions within the LLD process and contribute in complementary ways to SE. Formal learning primarily strengthens credentialed knowledge and long-term career signalling, informal learning supports continuous skill adaptation, and non-formal learning bridges the two by enabling targeted competence development without the rigidity of formal education (Manuti et al., 2015). The relevance of LLD for SE is also reflected by the 'Sustainable employability index' (DIX) developed by TNO (Koopmans et al., 2022), in which professional knowledge and skills are core elements of SE. Continuous learning through LLD directly contributes to this dimension by ensuring that workers' knowledge and skills remain aligned with changing job demands, technological developments, and sector-specific requirements.

Especially for solo self-employed workers certain challenges prevail with regard to LLD. The absence of organisational structures poses such a challenge to solo self-employed workers, since they have to rely on their own intrinsic motivation and resources to engage in LLD (Borghouts, 2023). Therefore, solo self-employed workers tend to engage in formal education less than employees (Vlasblom et al., 2015), since they are more heavily subjected to time and cost constraints (Grijpstra et al., 2019). However, this does not necessarily mean

they engage less in learning, since solo self-employed workers are more prone to engage in informal learning (Van der Torre and Dirven, 2016). Research from Piwowar-Sulej and Bąk-Grabowska (2024) suggests that self-employed workers invest more in training their future competencies than employees. Grijpstra et al. (2019) highlight that the challenges faced by solo self-employed workers are dependent on the context in which they operate. In the care sector, it is for example, mandatory to engage in certain schooling, and therefore this group shows above-average levels of formal schooling, while they lack the opportunities for entrepreneurial skill development.

Taken together, the literature indicates that LLD is a key mechanism shaping individuals SE (Forrier and Sels, 2003; Bakker and de Vries, 2020; Jabeen et al., 2022). By supporting continuous skill development and adaptability, LLD is expected to strengthen work ability by enhancing occupational competence and the capacity to meet evolving work demands (Ilmarinen et al., 2005; McGonagle et al., 2015). In addition, learning activities may contribute to vitality by fostering intrinsic motivation, learning related energy, and psychological resilience, which are central to sustained vitality and engagement at work (**?**Bakker and Demerouti, 2008). Finally, LLD is widely regarded as a core determinant of employability, as it enhances transferable skills, labour market relevance, and individuals' perceived and actual opportunities to obtain and maintain work in dynamic labour markets (van Harten et al., 2021; Meerman et al., 2022). This is particularly relevant for solo self-employed workers, who bear primary responsibility for their own development and labour market positioning (Cieślik and van Stel, 2024). Accordingly, this study hypothesises that lifelong learning and development is positively associated with sustainable employability among Dutch solo self-employed workers:

H1. Lifelong learning and development (LLD) is positively associated with sustainable employability (SE) among Dutch solo self-employed workers.

- **H1a.** LLD is positively associated with work ability.
- **H1b.** LLD is positively associated with vitality.
- **H1c.** LLD is positively associated with employability.

2.4 Financial Situation

The literature regarding LLD identified that the engagement in LLD is constrained by time and cost (Borghouts, 2023; Maslowski, 2019). The financial situation of workers, in particular solo self-employed workers, forms a critical foundation to the participation in LLD. Maslowski (2019) identified financial cost as one of the most evident barriers to LLD, highlighting that individuals with constrained budgets are less able to enrol in courses,

pay for certification, or absorb the income loss that accompanies time away from billable work. Research similarly shows that cost-related barriers are among the most frequently reported obstacles to adult learning, particularly for workers without access to training sponsored by organisations (Organisation for Economic Co-operation and Development, 2019). The latter seems to be especially salient among solo self-employed workers (Grijpstra et al., 2019; Vermeylen et al., 2017).

For solo self-employed workers, the relationship between financial situation and LLD is further complicated by the interdependence of time availability and income generation. When business activity is high, time constraints limit opportunities for participation in formal learning. Conversely, during periods of reduced workload, financial constraints may prevent investment in learning activities. As noted by Grijpstra et al. (2019), this creates a structural dilemma for solo self-employed workers: when they have sufficient work, they lack the time to engage in learning, and when time becomes available, financial resources are often insufficient to invest in development. This dynamic helps explain why participation in formal learning among solo self-employed workers remains relatively low, despite the recognised importance of continuous skill development.

These observations relate closely to the Conservation of Resources (COR) theory (Hobfoll and Wells, 1998), which argues that individuals strive to build and maintain resources, and that resource investment is necessary to secure future gains. Under COR theory, financial means are considered both object resources and energy resources: they have intrinsic value, but they also enable access to additional opportunities and help prevent resource loss. Financial resources can therefore be understood as operating in resource gain and loss cycles, whereby a favourable financial situation facilitates investment in LLD, which in turn strengthens employability and future income prospects, while financial insecurity constrains learning investments and may contribute to cumulative disadvantages over time (Forrier et al., 2009; De Vos et al., 2020). Therefore, this study proposes the following hypothesis:

H2. The financial situation of a solo self-employed worker is positively associated with LLD.

2.5 Learning Orientation

In literature, learning orientation is defined at various levels and interpretations. In this study, the mindset theory of Dweck (1986) will be used, which describes learning orientation as an individual's enduring disposition or mindset toward acquiring and applying new knowledge, characterised by a focus on mastery, curiosity, and the belief that abilities can be developed through effort and learning. In this study, learning orientation is examined at the individual level, as a personal trait that drives solo self-employed workers to engage in learning and development. This distinction is important because solo self-employed workers can not rely on the organisational

learning systems that employees are subject to, whereas previous research focused on the organisational level (Sinkula et al., 1997; Shaher and Mohd Ali, 2020; Wang et al., 2025). Therefore, solo self-employed workers rely on their own intrinsic learning orientation for participation in learning activities (Cerasoli et al., 2014). Within the broader framework of LLD, learning orientation provides the motivational foundation for individuals to engage in learning activities and to sustain personal and professional growth throughout their careers (De Vos et al., 2020).

Compared to employees, solo self-employed workers depend more heavily on their own learning orientation to remain employable and competitive. In organisational structures, learning is often institutionalised through formal training, performance assessments and peer learning opportunities (Tynjälä, 2013). In contrast, the solo self-employed lack these external structures and must engage in learning by their own self-initiative. Research showed that solo self-employed workers tend to engage in formal education less than employees (Vlasblom et al., 2015) and that self-employed workers are more likely to learn informally through daily tasks and problem-solving (Van der Torre and Dirven, 2016). A strong learning orientation enables them to actively transform work experiences in learning opportunities. Conversely, employees benefit from externally facilitated learning mechanisms, making their development less dependent on individual learning orientation (Sewdas et al., 2018). Moreover, a strong learning orientation is crucial for the solo self-employed because their careers depend on continuous learning to develop skills, career planning, and adapting to a dynamic environment (van den Groenendaal et al., 2022).

A higher learning orientation is expected to lead to greater participation in LLD, as individuals with a strong learning orientation tend to display more proactive learning behaviours, actively seek feedback, and invest time in skill development even in the absence of direct incentives (Van de Walle et al., 2001). As previously discussed, higher engagement in LLD is in turn associated with higher levels of SE. This leads to the formulation of the following hypothesis that this study aims to examine:

H3. The learning orientation of a solo self-employed worker is positively associated with LLD.

2.6 Cognitive Load

Cognitive Load Theory (CLT) posits that individuals' learning and development are constrained by the limits of their working memory, which can be overwhelmed when task demands exceed cognitive capacity (Sweller, 1988; Paas and van Merriënboer, 2020). While this theory has historically been applied to student learning, its principles are increasingly recognised as relevant to adult learning and professional development, particularly in work settings involving complex, self-directed tasks (Seufert, 2018; Wang and Lajoie, 2023). Solo self-

employed workers must perform many roles without supporting organisational structure and this raises the burden on their mental health and with that also their cognitive capacity (Kiefl et al., 2024). This is reflected in the measurement instrument for work and psychology of Van Veldhoven et al. (2014), which captures mental task demand that closely corresponds to cognitive load characteristics. High task complexity and frequent interruptions, as measured by the VBBA 2.0 (Van Veldhoven et al., 2014), consume working memory resources and may hinder the ability of solo self-employed workers to engage in structured learning activities. Moreover, the self-regulatory nature of the learning of solo self-employed workers requires them to free up more cognitive space for the planning of development before they even engage in the learning, which might be hindering the engagement in learning (Seufert, 2018; Kirschner et al., 2006).

At the same time, the strain of cognitive load can also work as a driver for engaging in learning. Research from LePine et al. (2005) provide crucial theoretical and empirical support for the idea that not all cognitive load is detrimental. Moderate challenges on the cognitive load of an individual can stimulate them to apply adaptive learning and problem-solving. Crawford et al. (2010) further identifies that the nature of a demand influences whether a challenge is perceived as a hindrance or as a driver for engagement in learning. This implies that there is a nuance in the effect of cognitive load on learning. Models integrating CLT and self-regulated learning suggest an inverted U-shaped relationship in which moderate task difficulty and cognitive load can trigger productive strategy use and deeper engagement, whereas very low or very high load reduce regulation and learning (Seufert, 2018; Seufert et al., 2024; Wang and Lajoie, 2023). Experimental studies similarly find that consistently high, yet manageable, task complexity can enhance germane load, meta cognitive awareness, and performance without harming interest (Zeitlhofer et al., 2024).

The educational background of solo self-employed workers also comes into play with regard to the cognitive load. A higher amount of prior knowledge results in more space in the cognitive load of a person, reducing the perceived difficulty of engaging in learning (Seufert, 2018). Research from Kirschner et al. (2006) also suggests that learning without structures supporting this are only effective when there is a sufficient amount of internal knowledge present in an individual, suggesting that with a higher educational background have the mental space to pick up on learning from their environment.

Given that solo self-employed workers often face continuously high task demands, frequent interruptions, and largely self-directed learning responsibilities (Kiefl et al., 2024; Van Veldhoven et al., 2014), it is reasonable to expect that they are more often situated on the “overload” side of this curve. In this context, the balance of evidence supports a negative hypothesised relationship between overall cognitive load at work and participation in LLD: higher experienced cognitive load is expected to be associated with lower engagement in LLD. This

leads to the following hypothesis for this study:

H4. The cognitive load of a solo self-employed worker is negatively associated with LLD.

3 Methods

This section outlines the methods adopted in this study. First, the context and the sample will be explained. Thereafter, the measurements of the variables will be discussed. Lastly, the type of empirical analyses that will be performed will be explained and reasoned why these were chosen.

3.1 Context

This study is conducted in collaboration with TNO and data that they have collected will be used in this study. TNO, together with the CBS, research and monitor the self-employed workers in the Netherlands. Every two year they send out a survey called the 'ZEA' in which self-employed workers are asked about their working conditions, working hours, health, training, employability, illness, any accidents etc. The aim of this survey is to obtain a representative picture of how self-employed workers in the Netherlands work and what occupational risks, conditions, and trends exist.

3.2 Sample

The empirical analysis in this study is based on secondary data obtained from the 2025 wave of the ZEA survey. Although the ZEA dataset spans multiple survey waves, the present study utilises only the most recent wave to conduct a cross-sectional analysis. This approach ensures consistency in measurement and sampling procedures and mitigates potential biases arising from changes across survey waves.

The 2025 wave initially comprised 6,184 respondents. As the ZEA includes both solo self-employed workers and self-employed individuals with personnel, this study focuses exclusively on solo self-employed workers, resulting in a final analytical sample of 5,243 respondents. Of these respondents, the majority were male (62.3%).

With respect to educational level, most respondents reported a middle to high level of education. Specifically, 37.5% held an MBO, HAVO, or VWO qualification, 23.7% had completed an HBO or WO bachelor's degree, and 21.9% held a master's degree or doctorate. Lower educational levels were less prevalent: 12.9% of respondents had completed VMBO, MBO level 1, or AVO onderbouw, and 4.0% reported only primary education. Information on educational level was missing for 4.1% of the sample ($n = 215$).

Respondents were active across a wide range of economic sectors. The largest proportions worked in business services (23.7%) and the 'other' sector category (23.2%). The construction sector accounted for 14.7% of the sample, followed by recreation (12.6%), trade (9.4%), and healthcare (9.3%). The agricultural sector was the

least represented, comprising 7.1% of respondents.

The age distribution of the sample indicates a predominance of middle-aged and older respondents. The largest age groups were those aged 55–64 years (22.5%), 35–44 years (21.6%), and 45–54 years (21.3%). Younger respondents aged 25–34 years accounted for 18.6% of the sample, while those aged 15–24 years represented 3.5%. Respondents aged 65 years and older comprised 12.5% of the sample.

Finally, within the sample of solo self-employed workers, 952 respondents (18.2%) reported combining self-employment with paid employment. Among these individuals, the average number of hours worked as an employee was 26 hours per week.

3.3 Measurements

Since this study uses an existing dataset, not every concept that this study focuses on is clearly defined in the data. Therefore, careful construction of the measurements was performed to ensure that the concepts of interest are well presented in the analysis. Moreover, the questionnaire of the ZEA is in Dutch, so the measurements have been translated to English for this study. In Table B.1 an overview of the used ZEA items can be found.

3.3.1 Work Ability

Work ability in this study was operationalised using items derived from the ZEA questionnaire. The selection of these items was chosen based on established measurement approaches to work ability developed in prior research ((Tuomi et al., 1998; McGonagle et al., 2015)). This study uses conceptually aligned ZEA items that capture respondents' perceived ability to perform their work. The following two items were included to measure work ability:

- I can easily meet the physical demands that my work places on me (strongly disagree – disagree – agree – strongly agree)
- I can easily meet the psychological demands that my work places on me (strongly disagree – disagree – agree – strongly agree)

These two ZEA items represent work ability well, but their aggregation needs careful handling. Averaging of the items could lead to the averaging of meaningful insights, since entrepreneurs could experience high work ability on the physical dimension, but low work ability on the mental dimension and these details would get lost in averaging. Therefore, a categorised scale is developed to capture these dimensions. The construction follows a three-category typology representing all possible combinations of physical and mental competence. The first

category is both high physical as well as high mental demands. Category two consists of high physical, but low mental demands or low physical, but high mental demands and lastly, the third category encompasses low physical and low mental demands. To ensure the reliability of the scale, a Principal Component Analysis (PCA) and Cronbach's Alpha test were conducted. From the PCA, the Total Variance Explained table (Table D.2)shows that the first component has an eigenvalue of 1.822, accounting for 91.08% of the total variance. This indicates an extremely strong shared variance between the two items. The second component has an eigenvalue of 0.178, explaining only 8.92% of the variance and falling well below the Kaiser criterion of 1. However, the two items have strong support in the literature to include both items. Moreover, the Cronbach's Alpha of 0.902 (Table D.3) shows excellent internal consistency. This further confirms that the two constructs have a strong correlation.

3.3.2 Vitality

In the dataset of the ZEA a scale that captures vitality is already constructed. In the ZEA three questions have been combined to form the scale of 'Bevlogenheid', which loosely translates to the work engagement of a person. This scale encompasses the physical vitality of solo self-employed workers, but also their passion and enthusiasm for their job, which refers more to the mental vitality. This scale corresponds to the scale that Schaufeli et al. (2019) developed. The construct in the ZEA consists of three questions that are mentioned below:

- Work engagement (scale: 1 = never – 7 = every day; 'fit and strong', 'enthusiastic', 'absorbed in work'; Cronbach's alpha = 0.84 (2025))
  - When I work, I feel fit and strong
  - I am enthusiastic about my work
  - I am completely absorbed in my work

The reported Cronbach's alpha from the scale is 0.84 and is therefore acceptable for the analysis. Moreover, the use of this scale is justified, since it is in line with the scale of Schaufeli et al. (2019), which is widely accepted in literature.

3.3.3 Employability

In the dataset that was used for this study, there was no direct measurement for employability. As a proxy, the construct 'Good job security' was used to capture employability. 'Good job security' primarily reflects individuals' perceptions of job security and continuity of employment, which previous research indicates is a central element of employability (Forrier and Sels, 2003). Nonetheless, 'Good job security' does not fully capture the

multidimensional nature of employability as described in the literature. Not only the job security and continuity of employment are relevant to employability, but also individual capacities, willingness to develop, labour market awareness, and the ability to perform a variety of tasks effectively across labour markets (Forrier and Sels, 2003; de Vries et al., 2001; van Vuuren et al., 2011). Consequently, a more comprehensive employability measure including dimensions such as skill adaptability, proactive development behaviour, and perceived internal and external labour market opportunities would be better suited to fully capture the construct as theorised. The use of 'Good job security' should therefore be interpreted as a partial and more narrowly focused operationalisation of employability, which represents a limitation of the current study. The item is measured as follows in the ZEA:

- Good job security (being able to rely on the continuity of assignments) [Satisfaction] (Not satisfied - Satisfied - very satisfied)

3.3.4 Sustainable Employability

The dependent variable of this study is sustainable employability and the literature identified that this consists of three dimensions: work ability, vitality and employability (Sociaal-Economische Raad (SER)). Given the multidimensional nature of this construct, no composite measure of SE was calculated. Instead, separate regression analyses were conducted for each of the three dimensions.

3.3.5 Long Life Development

The literature defines LLD as a multidimensional construct consisting of three learning components: formal, informal, and non-formal learning. For each component, items from the ZEA were selected:

- *Formal:* Have you followed a training course or education for your work in the past two years? (Yes - no)
- *Informal:* Do you learn a lot or little from the tasks you perform for your work? (A lot - neither much nor little - little)
- *Informal:* Do you learn a lot or little from people at your work, such as colleagues, clients, and customers? (A lot - neither much nor little - little)
- *Non-formal:* In the past two years, have you done one or more of the following? (attended a conference or workshop, coaching, knowledge sharing with other self-employed workers, self-study, another learning activity, none of these) (Yes - no)

Informal learning was measured using two items from the ZEA, each assessed on a three-point Likert scale. These items were combined by calculating their mean to create a single informal learning measure. Subsequently, this variable was rescaled into a dichotomous measure to ensure consistency with the measurement scales used for formal and non-formal learning.

The measures for formal and non-formal learning each consist of a single ZEA item; therefore, no assessment of internal consistency was required. In contrast, the informal learning measure comprises two items, and its internal consistency was evaluated using Cronbach's alpha. The resulting alpha coefficient was 0.628 (Table D.6), which is considered acceptable for this measure, since it only consists of two elements and the Cronbach's alpha is sensitive to the number of variables that are included.

To construct an overall LLD score, the three sub-measures were summed. The resulting composite score ranges from 0 to 3, with higher values indicating greater engagement in LLD. A score of 3 reflects high engagement, whereas a score of 0 indicates low engagement. This scoring approach provides an intuitive and interpretable representation of the underlying construct. This operationalisation treats LLD as a formative construct, in which the distinct learning domains jointly define the construct rather than reflect a single underlying latent trait. As engagement in formal, informal, and non-formal learning does not always co-occur, low inter-item correlations and a low Cronbach's alpha are theoretically expected. Consequently, internal consistency measures such as Cronbach's alpha are not appropriate indicators of measurement quality in this context. The use of a composite LLD index is nevertheless justified by extensive literature that conceptualises LLD as a multidimensional phenomenon encompassing multiple, complementary learning modes.

3.3.6 Financial Situation

The predictor financial situation is derived from a single item in the ZEA, so a single indicator will be used here, reflecting the financial strain, with higher values indicating better finances. This item is formulated as follows in the ZEA:

- How would you describe the current financial situation of your business? (Poor - Fair - Reasonable - Good - Very good)

3.3.7 Learning Orientation

Moreover, the predictor for learning orientation will be constructed from two items from the ZEA to include the various aspects of the predictor. The first question related to the intrinsic motivation of an individual to engage in learning, and is in line with the mastery orientation of Dweck (1986). The second question relates

to the self-efficacy of an individual in their learning abilities, and Maslowski (2019) suggests that persons with higher self-efficacy tend to engage in learning more easily. The mentioned questions are formulated in the ZEA as follows:

- In my work, I continuously try to learn new things (Strongly disagree - disagree - neither agree nor disagree - agree - strongly agree)
- Do you find it difficult or easy to learn new things for your work? (Hard - not hard, not easy - easy)

Learning orientation was operationalised as a composite index based on two items that are conceptually related yet empirically distinct. The first item was measured on a five-point Likert scale ranging from strongly disagree to strongly agree, whereas the second item was measured using three response categories ranging from hard to easy. To ensure comparability between the items, the five-point Likert scale was rescaled to a three-point scale. Specifically, the two disagreement categories and the two agreement categories were collapsed, while the neutral midpoint was retained as the middle category.

Following this rescaling procedure, the two items were averaged to construct the learning orientation index. The resulting measure ranges from 1 to 3, with higher values indicating a stronger learning orientation. Since this construct is an index, the Cronbach's alpha was not acceptable, but research suggests that with two items, the inter-item correlation is a sufficient measure to determine whether a construct is acceptable (Briggs and Cheek, 1986). This is partly because Cronbach's alpha reacts to the number of items in the reliability analysis and two is a relatively low number of variables for a construct. Briggs and Cheek (1986) suggest a guideline of inter-item correlation between 0.20 and 0.40 as an optimal range. For learning orientation, this inter-item correlation is 0.202 (Table D.7), which falls within these guidelines.

3.3.8 Cognitive Load

The operationalisation of cognitive load in this study is informed by prior research. Early work by Paas (1992) measured cognitive load using a nine-point self-report scale, providing a foundational approach to assessing perceived mental effort. In the ZEA, cognitive load is operationalised using a scaled construct comprising three items that collectively capture the cognitive demands experienced by solo self-employed workers. Although this differs from the original nine-point scale, the ZEA items are conceptually aligned with the underlying construct of cognitive load.

Consistent with more recent developments in the literature, particularly the work of Van Veldhoven and Meijman (2016), the selected ZEA items reflect approaches to measuring cognitive load in occupational settings.

In the present study, the ZEA scale is measured on a four-point response format. The resulting measure provides an indicator of cognitive load as experienced by solo self-employed workers and is based on the following items:

- Cognitive load/task difficulty (scale: 1 = never – 4 = always; 'intensive thinking', 'mental focus', 'high level of attention', Cronbach's Alpha = 0.775) Consisting of:
  - Does your work require intensive thinking? (Never - sometimes - often - always)
  - Does your work require you to keep your thoughts focused on the task? (Never - sometimes - often - always)
  - Does your work require a high level of attention from you? (Never - sometimes - often - always)

3.3.9 Covariates

Within the group of solo self-employed workers, substantial heterogeneity exists. To account for the potential influence of individual and occupational differences on the relationships under investigation, a set of relevant covariates was included in the analyses. Covariates are variables that are not central to the theoretical model but may exert systematic effects on either the mediator or the outcome variables, thereby potentially biasing the estimated relationships among the focal constructs.

Research indicates that several demographic and occupational characteristics play an important role in LLD and SE. Higher educated solo self-employed workers tend to exhibit stronger learning orientations, as they are more likely to possess higher learning-related self-efficacy (Maslowski, 2019). In addition, the type of work performed is relevant, as occupations in knowledge-intensive sectors often require continuous skill updating and therefore foster a stronger learning orientation, whereas manual occupations generally provide fewer external stimuli for learning (Van der Torre and Dirven, 2016; Maslowski, 2019). Age-related differences have also been observed, with younger solo self-employed workers typically displaying higher LLD due to greater exposure to digital tools and fewer fixed work routines, while older workers rely more strongly on experiential knowledge and tend to engage in learning activities closely aligned with their current practice (De Grip et al., 2020).

So based on prior research and data availability, the following covariates were included: age, gender, educational level, sector, and employment type (part-time versus full-time self-employment). To incorporate these variables appropriately in the analyses, dummy coding was applied to the categorical covariates in accordance with established methodological guidelines (Chen, 2010). Age, gender, educational level, and sector are categorical variables in the dataset and were therefore dummy coded using one category as the reference group.

Employment type required a different operationalisation. The ZEA questionnaire includes an item asking respondents to report the number of hours they work in waged employment in addition to their self-employment.

Based on this information, a dichotomous variable was constructed to distinguish between full-time and part-time self-employment. This variable was coded as 0 when no hours in waged employment were reported (indicating full-time self-employment) and as 1 when respondents reported any hours in waged employment, indicating part-time self-employment alongside paid employment.

3.4 Analytical Strategy

Prior to the analyses, the dataset was screened for missing values. Missing data were limited and primarily affected a small number of observations. Given the low proportion of missing values and the large initial sample size, a listwise deletion approach was applied, resulting in the exclusion of observations with missing values on the key variables included in the analyses. This approach is consistent with common practice in quantitative management research and is unlikely to bias the results.

To test the hypothesised relationships, the study performed multiple regressions using model 4 of the PROCESS macro for SPSS ((Hayes, 2018)). This approach enables the simultaneous estimation of direct and indirect effects within a single analytical framework and is well suited to examining the mediating role of variables in cross-sectional data. Given the inclusion of multiple theoretically distinct independent variables, separate mediation models were estimated for each predictor to allow for a clear interpretation of the effects associated with each independent variable and to avoid multicollinearity issues that may arise from estimating all predictors within a single model.

SE was conceptualised as a multidimensional construct comprising work ability, employability, and vitality. In line with this conceptualisation, the mediation analyses were conducted separately for each dimension, thereby allowing the relationships between the independent variables, the mediator, and each outcome dimension to be examined independently. This approach avoids imposing an assumption of unidimensionality and provides more nuanced insights into how the hypothesised mechanisms operate across different aspects of SE.

All models included a consistent set of covariates to control for individual and occupational characteristics that may influence both the mediator and the outcome variables.

4 Findings

This section presents the findings of the empirical study. First, descriptive statistics and correlations for the key variables are reported to provide an overview of the data and preliminary insights into the relationships among the constructs. Subsequently, the results of the regression analyses are presented to examine the hypothesised relationships and to assess the effects specified in the conceptual framework.

4.1 Descriptives

The descriptive statistics of the variables of interest show variation across the key study variables, which are presented in Table 4.1. On average, respondents reported a moderately positive financial situation of their business (M = 3.45, SD = 1.01) on a five-point scale; there was, however considerable variation among the respondents. Learning orientation was relatively high (M = 2.59 on a three-point scale), with limited variation (SD = 0.42), indicating that most respondents reported a generally positive orientation towards learning. Respondents reported a moderate to high level of cognitive load for their work, since the mean is 3 on a 4-point scale. LLD showed greater variability across the sample and this indicates notable differences among the respondents. With regard to the SE outcomes, respondents reported relatively high scores on all three dimensions of SE: work ability, vitality, and employability. Overall, the descriptive statistics demonstrate sufficient variability across all constructs to support subsequent regression-based mediation analyses. Missing values were limited, and given the large sample size, listwise deletion was applied in the regression analyses, resulting in an analytical sample of 5,166 respondents.

Table 4.1: Descriptive statistics of the study variables

Variable	**N**	**Min**	**Max**	**Mean**	**SD**
Financial situation	5,224	1.00	5.00	3.45	1.01
Learning orientation	5,239	1.00	3.00	2.59	0.42
Cognitive load	5,237	1.00	4.00	3.00	0.67
Life-long development	5,216	0.33	3.00	1.81	0.75
Work ability	5,214	1.00	3.00	2.68	0.68
Vitality	5,223	1.00	7.00	5.89	1.24
Employability	5,204	1.00	3.00	2.03	0.61
Valid N (listwise)	5,166				

4.2 Correlations

In Table 4.2, the correlations of the study variables is presented. Overall, the correlations are small to moderate in magnitude, indicating that the constructs are related, but empirically distinct. Financial situation

shows positive associations with learning orientation, LLD, and all three dimensions of SE, with the strongest relationship observed for employability. This suggests that a more favourable financial situation is associated with greater perceived work security and higher levels of SE. Learning orientation is positively correlated with LLD and vitality, indicating that individuals with a stronger orientation towards learning tend to engage more in learning activities and report higher levels of energy and enthusiasm at work. Contrary to the hypothesis, cognitive load is positively associated with LLD, suggesting that higher cognitive demands coincide with greater engagement in learning activities among solo self-employed workers. At the same time, cognitive load shows a weak negative correlation with work ability, indicating that higher mental demands may slightly undermine work ability. LLD shows small but significant positive associations with work ability and vitality, but is not significantly related to employability. Finally, the dimensions of SE are positively interrelated, most notably vitality and employability.

Moreover, multicollinearity among the key variables was assessed prior to the regression analyses. Variance inflation factors (VIF) were examined by estimating three separate regression models corresponding to the three dimensions of sustainable employability. Across these models, VIF values ranged from 1.06 to 1.20, which is well below commonly accepted thresholds. This indicates that the predictors are empirically distinct and that multicollinearity is not a concern in the analyses.

Table 4.2: Pearson correlations among study variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Financial situation	1						
(2) Learning orientation	.11***	1					
(3) Cognitive load	.04**	.15***	1				
(4) LLD	.06***	.16***	.20***	1			
(5) Work ability	.04**	.06***	-.04**	.04*	1		
(6) Vitality	.16***	.25***	.09***	.07***	.05***	1	
(7) Employability	.37***	.13***	.01	.01	-.01	.21***	1

Note. $N = 5{,}116$. Values are Pearson correlation coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed).

4.3 Regression Analysis

To examine whether LLD has a mediating effect on the relationships between financial situation, learning orientation and cognitive load and SE, nine separate mediation analyses were conducted using PROCESS model 4 (Hayes, 2018). In all models, age, gender, educational level, and employment type were taken into account as covariates. Moreover, the regressions were run on the three dimensions of SE, which causes the total number of models to be 9 (instead of 3). The results from these regressions will be discussed per outcome

variable, so per dimension of SE. Starting with work ability, thereafter vitality and lastly employability.

4.3.1 Regression analysis on Work Ability

In Table 4.3, Table 4.4, Table 4.5 the results from the regression of the models related to work ability are presented (Model 1,2 and 3). In Table 4.3 the results indicate that financial situation has a statistically significant minimal association with LLD ($B = 0.0234, p = 0.0206$). While the association is small, this does support hypothesis 2 of this study. Moreover, LLD was not significantly related to work ability when controlling for financial situation and the covariates ($B = 0.0148, p = 0.2675$). In contrast, financial situation showed a small but statistically significant direct association with work ability ($B = 0.0201, p = 0.0376$, indicating that a more favourable financial situation is associated with slightly higher work ability. The indirect effect of financial situation on work ability via LLD was not significant, as the bootstrap confidence interval included zero (indirect effect = 0.0003, 95% CI [0.0003, 0.0012]). Indicating that hypothesis 1a is not supported. Taken together, these findings provide no evidence for a mediating role of LLD in the relationship between financial situation and work ability. The association appears to operate primarily through a direct pathway.

In Table 4.4, the results for the regression of learning orientation on LLD and work ability is reported (model 2). The results indicate that learning orientation has a modest and statistically significant effect on LLD (B=0.2226, $p = 0.000$). This suggests that a higher learning orientation results in more engagement in LLD. This result is in support of hypothesis 3. In contrast, LLD does not have a significant effect on work ability, which suggests that engagement in LLD does not affect a solo self-employed worker's work ability. This would indicate that hypothesis 1a is not supported. The results also show a small direct effect of learning orientation on work ability (B=0.0560, $p = 0.0136$), this effect is, however, of such small magnitude that conclusions based on this effect should be carefully considered.

In Table 4.5, the results for the regression of cognitive load on LLD and work ability is reported. Model 3A shows that cognitive load is significantly positively associated with LLD ($B = 0.1644, p =< 0.001$). This suggests that a higher cognitive load leads to more engagement in LLD. Having said that, the effect is considered to be small. This aligns with the effect identified in the correlations and indicates that hypothesis 4 of this study is partially not supported, since this suggests that the effect between cognitive load and LLD has a negative relationship. Furthermore, Model 3B shows that cognitive load has a very small negative direct effect on work ability, indicating that a high cognitive load decrease the work ability of a solo self-employed worker. However, since the effect is of a diminutive nature, caution should be applied for linking conclusions to this effect.

Table 4.3: Model 1: Financial situation → LLD → Work ability

Model 1.A: Mediator model (Outcome = LLD; N = 5,148)						
	B	SE	t	p	LLCI	ULCI
Financial situation	0.0234	0.0101	2.3163	0.0206	0.0036	0.0432
Model summary	$R^2 = 0.1199$, $F(9, 5138) = 77.7902$, $p < .001$					
Model 1.B: Outcome model (Outcome = Work ability; N = 5,148)						
Financial situation	0.0201	0.0097	2.0800	0.0376	0.0012	0.0391
LLD	0.0148	0.0133	1.1089	0.2675	-0.0114	0.0409
Model summary	$R^2 = 0.0104$, $F(10, 5137) = 5.3882$, $p < .001$					
Model 1.C: Total, direct, and indirect effects of financial situation on work ability						
Total effect (c)	0.0205	0.0097	2.1168	0.0343	0.0015	0.0394
Direct effect (c')	0.0201	0.0097	2.0800	0.0376	0.0012	0.0391
Indirect effect (ab) via LLD	0.0003	0.0004			-0.0003	0.0012

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

Table 4.4: Model 2: Learning orientation → LLD → Work ability

Model 2.A: Mediator model (Outcome = LLD; N = 5,170)						
	B	SE	t	p	LLCI	ULCI
Learning orientation	0.2226	0.0233	9.5401	0.0000	0.1769	0.2683
Model summary	$R^2 = 0.1269$, $F(9, 5160) = 83.0938$, $p < .001$					
Model 2.B: Outcome model (Outcome = Work ability; N = 5,170)						
Learning orientation	0.0560	0.0227	2.4697	0.0136	0.0115	0.1005
LLD	0.0110	0.0134	0.8192	0.4127	-0.0153	0.0373
Model summary	$R^2 = 0.0108$, $F(10, 5159) = 5.6420$, $p < .001$					
Model 2.C: Total, direct, and indirect effects of learning orientation on work ability						
Total effect (c)	0.0584	0.0225	2.6002	0.0093	0.0144	0.1025
Direct effect (c')	0.0560	0.0227	2.4697	0.0136	0.0115	0.1005
Indirect effect (ab) via LLD	0.0024	0.0032			-0.0039	0.0087

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

Table 4.5: Model 3: Cognitive load → LLD → Work ability

	B	SE	t	p	LLCI	ULCI
Model 3.A: Mediator model (Outcome = LLD; N = 5,164)						
Cognitive load	0.1644	0.0149	11.0372	< .001	0.1352	0.1936
Model summary	$R^2 = 0.1397$, $F(9, 5154) = 92.97$, $p < .001$					
Model 3.B: Outcome model (Outcome = Work ability; N = 5,164)						
Cognitive load	-0.0459	0.0146	-3.1532	0.0016	-0.0745	-0.0174
LLD	0.0217	0.0135	1.6105	0.1074	-0.0047	0.0480
Model summary	$R^2 = 0.0116$, $F(10, 5153) = 6.02$, $p < .001$					
Model 3.C: Total, direct, and indirect effects of cognitive load on work ability						
Total effect (c)	-0.0423	0.0144	-2.9422	0.0033	-0.0706	-0.0141
Direct effect (c')	-0.0459	0.0146	-3.1532	0.0016	-0.0745	-0.0174
Indirect effect (ab) via LLD	0.0036	0.0023			-0.0009	0.0083

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

4.3.2 Regression analysis on Vitality

The results of the SE dimensions of vitality are reported in Table 4.6, Table 4.7, and Table 4.8, which correspond to model 4, model 5 and model 6, respectively.

Model 4 (Table 4.6) runs financial situation on vitality with LLD as the mediation factor and also all covariates were included. The model shows that financial situation has a small positive effect on LLD ($B = 0.0246, p = 0.015$), which is in line with hypothesis 2. Moreover, LLD was positively and significantly associated with vitality ($B = 0.1280, p < 0.001$), which supports hypothesis 1b. Furthermore, financial situation showed a moderate and statistically significant direct association with vitality ($B = 0.1609, p < 0.001$). The indirect effect of financial situation on vitality through LLD was very small but statistically significant (indirect effect = 0.0032, 95% CI [0.0006, 0.0062]), indicating partial mediation.

In Table 4.7, model 5 is presented, which reports the results of the regression of learning orientation on vitality with LLD as the mediating variable. In model 5A learning orientation showed a positive and significant effect on LLD ($B = 0.2228$, $p < 0.001$), in line with model 2 this also supports hypothesis 2. Moreover, model 5B shows that LLD is positively and significantly associated with vitality, but the effect is smaller in model 5 than model 4 ($B = 0.0805$, $p = 0.001$). Nonetheless, this further supports hypothesis 1b. Next to that, Learning orientation also demonstrated a strong and statistically significant direct association with vitality ($B = 0.7158$,

$p < 0.001$). The indirect effect via LLD was statistically significant (indirect effect = 0.0179, 95% CI [0.0069, 0.0296]), indicating partial mediation.

In Table 4.8, model 6 is presented with cognitive load as the predictor of the model. Model 6A shows that cognitive load is positively and significantly associated with LLD ($B = 0.1625$, $p < 0.001$), which is opposite of what was expected in the study. Therefore, this supports further proof that hypothesis 3 is not supported. Consistent with Hypothesis 1b, LLD was positively related to vitality ($B = 0.1113$, $p < 0.001$). Cognitive load also showed a strong direct association with vitality ($B = 0.1899$, $p < 0.001$). In addition, the indirect effect via LLD was statistically significant (indirect effect = 0.0181, 95% CI [0.0098, 0.0270]), indicating partial mediation.

Table 4.6: Model 4: Financial situation → LLD → Vitality

Model 4.A: Mediator model (Outcome = LLD; $N = 5{,}141$)						
	B	SE	t	p	LLCI	ULCI
Financial situation	0.0246	0.0101	2.4359	0.0149	0.0048	0.0445
Model summary	$R^2 = 0.1195$, $F(9, 5141) = 77.50$, $p < .001$					
Model 4.B: Outcome model (Outcome = Vitality; $N = 5{,}140$)						
Financial situation	0.1609	0.0172	9.3622	<.001	0.1272	0.1946
LLD	0.1280	0.0237	5.4070	<.001	0.0816	0.1745
Model summary	$R^2 = 0.0375$, $F(10, 5140) = 20.01$, $p < .001$					
Model 4.C: Total, direct, and indirect effects of financial situation on vitality						
Total effect (c)	0.1641	0.0172	9.5252	<.001	0.1303	0.1978
Direct effect (c')	0.1609	0.0172	9.3622	<.001	0.1272	0.1946
Indirect effect (ab) via LLD	0.0032	0.0014			0.0006	0.0062

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

Table 4.7: Model 5: Learning orientation → LLD → Vitality

	B	SE	t	p	LLCI	ULCI
Model 5.A: Mediator model (Outcome = LLD; N = 5,173)						
Learning orientation	0.2228	0.0234	9.5390	<.001	0.1770	0.2686
Model summary	$R^2 = 0.1339$, $F(9, 5163) = 88.69$, $p < .001$					
Model 5.B: Outcome model (Outcome = Vitality; N = 5,173)						
Learning orientation	0.7158	0.0395	18.1232	<.001	0.6384	0.7932
LLD	0.0805	0.0233	3.4498	.001	0.0347	0.1262
Model summary	$R^2 = 0.0797$, $F(10, 5162) = 44.70$, $p < .001$					
Model 5.C: Total, direct, and indirect effects of learning orientation on vitality						
Total effect (c)	0.7337	0.0392	18.7205	<.001	0.6569	0.8106
Direct effect (c')	0.7158	0.0395	18.1232	<.001	0.6384	0.7932
Indirect effect (ab) via LLD	0.0179	0.0058			0.0069	0.0296

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

Table 4.8: Model 6: Cognitive load → LLD → Vitality

	B	SE	t	p	LLCI	ULCI
Model 6.A: Mediator model (Outcome = LLD; N = 5,167)						
Cognitive load	0.1625	0.0149	10.8882	<.001	0.1332	0.1918
Model summary	$R^2 = 0.1386$, $F(9, 5157) = 92.20$, $p < .001$					
Model 6.B: Outcome model (Outcome = Vitality; N = 5,167)						
Cognitive load	0.1899	0.0260	7.3013	<.001	0.1389	0.2409
LLD	0.1113	0.0240	4.6372	<.001	0.0642	0.1583
Model summary	$R^2 = 0.0315$, $F(10, 5156) = 16.77$, $p < .001$					
Model 6.C: Total, direct, and indirect effects of cognitive load on vitality						
Total effect (c)	0.2080	0.0258	8.0718	<.001	0.1575	0.2585
Direct effect (c')	0.1899	0.0260	7.3013	<.001	0.1389	0.2409
Indirect effect (ab) via LLD	0.0181	0.0044			0.0098	0.0270

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

4.3.3 Regression analysis on Employability

In Table 4.9, Table 4.10, Table 4.11 the results for the regressions with employability as outcome variable are presented. The tables corresponds to model 7, 8, and 9, respectively.

In model 7 (Table 4.9) the results are reported of the regression where financial situation is the predictor of the model. Financial situation was positively and significantly associated with LLD ($B = 0.024, p < 0.05$), providing further support for Hypothesis 2. With this last model using financial situation, the results show that the effect of financial situation is supported throughout every model where it is the predictor. However, LLD was not significantly related to employability when financial situation and the covariates were controlled for, which suggests that hypothesis 1c is partly not supported. Financial situation showed a moderate and statistically significant direct association with employability ($B = 0.02422, p < 0.001$), and the total and direct effects were almost identical (0.2423 and 0.2422). The indirect effect of financial situation on employability via LLD was not significant, as the bootstrap confidence interval included zero. These findings indicate that financial situation affects employability directly rather than indirectly through LLD, and therefore, no mediation was observed.

In model 8 (Table 4.10), learning orientation was run as the predictor for employability with LLD as mediator. Results of this model showed that learning orientation was moderately and positively associated with LLD ($B = 0.22, p < 0.001$), offering clear support for hypothesis 3. In every model with learning orientation hypothesis 3 was supported, so this hypothesis can be accepted with confidence for all dimensions of SE. Learning orientation also demonstrated a positive and statistically significant direct association with employability, even after controlling for LLD and the covariates. However, LLD was not significantly associated with employability, and the indirect effect via LLD was not statistically significant, as indicated by a bootstrap confidence interval that included zero. This further provides evidence that hypothesis 1c is not supported. This pattern suggests that learning orientation enhances employability primarily through a direct pathway, rather than indirectly via LLD.

In model 9 (Table 4.11), cognitive load was run as the predictor. The results showed that cognitive load was positively and significantly associated with LLD ($B = 0.1628, p < 0.001$), contrary to the hypothesised negative relationship (H4). This finding is consistent with the findings in the other models (models 6 and 3), including cognitive load, which also showed a positive rather than a negative effect. When employability was regressed on cognitive load and LLD, neither LLD nor cognitive load showed a statistically significant direct association with employability, and the indirect effect via LLD was not significant. The total effect of cognitive load on employability was also non-significant. These findings indicate that although cognitive load is positively related to LLD, it does not translate into higher employability, either directly or indirectly. This provides the

last evidence that hypothesis 1c of this study cannot be supported by the analysis.

Table 4.9: Model 7: Financial situation → LLD → Employability

Model 7.A: Mediator model (Outcome = LLD; N = 5,139)						
	B	SE	t	p	LLCI	ULCI
Financial situation	0.0244	0.0101	2.4121	0.0159	0.0046	0.0443
Model summary	$R^2 = 0.1184$, $F(9, 5129) = 76.57$, $p < .001$					
Model 7.B: Outcome model (Outcome = Employability; N = 5,139)						
Financial situation	0.2422	0.0082	29.6899	< .001	0.2262	0.2582
LLD	0.0060	0.0112	0.5346	0.5930	-0.0160	0.0281
Model summary	$R^2 = 0.1577$, $F(10, 5128) = 96.03$, $p < .001$					
Model 7.C: Total, direct, and indirect effects of financial situation on employability						
Total effect (c)	0.2423	0.0082	29.7268	< .001	0.2263	0.2583
Direct effect (c')	0.2422	0.0082	29.6899	< .001	0.2262	0.2582
Indirect effect (ab) via LLD	0.0001	0.0003			-0.0004	0.0008

Notes. Unstandardised coefficients are reported. The mediator model includes the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are percentile bootstrap confidence intervals based on 5,000 resamples (95% CI).

Table 4.10: Model 8: Learning orientation → LLD → Employability

Model 8.A: Mediator model (Outcome = LLD; N = 5,161)						
	B	SE	t	p	LLCI	ULCI
Learning orientation	0.2246	0.0234	9.5874	< .001	0.1787	0.2705
Model summary	$R^2 = 0.1331$, $F(9, 5151) = 87.8793$, $p < .001$					
Model 8.B: Outcome model (Outcome = Employability; N = 5,161)						
Learning orientation	0.1634	0.0206	7.9191	< .001	0.1230	0.2039
LLD	0.0048	0.0122	0.3925	0.6947	-0.0191	0.0286
Model summary	$R^2 = 0.0248$, $F(10, 5150) = 13.1094$, $p < .001$					
Model 8.C: Total, direct, and indirect effects of learning orientation on employability						
Total effect (c)	0.1645	0.0205	8.0426	< .001	0.1244	0.2046
Direct effect (c')	0.1634	0.0206	7.9191	< .001	0.1230	0.2039
Indirect effect (ab) via LLD	0.0011	0.0026			-0.0040	0.0061

Notes. Unstandardised coefficients are reported. The mediator and outcome models include the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are based on percentile bootstrap confidence intervals with 5,000 resamples (95% CI).

Table 4.11: Model 9: Cognitive load → LLD → Employability

Model 9.A: Mediator model (Outcome = LLD; N = 5,155)						
	B	SE	t	p	LLCI	ULCI
Cognitive load	0.1628	0.0150	10.8656	< .001	0.1334	0.1922
Model summary	$R^2 = 0.1376$, $F(9, 5145) = 91.2014$, $p < .001$					
Model 9.B: Outcome model (Outcome = Employability; N = 5,155)						
Cognitive load	0.0198	0.0133	1.4852	0.1376	-0.0063	0.0460
LLD	0.0149	0.0123	1.2106	0.2261	-0.0092	0.0389
Model summary	$R^2 = 0.0133$, $F(10, 5144) = 6.9250$, $p < .001$					
Model 9.C: Total, direct, and indirect effects of cognitive load on employability						
Total effect (c)	0.0222	0.0132	1.6854	0.0920	-0.0036	0.0481
Direct effect (c')	0.0198	0.0133	1.4852	0.1376	-0.0063	0.0460
Indirect effect (ab) via LLD	0.0024	0.0020			-0.0014	0.0063

Notes. Unstandardised coefficients are reported. The mediator and outcome models include the covariates gender (M_V), age category (AgeCat2, AgeCat3), education category (EduCat2–EduCat5), and part-time status (Parttime). Indirect effects are based on percentile bootstrap confidence intervals with 5,000 resamples (95% CI).

4.3.4 Effects of Covariates

In every model, the same group of covariates was run to control for effects that do not come from the variables of interest. The results showed several consistent patterns with regard to the covariates, while others showed outcome-specific associations. Firstly, the educational level of solo self-employed workers displayed consistent patterns across the models. Higher educational attainment was consistently and positively associated with LLD across all models, indicating that more highly educated solo self-employed workers report higher levels of engagement in LLD. However, the association between education and the SE outcomes varied by dimension. For work ability, higher education levels were generally positively associated with the outcome, whereas for employability, higher education categories were negatively associated, suggesting that lower-educated workers may perceive their employability more positively. For vitality, education effects were weaker and less consistent, with only selected education categories showing significant associations.

Age also demonstrated differentiated effects across outcomes. Older age was consistently negatively associated with LLD, indicating lower engagement in LLD among older respondents. In contrast, age was positively related to vitality, suggesting that older solo self-employed workers reported higher vitality levels. Age effects on work ability and employability were comparatively small and inconsistent.

With regard to gender, women reported significantly higher levels of LLD and vitality in most models, while gender differences in work ability and employability were generally small and non-significant. Finally, part-time employment status showed no association with LLD but was negatively related to employability and, in some models, work ability.

Taken together, these findings suggest that while covariates, in particular education and age, play an important role in shaping levels of LLD and SE, their effects are not uniform across outcomes.

5 Discussion and Conclusion

5.1 Discussion

The aim of this study was to examine the role of LLD in shaping SE among Dutch solo self-employed workers and to identify how financial situation, learning orientation, and cognitive load influence participation in LLD. The study used data from the ZEA, a large, nationally representative dataset that is distributed biyearly to self-employed workers. This research contributes to literature by extending existing insights on LLD and SE to the context of solo self-employed workers. In this section, the results of the analysis will be further discussed and the underlying nuances will be dissected.

5.1.1 Hypothesis 1

The findings regarding the effects of LLD on the dimensions of SE reveal a differentiated pattern. LLD was found to be positively associated with vitality (H1b supported), but not with work ability (H1a not supported) or employability (H1c not supported).

The positive association between LLD and vitality suggests that engagement in learning contributes to higher levels of energy, enthusiasm, and engagement among solo self-employed workers. This finding aligns with research linking learning and personal growth to motivational resources and psychological well-being (Bakker and de Vries, 2020). Learning may enhance feelings of competence, autonomy, and purpose, which are central components of vitality and work engagement. For solo self-employed workers, who often operate under conditions of uncertainty and responsibility, LLD may function as a psychological resource that helps sustain motivation and resilience over time.

In contrast, no significant association was found between LLD and work ability. One possible explanation is that work ability among solo self-employed workers is already relatively high, as suggested by prior research pointing to a healthy worker effect in self-employment (Saarni et al., 2008; Sewdas et al., 2018). High autonomy

and self-selection into self-employment may result in a ceiling effect, limiting the observable impact of LLD on perceived physical and mental work ability.

Furthermore, the lack of support for the relationship between LLD and employability may reflect limitations in the operationalisation of employability in this study. Employability was proxied by perceived job security, which captures only a narrow aspect of the broader employability construct described in the literature (Forrier and Sels, 2003; Van Der Heijde and Van Der Heijden, 2006). While LLD may enhance skills, adaptability, and labour market opportunities, these effects do not translate directly into perceived work security.

Moreover, the results showed partial support for the mediation effect of LLD on the predictors and SE. The absence of these mediation effects may be related to the formative nature of the LLD construct. As the index captures diverse learning activities that do not necessarily co-occur, increases in one learning dimension may not translate into uniform effects on SE outcomes.

5.1.2 Hypothesis 2

The results of the analysis provide support for hypothesis 2, showing that the financial situation of solo self-employed workers is positively associated with LLD. This finding aligns closely with prior research that identified financial constraints as a key barrier to adult learning and development (Maslowski, 2019; Grijpstra et al., 2019). In line with Conservation of Resources (COR) theory (Hobfoll and Wells, 1998), a favourable financial situation can be an essential enabling resource that allows solo self-employed workers to invest time and money in learning activities. Moreover, given that solo self-employed workers lack organisational structures for income stability and training, financial resources seems to play an even more central role in LLD than in payroll employment. This result reinforces the notion that LLD participation among solo self-employed workers is highly sensitive to economic conditions and resource availability.

5.1.3 Hypothesis 3

Support was also found for hypothesis 3, indicating that learning orientation is positively associated with LLD. This result confirms the expectations derived from the mindset theory (Dweck, 1986) and prior research showing that individuals with strong mastery orientation are more inclined to engage in proactive learning behaviours (Van de Walle et al., 2001). Especially for solo self-employed workers, LLD seems to be a vital internal driver of development, compensating for the absence of organisational learning structures. It further supports research suggesting that self-employed workers rely more heavily on individual agency and self-directed learning to maintain their skills and competences (Van der Torre and Dirven, 2016).

5.1.4 Hypothesis 4

In contrast, no support was found for hypothesis 4, suggesting that cognitive load was not negatively associated with LLD. Instead, a positive association was found in the results. This result highlights the ambiguous role of cognitive load in learning processes and supports prior research distinguishing between hindrance and challenge demands (LePine et al., 2005; Crawford et al., 2010). Rather than exhausting cognitive resources to the point of inhibiting learning, higher cognitive load may signal complex, knowledge-intensive work that actively stimulates learning. For solo self-employed workers, cognitively demanding tasks may expose skill gaps or changing requirements, thereby triggering engagement in LLD as an adaptive response. This interpretation is consistent with the idea that moderate to high cognitive demands can foster learning when individuals perceive them as manageable and meaningful. The finding suggests that cognitive load should not be viewed solely as a barrier to LLD, but also as a potential driver for development in entrepreneurial work contexts.

5.2 Limitations

This study has several limitations that should be acknowledged and that offer directions for future research. First, the study relies on secondary data, which constrains the extent to which the constructs of interest can be fully captured. Although the measures used are grounded in existing literature, some variables do not comprehensively reflect all dimensions of the underlying constructs. In particular, the measure of employability does not capture the full concept identified in prior research. Moreover, the ZEA questionnaire does not explicitly assess whether formal learning activities result in recognised certification, limiting the ability to distinguish between credentialed and non-credentialed learning. Future research could address these limitations by collecting primary data that allows for more comprehensive and fine-grained measurement of SE and LLD.

Second, LLD was operationalised as a single composite index, which limits an examination of potentially differential effects of formal, informal, and non-formal learning. As prior literature suggests that these learning types may contribute to SE through distinct mechanisms, future studies could disentangle these forms of learning to assess whether specific types of LLD are more strongly associated with particular dimensions of SE.

Third, this study did not find empirical support for the hypothesised relationships between LLD and employability and work ability. It is possible that aggregating different forms of learning into a single index obscured more nuanced effects. Future research could therefore examine whether disaggregated measures of LLD reveal stronger or more differentiated relationships with these outcomes.

In addition, the estimated coefficients in the regression models were relatively small. Although statistically meaningful, their magnitude suggests that the practical effects may be limited. Therefore, caution is advised

when drawing strong conclusions from these findings. Future research could further examine these relationships using alternative samples or research designs to assess the robustness and generalisability of the results.

Finally, although several demographic and occupational covariates were included as covariates, their significant associations with key outcomes suggest that they may play a bigger role in shaping LLD and SE. Future studies could explore these variables as potential moderators to better understand for whom and under which conditions LLD contributes to SE.

5.3 Theoretical Implications

This study contributes to the SE literature by extending existing frameworks to solo self-employed workers, a group that has received limited attention in employability and lifelong learning research (De Vos et al., 2020; Cieślik and van Stel, 2024). The findings further align with Conservation of Resources theory (Hobfoll and Wells, 1998) by showing that engagement in LLD is shaped by access to key resources, particularly financial resources and cognitive capacity, which condition individuals' ability to invest in development and generate future resource gains (Forrier et al., 2009; De Vos et al., 2020). Moreover, the findings further underscore that motivational components like learning orientation shape the engagement in LLD (Van de Walle et al., 2001; De Vos et al., 2020; Dweck, 1986). In addition, by analysing the dimensions of sustainable employability separately, this study responds to calls to treat sustainable employability as a multidimensional construct rather than a single outcome (Ilmarinen et al., 2005; Stuer et al., 2019), thereby offering a more nuanced understanding of how LLD contributes to sustainable careers in self-employed contexts.

5.4 Practical and Policy Implications

From a practical perspective, the findings firstly underline that reducing financial barriers to engage in LLD is of importance for solo self-employed workers. Targeted policy instruments, such as learning vouchers, tax deductions, or subsidised training programmes, could facilitate investment in development for workers facing income volatility. In addition, initiatives that foster learning orientation, such as peer learning networks or mentoring, may indirectly support SE by stimulating engagement in LLD. In addition, given the high cognitive demands often associated with self-employment, flexible and modular learning formats that can be integrated into daily work practices appear particularly well suited to this group. Supporting LLD among solo self-employed workers may therefore enhance not only individual SE, but also the adaptability and resilience of the broader labour market.

5.5 Conclusion

This study set out to examine the role of LLD in enhancing SE among Dutch solo self-employed workers, while also exploring how financial situation, learning orientation, and cognitive load predict participation in LLD. Using cross-sectional data from the 2025 wave of the Dutch Self-Employed Labour Survey (ZEA), this research contributes to the literature by extending established SE research to the group of solo self-employed workers.

The results show that LLD is positively and significantly related to vitality, but not to work ability or employability. This finding suggests that LLD among solo self-employed workers primarily contributes to their energy, enthusiasm, and psychological engagement with work, rather than directly enhancing their perceived ability to meet work demands or their perceived job security. These results partially support the theoretical expectation that learning contributes to SE, but also indicate that the effects of LLD are more nuanced in a self-employed context than in traditional employment settings.

Regarding the predictors of LLD, the findings demonstrate that financial situation, learning orientation, and cognitive load are all positively associated with engagement in LLD. The positive association between cognitive load and LLD contrasts with the hypothesised negative relationship. This suggests that cognitively demanding work may function as a learning trigger rather than a barrier, motivating solo self-employed workers to engage in learning to cope with complexity and maintain performance.

In conclusion, as solo self-employment continues to grow in the Netherlands and beyond, supporting SE among this group becomes increasingly important. Policies and interventions that lower financial barriers to learning, strengthen learning-oriented mindsets, and help manage cognitive demands may play a crucial role in enabling solo self-employed workers to develop sustainably throughout their working lives.

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A The Use of AI tools

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Course name: Thesis Strategic Management

Supervisor: Josette Dijkhuizen

Thesis title: From Learning to Lasting: How Life-Long Development Shapes Sustainable Employability among Dutch Solo Self-Employed Workers

Due date: 12-01-2026

Date	**AI tool used**	**Purpose of use**	**Part of thesis affected by AI tool usage**
09/2025 – 01/2026	ChatGPT	Language improvement, structuring of paragraphs, clarification of theoretical arguments, drafting summaries	Chapters 1, 2, 3, 4, and 5
10/2025 – 01/2026	ChatGPT	Troubleshooting and clarification of analytical procedures in SPSS	Chapter 4
09/2025 – 01/2026	Consensus	Identifying and verifying relevant academic literature and references	Chapter 2

Table A.1: Overview of AI Use

After using this tool/service, Britt van den Berg evaluated the validity of the tool's outputs, including the sources that generative AI tools have used, and edited the content as needed. As a consequence, Britt van den Berg takes full responsibility for the content of their work.

B Overview of ZEA variables

Table B.1: Overview ZEA Items for Study Variables

Question	**Variabelename**	**Answering options**
Work ability		
Ik kan gemakkelijk voldoen aan de fysieke eisen die mijn werk aan mij stelt	Compet_a	1: helemaal niet eens; 2: niet eens; 3: eens; 4: helemaal eens

Question	Variabelename	Answering options
Ik kan gemakkelijk voldoen aan de psychische eisen die mijn werk aan mij stelt	Compet_b	1: helemaal niet eens; 2: niet eens; 3: eens; 4: helemaal eens
Vitality		
Bevlogenheid (schaal 1–7)	Afl_Bevlogenheid	schaal: 1=nooit - 7=elke dag; 'fit en sterk', 'enthousiast', 'ga op in werk']
Employability		
Goede werkzekerheid (vertrouwen op behoud van opdrachten)	AspTevr_e	1: niet tevreden; 2: tevreden; 3: heel tevreden
LLD		
Heeft u in de afgelopen twee jaar een opleiding of cursus gevolgd?	OplCursus	0: nee; 1: ja
Leert u veel of weinig van de taken die u uitvoert?	LerenTaken	1: veel; 2: niet veel en niet weinig; 3: weinig
Leert u veel of weinig van mensen op uw werk?	LerenMensen	1: veel; 2: niet veel en niet weinig; 3: weinig
Leeractiviteiten (congres, workshop, coaching, kennisdeling, zelfstudie, andere, geen)	AndLeerAct...	1: ja; 2: nee
Financial Situation		
Hoe is op dit moment de financiële situatie van uw bedrijf?	FinSitBedr_om	1: slecht; 2: matig; 3: redelijk; 4: goed; 5: zeer goed
Learning Orientation		
In mijn werk probeer ik telkens nieuwe dingen te leren	LeerOr_a	1: helemaal oneens; 2: oneens; 3: niet eens, niet oneens; 4: eens; 5: helemaal eens
Vindt u het moeilijk of makkelijk om nieuwe dingen te leren?	LerenNieuw	1: moeilijk; 2: niet moeilijk en niet makkelijk; 3: makkelijk
Cognitive Load		
Cognitieve belasting/moeilijkheidsgraad	Afl_Moeilijkheidsgraad	schaal: 1=nooit - 4=altijd; 'intensief nadenken', 'gedachten erbij', 'veel aandacht'

C Descriptive statistics of sample

Table C.1: Descriptive statistics of the sample

Variable	Category	N	Valid %
Highest educational attainment			
	Primary education	199	4.0
	VMBO / MBO 1 / AVO underbouw	649	12.9
	MBO / HAVO / VWO	1,886	37.5
	HBO / WO bachelor	1,190	23.7
	HBO / WO master or doctorate	1,103	21.9
	Missing	215	–
Sector			
	Agriculture	372	7.1
	Construction	772	14.7
	Trade	493	9.4
	Business services	1,242	23.7
	Healthcare	485	9.3
	Recreation	660	12.6
	Other	1,218	23.2
Age category			
	15–24 years	181	3.5
	25–34 years	973	18.6
	35–44 years	1,134	21.6
	45–54 years	1,116	21.3
	55–64 years	1,180	22.5
	65–74 years	562	10.7
	75 years and older	96	1.8
Total sample size			
		5,243	100.0

D Reliability of variables

D.1 Work Ability

Table D.1: Case Processing Summary Work Ability

		N	%
Cases	Valid	5,214.27	99.5
	Excluded	28.39	0.5
	Total	5,242.66	100.0

Table D.2: Total Variance Explained Work Ability

		Initial Eigenvalues		Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Compet_a	1.822	91.084	91.084	1.822	91.084	91.084
Compet_b	0.178	8.916	100.000			

Extraction Method: Principal Component Analysis.

Table D.3: Reliability Statistics Work Ability

Cronbach's Alpha	**Cronbach's Alpha (Standardised Items)**	**N of Items**
0.902	0.902	2

Table D.4: Scale Statistics Work Ability

Mean	**Variance**	**Std. Deviation**	**N of Items**
6.226	3.009	1.735	2

D.2 Informal Learning

Table D.5: Case Processing Summary Informal Learning

		N	**%**
Cases	Valid	5,201.65	99.2
	Excluded	41.01	0.8
	Total	5,242.66	100.0

Table D.6: Reliability Statistics Informal Learning

Cronbach's Alpha	**Cronbach's Alpha (Standardised Items)**	**N of Items**
0.628	0.631	2

D.3 Learning Orientation

Table D.7: Inter-Item Correlation Matrix Learning Orientation

	LeerOr_a	**LerenNieuw**
LeerOr_a	1.000	0.202
LerenNieuw	0.202	1.000

Note. Values represent Pearson inter-item correlations. LeerOr_a = "In my work, I continuously try to learn new things"; LerenNieuw = "Do you find it difficult or easy to learn new things for your work?".

E Regressions Work Ability

Table E.1: PROCESS Model 4 (X = Finsit, M = LLD, Y = WA) with covariates (N = 5148)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3352$, $R^2 = 0{,}1124$, MSE = 0,4844, $F(8, 5139) = 81{,}3379$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,2891	0,0542	23,8064	0,0000	1,1830	1,3953
Finsit	0,0185	0,0101	1,8316	0,0671	-0,0013	0,0384
AgeCat2	-0,0072	0,0275	-0,2610	0,7941	-0,0610	0,0467
AgeCat3	-0,1091	0,0230	-4,7446	0,0000	-0,1542	-0,0640
EduCat2	0,1391	0,0498	2,7949	0,0052	0,0415	0,2367
EduCat3	0,5013	0,0439	11,4121	0,0000	0,4152	0,5874
EduCat4	0,6550	0,0455	14,4025	0,0000	0,5658	0,7441
EduCat5	0,8014	0,0453	17,6906	0,0000	0,7126	0,8903
Parttime	-0,0234	0,0264	-0,8866	0,3754	-0,0751	0,0283
Outcome model: Outcome = WA (controlling for LLD)						
Model summary: $R = 0{,}0998$, $R^2 = 0{,}0100$, MSE = 0,4390, $F(9, 5138) = 5{,}7491$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,4653	0,0543	45,3812	0,0000	2,3588	2,5718
Finsit	0,0190	0,0096	1,9755	0,0483	0,0001	0,0379
LLD	0,0166	0,0133	1,2485	0,2119	-0,0095	0,0426
AgeCat2	0,0389	0,0262	1,4867	0,1372	-0,0124	0,0902
AgeCat3	0,0160	0,0219	0,7310	0,4648	-0,0270	0,0591
EduCat2	0,0348	0,0474	0,7333	0,4634	-0,0582	0,1277
EduCat3	0,0907	0,0424	2,1418	0,0323	0,0077	0,1737
EduCat4	0,1672	0,0442	3,7861	0,0002	0,0806	0,2538
EduCat5	0,1617	0,0444	3,6405	0,0003	0,0746	0,2488
Parttime	0,0368	0,0251	1,4656	0,1428	-0,0124	0,0860
Total effect model: Outcome = WA (without LLD)						
Model summary: $R = 0{,}0983$, $R^2 = 0{,}0097$, MSE = 0,4391, $F(8, 5139) = 6{,}2722$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,4867	0,0516	48,2301	0,0000	2,3856	2,5878
Finsit	0,0194	0,0096	2,0079	0,0447	0,0005	0,0382
AgeCat2	0,0388	0,0262	1,4821	0,1384	-0,0125	0,0900
AgeCat3	0,0142	0,0219	0,6500	0,5157	-0,0287	0,0572
EduCat2	0,0371	0,0474	0,7825	0,4340	-0,0558	0,1300
EduCat3	0,0990	0,0418	2,3674	0,0180	0,0170	0,1810
EduCat4	0,1781	0,0433	4,1124	0,0000	0,0932	0,2630
EduCat5	0,1750	0,0431	4,0575	0,0001	0,0905	0,2596
Parttime	0,0364	0,0251	1,4502	0,1471	-0,0128	0,0857

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table E.2: Total, direct, and indirect effects of Finsit on WA (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,0194	0,0096	2,0079	0,0447	0,0005	0,0382
Direct effect (c')	0,0190	0,0096	1,9755	0,0483	0,0001	0,0379
Indirect effect via LLD (ab)	0,0003	0,0003	—	—	-0,0002	0,0011

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output.

Table E.3: PROCESS Model 4 (X = LearOr, M = LLD, Y = WA) with covariates (N = 5170)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3563$, $R^2 = 0{,}1269$, MSE = 0,4759, $F(8, 5161) = 93{,}8063$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,7822	0,0736	10,6222	0,0000	0,6379	0,9266
LearOr	0,2215	0,0234	9,4525	0,0000	0,1755	0,2674
AgeCat2	0,0118	0,0273	0,4341	0,6643	-0,0416	0,0653
AgeCat3	-0,0775	0,0229	-3,3811	0,0007	-0,1225	-0,0326
EduCat2	0,1493	0,0490	3,0482	0,0023	0,0533	0,2453
EduCat3	0,4904	0,0431	11,3786	0,0000	0,4059	0,5749
EduCat4	0,6322	0,0448	14,1214	0,0000	0,5445	0,7200
EduCat5	0,7703	0,0445	17,3153	0,0000	0,6831	0,8575
Parttime	-0,0268	0,0259	-1,0342	0,3011	-0,0776	0,0240
Outcome model: Outcome = WA (controlling for LLD)						
Model summary: $R = 0{,}1022$, $R^2 = 0{,}0104$, MSE = 0,4380, $F(9, 5160) = 6{,}0477$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,3891	0,0714	33,4538	0,0000	2,2491	2,5291
LearOr	0,0554	0,0227	2,4428	0,0146	0,0109	0,0998
LLD	0,0127	0,0134	0,9536	0,3403	-0,0134	0,0389
AgeCat2	0,0430	0,0261	1,6444	0,1002	-0,0083	0,0942
AgeCat3	0,0230	0,0220	1,0460	0,2956	-0,0201	0,0662
EduCat2	0,0454	0,0470	0,9658	0,3342	-0,0468	0,1376
EduCat3	0,0978	0,0419	2,3368	0,0195	0,0158	0,1799
EduCat4	0,1713	0,0438	3,9142	0,0001	0,0855	0,2572
EduCat5	0,1675	0,0439	3,8167	0,0001	0,0815	0,2536
Parttime	0,0317	0,0249	1,2748	0,2024	-0,0170	0,0804
Total effect model: Outcome = WA (without LLD)						
Model summary: $R = 0{,}1013$, $R^2 = 0{,}0103$, MSE = 0,4379, $F(8, 5161) = 6{,}6901$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,3991	0,0706	33,9588	0,0000	2,2606	2,5376
LearOr	0,0582	0,0225	2,5893	0,0096	0,0141	0,1023
AgeCat2	0,0431	0,0261	1,6502	0,0990	-0,0081	0,0944
AgeCat3	0,0221	0,0220	1,0023	0,3162	-0,0211	0,0652
EduCat2	0,0473	0,0470	1,0072	0,3139	-0,0448	0,1394
EduCat3	0,1041	0,0413	2,5170	0,0119	0,0230	0,1851
EduCat4	0,1794	0,0430	4,1766	0,0000	0,0952	0,2636
EduCat5	0,1774	0,0427	4,1558	0,0000	0,0937	0,2610
Parttime	0,0314	0,0249	1,2612	0,2073	-0,0174	0,0801

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table E.4: Total, direct, and indirect effects of LearOr on WA (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,0582	0,0225	2,5893	0,0096	0,0141	0,1023
Direct effect (c')	0,0554	0,0227	2,4428	0,0146	0,0109	0,0998
Indirect effect via LLD (ab)	0,0028	0,0031	—	—	-0,0033	0,0092

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table E.5: PROCESS Model 4 (X = Cog, M = LLD, Y = WA) with covariates (N = 5164)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3626$, $R^2 = 0{,}1315$, MSE = 0,4737, $F(8, 5155) = 97{,}5287$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,8954	0,0600	14,9143	0,0000	0,7777	1,0131
Cog	0,1602	0,0150	10,7118	0,0000	0,1309	0,1895
AgeCat2	-0,0101	0,0272	-0,3728	0,7093	-0,0634	0,0431
AgeCat3	-0,1122	0,0227	-4,9412	0,0000	-0,1567	-0,0677
EduCat2	0,1498	0,0489	3,0616	0,0022	0,0539	0,2457
EduCat3	0,4896	0,0431	11,3662	0,0000	0,4051	0,5740
EduCat4	0,6216	0,0448	13,8713	0,0000	0,5337	0,7094
EduCat5	0,7418	0,0447	16,5836	0,0000	0,6541	0,8295
Parttime	-0,0126	0,0259	-0,4846	0,6280	-0,0634	0,0383
Outcome model: Outcome = WA (controlling for LLD)						
Model summary: $R = 0{,}1063$, $R^2 = 0{,}0113$, MSE = 0,4380, $F(9, 5154) = 6{,}5405$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,6470	0,0590	44,8948	0,0000	2,5314	2,7625
Cog	-0,0468	0,0145	-3,2213	0,0013	-0,0753	-0,0183
LLD	0,0232	0,0134	1,7315	0,0834	-0,0031	0,0494
AgeCat2	0,0403	0,0261	1,5439	0,1227	-0,0109	0,0915
AgeCat3	0,0184	0,0219	0,8407	0,4005	-0,0245	0,0613
EduCat2	0,0424	0,0471	0,8996	0,3684	-0,0499	0,1347
EduCat3	0,1046	0,0419	2,4937	0,0127	0,0224	0,1868
EduCat4	0,1857	0,0439	4,2308	0,0000	0,0996	0,2717
EduCat5	0,1907	0,0441	4,3207	0,0000	0,1042	0,2773
Parttime	0,0256	0,0249	1,0275	0,3042	-0,0233	0,0745
Total effect model: Outcome = WA (without LLD)						
Model summary: $R = 0{,}1035$, $R^2 = 0{,}0107$, MSE = 0,4382, $F(8, 5155) = 6{,}9806$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,6677	0,0577	46,2039	0,0000	2,5545	2,7809
Cog	-0,0431	0,0144	-2,9981	0,0027	-0,0713	-0,0149
AgeCat2	0,0401	0,0261	1,5346	0,1249	-0,0111	0,0913
AgeCat3	0,0158	0,0218	0,7234	0,4695	-0,0270	0,0586
EduCat2	0,0458	0,0470	0,9741	0,3301	-0,0464	0,1381
EduCat3	0,1159	0,0414	2,7983	0,0052	0,0347	0,1971
EduCat4	0,2001	0,0431	4,6427	0,0000	0,1156	0,2845
EduCat5	0,2079	0,0430	4,8335	0,0000	0,1236	0,2923
Parttime	0,0253	0,0249	1,0157	0,3098	-0,0236	0,0742

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table E.6: Total, direct, and indirect effects of Cog on WA (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	-0,0431	0,0144	-2,9981	0,0027	-0,0713	-0,0149
Direct effect (c')	-0,0468	0,0145	-3,2213	0,0013	-0,0753	-0,0183
Indirect effect via LLD (ab)	0,0037	0,0023	—	—	-0,0006	0,0084

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table E.7: PROCESS Model 4 (X = Cog, M = LLD, Y = WA) with covariates (N = 5164)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3626$, $R^2 = 0{,}1315$, MSE = 0,4737, $F(8, 5155) = 97{,}5287$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,8954	0,0600	14,9143	0,0000	0,7777	1,0131
Cog	0,1602	0,0150	10,7118	0,0000	0,1309	0,1895
AgeCat2	-0,0101	0,0272	-0,3728	0,7093	-0,0634	0,0431
AgeCat3	-0,1122	0,0227	-4,9412	0,0000	-0,1567	-0,0677
EduCat2	0,1498	0,0489	3,0616	0,0022	0,0539	0,2457
EduCat3	0,4896	0,0431	11,3662	0,0000	0,4051	0,5740
EduCat4	0,6216	0,0448	13,8713	0,0000	0,5337	0,7094
EduCat5	0,7418	0,0447	16,5836	0,0000	0,6541	0,8295
Parttime	-0,0126	0,0259	-0,4846	0,6280	-0,0634	0,0383
Outcome model: Outcome = WA (controlling for LLD)						
Model summary: $R = 0{,}1063$, $R^2 = 0{,}0113$, MSE = 0,4380, $F(9, 5154) = 6{,}5405$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,6470	0,0590	44,8948	0,0000	2,5314	2,7625
Cog	-0,0468	0,0145	-3,2213	0,0013	-0,0753	-0,0183
LLD	0,0232	0,0134	1,7315	0,0834	-0,0031	0,0494
AgeCat2	0,0403	0,0261	1,5439	0,1227	-0,0109	0,0915
AgeCat3	0,0184	0,0219	0,8407	0,4005	-0,0245	0,0613
EduCat2	0,0424	0,0471	0,8996	0,3684	-0,0499	0,1347
EduCat3	0,1046	0,0419	2,4937	0,0127	0,0224	0,1868
EduCat4	0,1857	0,0439	4,2308	0,0000	0,0996	0,2717
EduCat5	0,1907	0,0441	4,3207	0,0000	0,1042	0,2773
Parttime	0,0256	0,0249	1,0275	0,3042	-0,0233	0,0745
Total effect model: Outcome = WA (without LLD)						
Model summary: $R = 0{,}1035$, $R^2 = 0{,}0107$, MSE = 0,4382, $F(8, 5155) = 6{,}9806$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,6677	0,0577	46,2039	0,0000	2,5545	2,7809
Cog	-0,0431	0,0144	-2,9981	0,0027	-0,0713	-0,0149
AgeCat2	0,0401	0,0261	1,5346	0,1249	-0,0111	0,0913
AgeCat3	0,0158	0,0218	0,7234	0,4695	-0,0270	0,0586
EduCat2	0,0458	0,0470	0,9741	0,3301	-0,0464	0,1381
EduCat3	0,1159	0,0414	2,7983	0,0052	0,0347	0,1971
EduCat4	0,2001	0,0431	4,6427	0,0000	0,1156	0,2845
EduCat5	0,2079	0,0430	4,8335	0,0000	0,1236	0,2923
Parttime	0,0253	0,0249	1,0157	0,3098	-0,0236	0,0742

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table E.8: Total, direct, and indirect effects of Cog on WA (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	-0,0431	0,0144	-2,9981	0,0027	-0,0713	-0,0149
Direct effect (c')	-0,0468	0,0145	-3,2213	0,0013	-0,0753	-0,0183
Indirect effect via LLD (ab)	0,0037	0,0023	—	—	-0,0006	0,0084

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

F Regressions Vitality

Table F.1: PROCESS Model 4 (X = Finsit, M = LLD, Y = VIT) with covariates (N = 5151)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3344$, $R^2 = 0{,}1118$, MSE = 0,4857, $F(8, 5142) = 80{,}9304$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,2925	0,0542	23,8678	0,0000	1,1863	1,3986
Finsit	0,0197	0,0101	1,9435	0,0520	-0,0002	0,0396
AgeCat2	-0,0074	0,0275	-0,2712	0,7862	-0,0613	0,0464
AgeCat3	-0,1130	0,0230	-4,9117	0,0000	-0,1581	-0,0679
EduCat2	0,1342	0,0499	2,6901	0,0072	0,0364	0,2319
EduCat3	0,4949	0,0441	11,2332	0,0000	0,4085	0,5813
EduCat4	0,6520	0,0456	14,3023	0,0000	0,5627	0,7414
EduCat5	0,7949	0,0454	17,5007	0,0000	0,7058	0,8839
Parttime	-0,0279	0,0264	-1,0596	0,2894	-0,0797	0,0238
Outcome model: Outcome = VIT (controlling for LLD)						
Model summary: $R = 0{,}1899$, $R^2 = 0{,}0361$, MSE = 1,3904, $F(9, 5141) = 21{,}3702$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	5,0297	0,0966	52,0882	0,0000	4,8404	5,2190
Finsit	0,1573	0,0171	9,1743	0,0000	0,1237	0,1909
LLD	0,1341	0,0236	5,6822	0,0000	0,0878	0,1803
AgeCat2	0,0971	0,0465	2,0903	0,0366	0,0060	0,1882
AgeCat3	0,2676	0,0390	6,8572	0,0000	0,1911	0,3441
EduCat2	-0,0166	0,0844	-0,1969	0,8439	-0,1822	0,1489
EduCat3	0,0460	0,0754	0,6095	0,5422	-0,1019	0,1939
EduCat4	-0,0496	0,0787	-0,6302	0,5286	-0,2038	0,1046
EduCat5	-0,1899	0,0791	-2,4006	0,0164	-0,3450	-0,0348
Parttime	-0,0221	0,0446	-0,4961	0,6199	-0,1096	0,0654
Total effect model: Outcome = VIT (without LLD)						
Model summary: $R = 0{,}1732$, $R^2 = 0{,}0300$, MSE = 1,3989, $F(8, 5142) = 19{,}8846$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	5,2030	0,0919	56,6172	0,0000	5,0228	5,3831
Finsit	0,1600	0,0172	9,3034	0,0000	0,1263	0,1937
AgeCat2	0,0961	0,0466	2,0625	0,0392	0,0048	0,1875
AgeCat3	0,2524	0,0390	6,4644	0,0000	0,1759	0,3290
EduCat2	0,0014	0,0846	0,0161	0,9872	-0,1646	0,1673
EduCat3	0,1123	0,0748	1,5025	0,1330	-0,0342	0,2589
EduCat4	0,0379	0,0774	0,4892	0,6247	-0,1138	0,1895
EduCat5	-0,0833	0,0771	-1,0810	0,2797	-0,2344	0,0678
Parttime	-0,0259	0,0448	-0,5783	0,5631	-0,1136	0,0619

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table F.2: Total, direct, and indirect effects of Finsit on VIT (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,1600	0,0172	9,3034	0,0000	0,1263	0,1937
Direct effect (c')	0,1573	0,0171	9,1743	0,0000	0,1237	0,1909
Indirect effect via LLD (ab)	0,0026	0,0015	—	—	0,0000	0,0058

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table F.3: PROCESS Model 4 (X = LearOr, M = LLD, Y = VIT) with covariates (N = 5173)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3554$, $R^2 = 0{,}1263$, MSE = 0,4772, $F(8, 5164) = 93{,}3305$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,7887	0,0737	10,7034	0,0000	0,6443	0,9332
LearOr	0,2217	0,0235	9,4522	0,0000	0,1757	0,2677
AgeCat2	0,0116	0,0272	0,4253	0,6706	-0,0418	0,0650
AgeCat3	-0,0813	0,0229	-3,5447	0,0004	-0,1263	-0,0364
EduCat2	0,1443	0,0491	2,9410	0,0033	0,0481	0,2406
EduCat3	0,4845	0,0432	11,2104	0,0000	0,3998	0,5693
EduCat4	0,6296	0,0449	14,0298	0,0000	0,5417	0,7176
EduCat5	0,7641	0,0446	17,1325	0,0000	0,6767	0,8515
Parttime	-0,0319	0,0259	-1,2288	0,2192	-0,0827	0,0190
Outcome model: Outcome = VIT (controlling for LLD)						
Model summary: $R = 0{,}2804$, $R^2 = 0{,}0786$, MSE = 1,3309, $F(9, 5163) = 48{,}9570$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	3,7632	0,1244	30,2459	0,0000	3,5193	4,0071
LearOr	0,7140	0,0395	18,0710	0,0000	0,6365	0,7914
LLD	0,0858	0,0232	3,6920	0,0002	0,0402	0,1314
AgeCat2	0,1576	0,0455	3,4638	0,0005	0,0684	0,2468
AgeCat3	0,3605	0,0384	9,3955	0,0000	0,2853	0,4357
EduCat2	0,0676	0,0820	0,8244	0,4098	-0,0932	0,2284
EduCat3	0,0866	0,0731	1,1856	0,2358	-0,0566	0,2298
EduCat4	-0,0459	0,0764	-0,6016	0,5475	-0,1956	0,1038
EduCat5	-0,1810	0,0766	-2,3640	0,0181	-0,3311	-0,0309
Parttime	-0,0604	0,0433	-1,3946	0,1632	-0,1453	0,0245
Total effect model: Outcome = VIT (without LLD)						
Model summary: $R = 0{,}2760$, $R^2 = 0{,}0762$, MSE = 1,3342, $F(8, 5164) = 53{,}2425$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	3,8309	0,1232	31,0915	0,0000	3,5893	4,0724
LearOr	0,7330	0,0392	18,6895	0,0000	0,6561	0,8099
AgeCat2	0,1586	0,0456	3,4814	0,0005	0,0693	0,2479
AgeCat3	0,3535	0,0384	9,2136	0,0000	0,2783	0,4287
EduCat2	0,0800	0,0821	0,9750	0,3296	-0,0809	0,2409
EduCat3	0,1282	0,0723	1,7737	0,0762	-0,0135	0,2699
EduCat4	0,0081	0,0750	0,1078	0,9142	-0,1390	0,1552
EduCat5	-0,1154	0,0746	-1,5481	0,1216	-0,2616	0,0307
Parttime	-0,0631	0,0433	-1,4561	0,1454	-0,1481	0,0219

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table F.4: Total, direct, and indirect effects of LearOr on VIT (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,7330	0,0392	18,6895	0,0000	0,6561	0,8099
Direct effect (c')	0,7140	0,0395	18,0710	0,0000	0,6365	0,7914
Indirect effect via LLD (ab)	0,0190	0,0057	—	—	0,0085	0,0308

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table F.5: PROCESS Model 4 (X = Cog, M = LLD, Y = VIT) with covariates (N = 5167)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3610$, $R^2 = 0{,}1303$, MSE = 0,4754, $F(8, 5158) = 96{,}6337$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,9066	0,0602	15,0648	0,0000	0,7886	1,0245
Cog	0,1584	0,0150	10,5722	0,0000	0,1290	0,1878
AgeCat2	-0,0105	0,0272	-0,3854	0,6999	-0,0637	0,0428
AgeCat3	-0,1162	0,0227	-5,1140	0,0000	-0,1608	-0,0717
EduCat2	0,1470	0,0490	2,9975	0,0027	0,0509	0,2431
EduCat3	0,4848	0,0432	11,2232	0,0000	0,4002	0,5695
EduCat4	0,6204	0,0449	13,8106	0,0000	0,5323	0,7085
EduCat5	0,7378	0,0448	16,4511	0,0000	0,6498	0,8257
Parttime	-0,0174	0,0259	-0,6711	0,5022	-0,0683	0,0334
Outcome model: Outcome = VIT (controlling for LLD)						
Model summary: $R = 0{,}1741$, $R^2 = 0{,}0303$, MSE = 1,3994, $F(9, 5157) = 17{,}9166$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	5,0239	0,1055	47,6212	0,0000	4,8171	5,2307
Cog	0,1864	0,0260	7,1743	0,0000	0,1355	0,2374
LLD	0,1171	0,0239	4,9031	0,0000	0,0703	0,1640
AgeCat2	0,0989	0,0466	2,1233	0,0338	0,0076	0,1903
AgeCat3	0,2681	0,0391	6,8575	0,0000	0,1914	0,3447
EduCat2	0,0440	0,0842	0,5220	0,6017	-0,1211	0,2090
EduCat3	0,1022	0,0750	1,3622	0,1732	-0,0449	0,2493
EduCat4	-0,0247	0,0785	-0,3153	0,7525	-0,1786	0,1291
EduCat5	-0,1653	0,0789	-2,0945	0,0363	-0,3201	-0,0106
Parttime	-0,0512	0,0445	-1,1497	0,2503	-0,1384	0,0361
Total effect model: Outcome = VIT (without LLD)						
Model summary: $R = 0{,}1606$, $R^2 = 0{,}0258$, MSE = 1,4057, $F(8, 5158) = 17{,}0750$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	5,1301	0,1035	49,5754	0,0000	4,9272	5,3329
Cog	0,2050	0,0258	7,9556	0,0000	0,1545	0,2555
AgeCat2	0,0977	0,0467	2,0923	0,0365	0,0062	0,1893
AgeCat3	0,2544	0,0391	6,5113	0,0000	0,1778	0,3311
EduCat2	0,0612	0,0843	0,7254	0,4682	-0,1041	0,2265
EduCat3	0,1590	0,0743	2,1401	0,0324	0,0133	0,3046
EduCat4	0,0479	0,0772	0,6204	0,5350	-0,1035	0,1994
EduCat5	-0,0789	0,0771	-1,0233	0,3062	-0,2301	0,0723
Parttime	-0,0532	0,0446	-1,1929	0,2330	-0,1406	0,0342

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table F.6: Total, direct, and indirect effects of Cog on VIT (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,2050	0,0258	7,9556	0,0000	0,1545	0,2555
Direct effect (c')	0,1864	0,0260	7,1743	0,0000	0,1355	0,2374
Indirect effect via LLD (ab)	0,0186	0,0044	—	—	0,0104	0,0278

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

G Regressions Employability

Table G.1: PROCESS Model 4 (X = Finsit, M = LLD, Y = EM) with covariates (N = 5139)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3325$, $R^2 = 0{,}1106$, MSE = 0,4856, $F(8, 5130) = 79{,}7185$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,2955	0,0543	23,8587	0,0000	1,1891	1,4020
Finsit	0,0194	0,0101	1,9099	0,0562	-0,0005	0,0392
AgeCat2	-0,0060	0,0275	-0,2202	0,8257	-0,0599	0,0478
AgeCat3	-0,1108	0,0230	-4,8085	0,0000	-0,1560	-0,0656
EduCat2	0,1302	0,0501	2,5994	0,0094	0,0320	0,2285
EduCat3	0,4922	0,0443	11,1241	0,0000	0,4055	0,5790
EduCat4	0,6486	0,0458	14,1677	0,0000	0,5588	0,7383
EduCat5	0,7899	0,0456	17,3131	0,0000	0,7004	0,8793
Parttime	-0,0264	0,0264	-1,0013	0,3167	-0,0781	0,0253
Outcome model: Outcome = EM (controlling for LLD)						
Model summary: $R = 0{,}3972$, $R^2 = 0{,}1577$, MSE = 0,3122, $F(9, 5129) = 106{,}7222$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,3456	0,0459	29,3215	0,0000	1,2556	1,4355
Finsit	0,2421	0,0081	29,7739	0,0000	0,2262	0,2581
LLD	0,0061	0,0112	0,5447	0,5860	-0,0158	0,0280
AgeCat2	-0,0406	0,0220	-1,8444	0,0652	-0,0838	0,0026
AgeCat3	-0,0651	0,0185	-3,5139	0,0004	-0,1014	-0,0288
EduCat2	-0,0756	0,0402	-1,8795	0,0602	-0,1544	0,0033
EduCat3	-0,0984	0,0359	-2,7393	0,0062	-0,1688	-0,0280
EduCat4	-0,1731	0,0374	-4,6261	0,0000	-0,2464	-0,0997
EduCat5	-0,1770	0,0376	-4,7019	0,0000	-0,2507	-0,1032
Parttime	-0,0619	0,0211	-2,9289	0,0034	-0,1034	-0,0205
Total effect model: Outcome = EM (without LLD)						
Model summary: $R = 0{,}3971$, $R^2 = 0{,}1577$, MSE = 0,3122, $F(8, 5130) = 120{,}0418$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,3535	0,0435	31,0891	0,0000	1,2681	1,4388
Finsit	0,2422	0,0081	29,8010	0,0000	0,2263	0,2582
AgeCat2	-0,0406	0,0220	-1,8462	0,0649	-0,0838	0,0025
AgeCat3	-0,0658	0,0185	-3,5587	0,0004	-0,1020	-0,0295
EduCat2	-0,0748	0,0402	-1,8611	0,0628	-0,1535	0,0040
EduCat3	-0,0954	0,0355	-2,6878	0,0072	-0,1649	-0,0258
EduCat4	-0,1691	0,0367	-4,6083	0,0000	-0,2411	-0,0972
EduCat5	-0,1721	0,0366	-4,7060	0,0000	-0,2439	-0,1004
Parttime	-0,0621	0,0211	-2,9370	0,0033	-0,1036	-0,0206

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table G.2: Total, direct, and indirect effects of Finsit on EM (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,2422	0,0081	29,8010	0,0000	0,2263	0,2582
Direct effect (c')	0,2421	0,0081	29,7739	0,0000	0,2262	0,2581
Indirect effect via LLD (ab)	0,0001	0,0002	—	—	-0,0004	0,0007

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table G.3: PROCESS Model 4 (X = LearOr, M = LLD, Y = EM) with covariates (N = 5161)

Mediator model: Outcome = LLD

Model summary: $R = 0{,}3540$, $R^2 = 0{,}1253$, MSE = 0,4770, $F(8, 5152) = 92{,}2561$, $p = 0{,}0000$

Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,7855	0,0740	10,6156	0,0000	0,6404	0,9306
LearOr	0,2236	0,0235	9,5019	0,0000	0,1774	0,2697
AgeCat2	0,0134	0,0272	0,4930	0,6220	-0,0400	0,0668
AgeCat3	-0,0791	0,0230	-3,4403	0,0006	-0,1241	-0,0340
EduCat2	0,1396	0,0493	2,8315	0,0047	0,0429	0,2362
EduCat3	0,4820	0,0434	11,1080	0,0000	0,3970	0,5671
EduCat4	0,6262	0,0450	13,9017	0,0000	0,5379	0,7146
EduCat5	0,7590	0,0448	16,9508	0,0000	0,6712	0,8468
Parttime	-0,0300	0,0259	-1,1594	0,2464	-0,0808	0,0208

Outcome model: Outcome = EM (controlling for LLD)

Model summary: $R = 0{,}1556$, $R^2 = 0{,}0242$, MSE = 0,3607, $F(9, 5151) = 14{,}1966$, $p = 0{,}0000$

Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,6974	0,0650	26,0945	0,0000	1,5698	1,8249
LearOr	0,1641	0,0206	7,9529	0,0000	0,1237	0,2046
LLD	0,0027	0,0121	0,2227	0,8238	-0,0211	0,0264
AgeCat2	-0,0167	0,0237	-0,7067	0,4798	-0,0632	0,0297
AgeCat3	-0,0319	0,0200	-1,5923	0,1114	-0,0711	0,0074
EduCat2	0,0058	0,0429	0,1347	0,8928	-0,0783	0,0899
EduCat3	-0,0014	0,0382	-0,0360	0,9713	-0,0762	0,0735
EduCat4	-0,0992	0,0399	-2,4852	0,0130	-0,1774	-0,0209
EduCat5	-0,0640	0,0400	-1,6006	0,1095	-0,1425	0,0144
Parttime	-0,1366	0,0225	-6,0603	0,0000	-0,1807	-0,0924

Total effect model: Outcome = EM (without LLD)

Model summary: $R = 0{,}1555$, $R^2 = 0{,}0242$, MSE = 0,3607, $F(8, 5152) = 15{,}9679$, $p = 0{,}0000$

Predictor	b	SE	t	p	LLCI	ULCI
Constant	1,6995	0,0643	26,4137	0,0000	1,5734	1,8256
LearOr	0,1647	0,0205	8,0525	0,0000	0,1246	0,2048
AgeCat2	-0,0167	0,0237	-0,7052	0,4807	-0,0631	0,0297
AgeCat3	-0,0321	0,0200	-1,6050	0,1086	-0,0712	0,0071
EduCat2	0,0062	0,0429	0,1436	0,8858	-0,0779	0,0902
EduCat3	-0,0001	0,0377	-0,0020	0,9984	-0,0740	0,0739
EduCat4	-0,0975	0,0392	-2,4885	0,0129	-0,1743	-0,0207
EduCat5	-0,0620	0,0389	-1,5922	0,1114	-0,1383	0,0143
Parttime	-0,1366	0,0225	-6,0652	0,0000	-0,1808	-0,0925

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table G.4: Total, direct, and indirect effects of LearOr on EM (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,1647	0,0205	8,0525	0,0000	0,1246	0,2048
Direct effect (c')	0,1641	0,0206	7,9529	0,0000	0,1237	0,2046
Indirect effect via LLD (ab)	0,0006	0,0026	—	—	-0,0046	0,0058

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.

Table G.5: PROCESS Model 4 (X = Cog, M = LLD, Y = EM) with covariates (N = 5155)

Mediator model: Outcome = LLD						
Model summary: $R = 0{,}3592$, $R^2 = 0{,}1290$, MSE = 0,4754, $F(8, 5146) = 95{,}2594$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	0,9095	0,0604	15,0529	0,0000	0,7910	1,0279
Cog	0,1582	0,0150	10,5175	0,0000	0,1287	0,1877
AgeCat2	-0,0085	0,0272	-0,3144	0,7532	-0,0618	0,0447
AgeCat3	-0,1139	0,0228	-5,0048	0,0000	-0,1585	-0,0693
EduCat2	0,1413	0,0493	2,8685	0,0041	0,0447	0,2379
EduCat3	0,4814	0,0434	11,0941	0,0000	0,3963	0,5664
EduCat4	0,6165	0,0451	13,6676	0,0000	0,5281	0,7049
EduCat5	0,7320	0,0450	16,2492	0,0000	0,6437	0,8203
Parttime	-0,0159	0,0259	-0,6148	0,5387	-0,0668	0,0349
Outcome model: Outcome = EM (controlling for LLD)						
Model summary: $R = 0{,}1122$, $R^2 = 0{,}0126$, MSE = 0,3651, $F(9, 5145) = 7{,}2895$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,0434	0,0541	37,7711	0,0000	1,9374	2,1495
Cog	0,0213	0,0133	1,5957	0,1106	-0,0049	0,0474
LLD	0,0125	0,0122	1,0266	0,3047	-0,0114	0,0365
AgeCat2	-0,0299	0,0238	-1,2585	0,2083	-0,0766	0,0167
AgeCat3	-0,0520	0,0200	-2,6013	0,0093	-0,0912	-0,0128
EduCat2	0,0008	0,0432	0,0194	0,9845	-0,0839	0,0855
EduCat3	0,0044	0,0385	0,1143	0,9090	-0,0710	0,0798
EduCat4	-0,0897	0,0402	-2,2293	0,0258	-0,1686	-0,0108
EduCat5	-0,0521	0,0405	-1,2860	0,1985	-0,1314	0,0273
Parttime	-0,1359	0,0227	-5,9813	0,0000	-0,1805	-0,0914
Total effect model: Outcome = EM (without LLD)						
Model summary: $R = 0{,}1113$, $R^2 = 0{,}0124$, MSE = 0,3651, $F(8, 5146) = 8{,}0688$, $p = 0{,}0000$						
Predictor	b	SE	t	p	LLCI	ULCI
Constant	2,0548	0,0529	38,8089	0,0000	1,9510	2,1586
Cog	0,0232	0,0132	1,7632	0,0779	-0,0026	0,0491
AgeCat2	-0,0301	0,0238	-1,2630	0,2066	-0,0767	0,0166
AgeCat3	-0,0534	0,0199	-2,6792	0,0074	-0,0925	-0,0143
EduCat2	0,0026	0,0432	0,0605	0,9518	-0,0820	0,0873
EduCat3	0,0104	0,0380	0,2744	0,7838	-0,0641	0,0850
EduCat4	-0,0820	0,0395	-2,0738	0,0382	-0,1595	-0,0045
EduCat5	-0,0429	0,0395	-1,0860	0,2775	-0,1203	0,0345
Parttime	-0,1361	0,0227	-5,9903	0,0000	-0,1807	-0,0916

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Note. Unstandardized coefficients (b). LLCI/ULCI are 95% confidence interval bounds. Covariates: AgeCat2, AgeCat3, EduCat2–EduCat5, Parttime.

Table G.6: Total, direct, and indirect effects of Cog on EM (PROCESS Model 4; bootstrap = 5000)

Effect	Estimate	SE/BootSE	t	p	LLCI/BootLLCI	ULCI/BootULCI
Total effect (c)	0,0232	0,0132	1,7632	0,0779	-0,0026	0,0491
Direct effect (c')	0,0213	0,0133	1,5957	0,1106	-0,0049	0,0474
Indirect effect via LLD (ab)	0,0020	0,0018	—	—	-0,0015	0,0057

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Note. Indirect effect uses percentile bootstrap confidence intervals (5000 samples); therefore t and p are not reported for the indirect effect in PROCESS output. Confidence level = 95%.