Centro de Investigación Mente, Cerebro y Comportamiento (CIMCYC)

UNIVERSIDAD DE GRANADA

PROGRAMA DE DOCTORADO EN PSICOLOGÍA (B.13.56.1)

TESIS DOCTORAL

VARIABLES MODULADORAS DE LA COGNICIÓN ANTE LA AUSENCIA DE EMPLEO

MARÍA VÉLEZ COTO

Esta Tesis Doctoral ha sido dirigida por:

Alfonso Caracuel Romero y Miguel Pérez García

Editor: Universidad de Granada. Tesis Doctorales
Autor: María Vélez Coto
ISBN: 978-84-1306-743-8
URI: http://hdl.handle.net/10481/65439

Editor: Universidad de Granada. Tesis doctorales
Autora: María Vélez Coto

"… y se dio cuenta de que nadie jamás está solo en el mar."
- E. Hemingway -

En este proceso tan largo y enriquecedor he tenido la suerte de contar con el apoyo y compañía de personas maravillosas que han hecho de estos años mucho más que una etapa de crecimiento profesional.

Gracias a mi familia, en especial a mis padres. Gracias por mantenerme y apoyarme en el camino de todas las formas posibles, por transmitirme la pasión por el trabajo y por estar siempre orgullosos. Por darme la educación que he recibido, la más importante de todas. Hoy soy quien soy por vosotros. Os quiero.

Moody, gracias por tener tanta paciencia. ¡Te debo tantos paseos!

A mis pilares fundamentales. Luna, mi hermana por suerte. Siempre ahí incluso cuando la vida nos pone lejos. Gracias por tu fe, por tus dosis de realidad y por recordarme que «casa» está donde nosotras queramos que esté. Sandra, tu cariño, tu apoyo diario, nuestras risas… han sido el gran hallazgo de todo esto. Gracias por tu existencia y por compartirla conmigo. Almu, amiga. Gracias por tu templanza, por tu sabiduría, fuerza y compañía. Por los ratos intentando descifrar cómo disfrutar y cómo superar todo lo que se nos presenta.
La vida con vosotras es más vida. ♡

Gracias a las personas que han aportado mucho a mi vida y no se lo he dicho lo suficiente. Rafiti, por estar siempre, pase lo que pase. Noemí, por madurar todos estos años conmigo. Álvaro y María, porque juntos aprendimos a pensar e investigar la psicología. Jose, gracias por hacer que tanto cariño sobreviva a los años y los kilómetros. Marina, por una amistad infinita que a pesar de las distancias y los vaivenes seguirá siendo parte de mí.

A los componentes de PNínsula que han traspasado límites. Nat, tengo mucho que agradecerte. Gracias por tu confianza, por haberme acompañado en gran parte de este proceso, dentro y fuera de él. Carlos, gracias por las risas, charlas y consejos. Auxi, gracias por tener esa sonrisa permanente y por tu cariño. Por cuidarme y por acompañarme en momentos importantes. Mis queridas *girls*: Julia, Encarna, Sabina y Noelia. Gracias por ser como sois, por tantos buenos momentos y por vuestro ánimo y apoyo.
PNínsula, un cerebro formado de colores tan diversos y necesarios como quien lo compone. Os he sentido como a mi segunda familia.

Por supuesto, a mis directores de tesis: Miguel y Alfonso.
Miguel, eres todo un ejemplo. Gracias por hacerme ver que, aunque las cosas no son fáciles, hay un camino y una oportunidad para todos. Por enseñarnos a ser grandes profesionales y mejores personas. Un jefazo como tú es un lujo, eres inspirador. Gracias por confiar en este proyecto y en mí para llevarlo a cabo.
Alfonso, lo tuyo excede todas las esferas posibles. Gracias también por haber confiado en esta idea y en que fuera capaz de desarrollarla. Gracias por ser mi mentor. Gracias por contar conmigo para hacer otras tantas cosas. Por ayudarme a buscar el hueco. Por tus palabras. Por la paciencia. Por tu ayuda inmensurable. Por tu tiempo. Por enseñarme tantas cosas. Gracias, gracias, gracias.

Thanks to Ross Andel for giving me the opportunity to learn from him and for making it possible one of the best experiences in my life.

A todas las personas desempleadas que decidieron ser el corazón de esta investigación. Gracias por compartir vuestras sensaciones conmigo.

Y gracias a ti, por tu interés en leer estas páginas.

∴

Parte de este proyecto se llevó a cabo gracias a un proyecto de financiación colectiva a través de la plataforma *iLoveScience*. Gracias también a quienes participaron en él:

Eva Aneiros, Carlos Gil, Patricia Ramírez, Mery Dávila, Laura Guerrero, José Vélez, Sebastiano de Franciscis, Jesús Coto, Pnínsula, Antonio Pérez, Noelia Sáez, Ángela Rodríguez, Natalia Bueso, Héctor Cobacho, Mª Ángeles García León, Rafa Armada, Oren Contreras, Cástor Aranda, Julia Daugherty, Silvia Vélez, Romualdo Abellán, Mª Jesús Pérez Carrillo, Sandra Santiago, Sara Medrano, Sandra Rute, Miguel Ángel Ábalos, Ismael Parra, Esperanza Vergara, Juan Verdejo, Fina Salom, Rafael Caparrós, Miriam Albusac, Trinidad Caracuel, Carlos Valls, Alba MG, Ana Rodríguez, Alfonso Caracuel, Álvaro Holgado, Luis Fernández, Miguel Pérez, Fernando García, Lucía Prieto, Beatriz M, Cristina Martín, Manuela Coto, Ana Santos, Mª José Rodríguez Fórtiz.

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RESUMEN

RESUMEN

La vida laboral de las personas ocupa prácticamente la totalidad de la vida adulta, por lo que la convierte en una faceta relevante en el desarrollo de la identidad, el estatus social, las relaciones interpersonales y las habilidades personales, intelectuales y manuales. Su gran alcance hace que el empleo tenga un impacto sobre el bienestar físico, psicológico y cognitivo de las personas. No obstante, llegado un punto, la actividad laboral finaliza, dando paso a la jubilación, la cual supone una transición vital. Este cambio también afecta a las diferentes esferas de la salud de los individuos y en él puede resultar determinante la vivencia de experiencias anteriores.

El desarrollo ocupacional que experimenta cada persona también puede verse detenido por crisis de estabilidad, como sucede ante una situación de desempleo. Actualmente, en el año 2020, se calcula que existen aproximadamente 190,5 millones de personas desempleadas en todo el mundo. La situación laboral de desempleo también interfiere en la salud y calidad de vida de las personas, pero, además, las diferencias individuales en el estado físico, cognitivo y emocional también puede determinar la permanencia o la exclusión del mercado laboral. Sin embargo, los estudios de investigación existentes aún no han profundizado lo suficiente en cómo se interrelacionan los factores sociodemográficos, ocupacionales y emocionales que pueden intervenir en el rendimiento cognitivo de las personas desempleadas. Así, si el desempleo se enfocara de una manera global e incluyeran los factores anteriores, se podrían desarrollar intervenciones más eficientes que mejoraran la vida de los afectados.

En vista de todo ello, el objetivo principal de la presente Tesis Doctoral es analizar la relación entre la ausencia de empleo, por desempleo o jubilación, y el rendimiento

cognitivo, así como las variables que modulan esta asociación. Para ello, esta Tesis Doctoral consta de un total de 9 capítulos estructurados en cuatro apartados.

En la primera parte, se revisa la literatura relacionada con cómo el trabajo, y su ausencia, se relacionan con el rendimiento cognitivo. En el capítulo 1 se realiza una conceptualización del trabajo y el significado vital que tiene para las personas. Igualmente, se presenta la influencia que ejerce sobre la salud y el rendimiento cognitivo, así como los principales hallazgos y modelos teóricos que la apoyan. En el capítulo 2 se exponen los efectos de la transición a la jubilación y su influencia en el envejecimiento cognitivo. Asimismo, se indican de forma específica los hallazgos sobre la influencia de la complejidad del trabajo desempeñado a lo largo de la adultez en el rendimiento cognitivo de los mayores. En el capítulo 3 se describe el impacto que tiene el desempleo en todas las áreas vitales: salud física y emocional, repercusiones sociales, y rendimiento cognitivo, así como recoge el debate sobre la bidireccionalidad de esta asociación. Además, se exponen los modelos teóricos que explican los efectos psicológicos y cognitivos de la ausencia de empleo.

El segundo apartado incluye el capítulo 4, en el cual se presenta la justificación y los objetivos específicos de la presente Tesis.

En el tercer apartado, compuesto por los capítulos 5-7, se presenta la memoria de los trabajos empíricos realizados para cumplir con los objetivos de la Tesis Doctoral. Los dos primeros estudios están incluidos en el capítulo 5. La primera parte de este estudio tuvo como objetivo determinar la influencia de la complejidad laboral en el rendimiento cognitivo de un grupo de trabajadores mayores. Los resultados mostraron una asociación positiva entre el nivel de complejidad del trabajo y el funcionamiento ejecutivo. El segundo estudio tuvo como objetivo estudiar la influencia de la complejidad

laboral en el cambio cognitivo producido durante la transición a la jubilación. Los resultados mostraron que aquellos que tuvieron un empleo de alta complejidad en el trato con personas presentaron un declive cognitivo más atenuado tras la jubilación. El tercer estudio, comprendido en el capítulo 6, tuvo como objetivo analizar y determinar la fuerza de la asociación entre el desempleo y el estado cognitivo. Los resultados de la revisión sistemática y metaanálisis mostraron evidencias para la causalidad directa e inversa. No obstante, se mostraron más consistentes para un efecto del desempleo sobre la cognición. Por último, incluido en el capítulo 7, el estudio 4 consistió en comprobar la validez de un modelo integral sobre la relación del desempleo con el estado cognitivo y emocional en adultos sanos, teniendo en cuenta el efecto de variables sociodemográficas y ocupacionales. Los resultados mostraron un efecto directo de las variables ocupacionales y de la duración del desempleo sobre el rendimiento cognitivo, especialmente en el funcionamiento ejecutivo.

En la cuarta sección, la cual incluye el capítulo 8, se incluye la discusión general y conclusiones de los resultados obtenidos en la presente Tesis Doctoral. Todos los resultados obtenidos indican que la ausencia de empleo, bien a causa de la jubilación o el desempleo, provoca una alteración del rendimiento cognitivo. Estos cambios, además, están modulados por factores ocupacionales, sugiriendo que una mayor estimulación obtenida a través de la complejidad del empleo contribuye a la capacidad de reserva cognitiva, protegiendo al funcionamiento cognitivo en situaciones críticas.

Por último, en el quinto apartado se presenta el capítulo 9, el cual se reserva para la obtención de la mención de Doctorado Internacional.

SUMMARY

The working life spans most of adulthood. That makes it a relevant facet in the development of identity, social status, interpersonal relationships and personal, intellectual and manual skills. Employment has a great scope, and impact on the physical, psychological and cognitive well-being of people. However, at some point, work activity ends, giving way to retirement, which is a vital transition. This change also affects the different spheres of the health of individuals. Previous experiences can also be a determining factor in this change.

The occupational development that each person experiences can also be halted by crises of stability, as occurs in unemployment. Currently, in the year 2020, it is estimated that there are approximately 190.5 million unemployed people worldwide. Unemployment also interferes with people's health and quality of life. But the opposite also happens, individual differences in physical, cognitive and emotional status can also determine permanence or exclusion from the labor market. However, the studies have not yet gone deeply enough into how the sociodemographic, occupational and emotional factors that may intervene in the cognitive performance of unemployed individuals are interrelated. Thus, if the study of unemployment were approached in a comprehensive manner and included the above factors, more efficient interventions could be developed to improve the lives of those affected.

In view of all this, the main objective of this Doctoral Thesis is to analyze the relationship between the absence of work, due to unemployment or retirement, and cognitive performance, including variables that modulate this association. For that purpose, this Doctoral Thesis comprises a total of 9 chapters structured in four sections.

In the first part, the literature related to how work and its absence are related to cognitive performance is reviewed. Chapter 1 includes a conceptualization of work and its meaningful role. It also presents the influence work has on health and cognitive performance, as well as the main findings and theoretical models that support this association. Chapter 2 presents the effects of the transition to retirement and its influence on cognitive aging. Likewise, the findings about the influence of complexity of pre-retirement work on the cognitive performance of older adults are indicated. Chapter 3 describes the impact of unemployment in distinct areas of life: physical and emotional health, social impacts, and cognitive performance, as well as includes the debate on the bidirectional nature of this association. In addition, the theoretical models that explain the psychological and cognitive effects of the lack of employment are exposed.

The second section includes chapter 4, in which the justification and specific objectives of this Thesis are presented.

The third section, comprised by chapters 5-7, presents the empirical works conducted to fulfill the objectives of the Doctoral Thesis. The first two studies are included in chapter 5. The first part of this study was aimed to determine the influence of occupational complexity on the cognitive performance of a group of mid-age and older workers. The results showed a positive association between the level of complexity of work and executive functioning.

The second study was aimed to study the influence of occupational complexity on the cognitive trajectory during the transition to retirement. The results showed that those who had a higher complex job in dealing with people showed an attenuated cognitive decline after retirement. The third study, included in chapter 6, aimed to analyze and determine the strength of the association between unemployment and

cognitive status. The results of the systematic review and meta-analysis showed evidence for both the normal and reverse causation. However, they were more consistent for an effect of unemployment on cognition. Finally, included in chapter 7, the fourth study consisted of testing the validity of a comprehensive model about the relationship between unemployment and cognitive and emotional state in healthy adults, accounting for the effect of sociodemographic and occupational variables. The results showed a direct effect of both the occupational variables and length of unemployment on the cognitive performance, especially in the executive functioning.

The fourth section, which includes chapter 8, includes the general discussion and conclusions of the results obtained in the present Doctoral Thesis. All the results indicated that the absence of employment, either due to retirement or unemployment, causes an alteration in cognitive performance. These changes are modulated by occupational factors, suggesting that a greater stimulation obtained through education and complexity of work contributes to the capacity of cognitive reserve, protecting cognitive functioning in critical situations.

Finally, in the fifth section, chapter 9 is presented, which is reserved for obtaining the mention of International Doctorate.

I. INTRODUCCIÓN

Capítulo 1.
El trabajo y su influencia en la salud

Algunos fragmentos este capítulo han sido traducidos y adaptados de Vélez-Coto, M., Andel, R., Pérez-García, M. & Caracuel, A. (In press). Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement. *Psychology and Aging*.

1.1. El concepto de trabajo y su significado vital

Desde el punto de vista de la teoría del ciclo vital (Erikson, 1985), el desarrollo evolutivo se traduce como un proceso que tiene lugar a través de distintas etapas en la vida de una persona y en las que la tanto la estabilidad, como los cambios, son elementos fundamentales. A cada etapa vital se le atribuyen una serie de hitos, roles sociales, normas y procesos. En el caso de la vida adulta, estos eventos no dependen tanto del paso del tiempo y de un desarrollo madurativo, sino que están asociados a la propia experiencia personal. Así, la adultez se caracteriza por la adquisición de nuevos roles y crisis relacionadas con los mismos (Stassen & Thompson, 2001). Entre los tres más importantes se encuentran: el rol familiar, el comunitario y el rol laboral (Izquierdo, 2012).

El trabajo permite a los individuos construir su identidad como adulto (Neffa, 2015), además de fomentar las relaciones interpersonales, movilizar sus conocimientos y descubrir y desarrollar las propias habilidades y potencialidades (Organización Internacional del Trabajo, OIT, 1982).

El empleo adquiere un significado que va más allá de la remuneración económica obtenida a cambio de un esfuerzo físico y/o mental (Rosso et al., 2010). Por ello, las personas adoptan una aptitud comprometida con su trabajo, en parte por la motivación intrínseca de procurarse el propio bienestar y una buena calidad de vida (Wielers & van der Meer, 2020). Según la teoría de la autodeterminación (Deci & Ryan, 2000), hay tres aspectos que llevan a las personas a implicarse en su empleo y cubren tres necesidades básicas:

- *La autonomía para tomar decisiones en el trabajo*. Este elemento hace referencia al grado en el que la persona se siente libre para decidir qué hacer y cómo. No

obstante, aunque los distintos trabajos difieren en el grado de autonomía que tienen los empleados, esta característica está también relacionada con el nivel de felicidad (van der Meer & Wielers, 2013). En el lado opuesto se encontraría la presión laboral.

- *Los sentimientos de familiaridad y las oportunidades para relacionarse*. La posibilidad de tener relaciones de calidad con compañeros de trabajo, así como con superiores, incrementa la sensación de pertenencia y, por tanto, el bienestar de los trabajadores.
- *Competencia*. Este requisito se refiere a la posibilidad de aplicar los propios conocimientos, talentos y habilidades de una forma estructurada y dirigida hacia un objetivo.

En definitiva, el trabajo permite el desarrollo de la identidad, habilidades sociales y capacidades y conocimientos, pero además se trata de un contexto en el que estas habilidades son requeridas y demandadas. Estas características conllevan que el empleo aporte una serie de beneficios para la salud física y psicológica.

1.2. Influencia del empleo en la salud

Establecer una relación entre el empleo y la salud resulta complicado en tanto que las variaciones en los niveles de salud pueden ser causa o consecuencia de cambios en el estado y las condiciones laborales (Modini et al., 2016). Además, para entender la relación entre la salud y el trabajo es necesario tener en cuenta que en ella intervienen factores socioeconómicos que determinan el acceso y las oportunidades a factores preventivos y paliativos de la salud (Waddel & Barton, 2006).

No obstante, el tener un trabajo se ha asociado a un mayor bienestar percibido, menor presencia de síntomas depresivos y ansiosos, más recursos de afrontamiento y

más oportunidades para realizar actividades que son beneficiosas para la salud (Modini et al., 2016). De manera más específica, un 16% de las personas con empleo presentan problemas psicológicos, en comparación al 34% de las personas desempleadas (Paul & Moser, 2009). Además, comenzar a trabajar tras un período de desempleo, está asociado a una mejora en la salud física general, funcionamiento corporal y social, vitalidad, dolores corporales y en otras limitaciones por problemas emocionales o físicos, así como una mejora en la salud mental (Schuring et al., 2011). También Butterworth et al. (2011) vieron que los empleados tenían una mayor salud mental que las personas que no participaban en el mercado laboral. Sin embargo, esto estaba condicionado por la calidad del trabajo, medida en función de la seguridad, la percepción de tener un sueldo justo, el control percibido, y las demandas y complejidad laboral. Teniendo esto en cuenta, encontraron que quienes tenían un empleo de peor calidad mostraban peor salud mental que aquellos con un mejor trabajo.

En este sentido, parece ser que las características del empleo juegan un papel fundamental en cómo influye el trabajo en la salud, pues según éstas el empleo puede suponer un beneficio o una amenaza (Waddel & Barton, 2006).

1.2.1. Factores que moderan la influencia del empleo en la salud

En primer lugar, la categoría laboral, puede determinar el acceso a ciertos beneficios del empleo y, por tanto, a un efecto más positivo sobre la salud, siendo mayor para aquellos con una categoría laboral más alta. Estos beneficios, según Batinic et al. (2010), consistían en un mayor significado colectivo, el acceso a contacto social, la realización de actividades estimulantes, un mayor estatus e identidad social y una mayor estructura del tiempo.

También se ha hecho referencia, con relación a la salud, al grado de control en el trabajo, la exposición a peligros físicos, los turnos u horarios y la inseguridad laboral (Doyle et al., 2005).

El control en el trabajo, es decir, la posibilidad de ejercer influencia en el propio empleo se ha asociado positivamente con la presencia de trastornos mentales como la depresión o exhaustividad emocional (Rosen & Wischniewski, 2019; Theorell et al., 2015), así como con el bienestar psicológico general (Häusser et al., 2010).

Además, según el empleo, los trabajadores pueden estar expuestos de forma directa o indirecta a agentes nocivos para la salud, como la manipulación de objetos contaminados, ruido excesivo, alta exposición al sol, temperatura inadecuada, mala calidad del aire, falta de ventilación, o exceso de polución (Pacheco-Ferreira et al., 2018).

También los horarios y turnos laborales se han asociado a variaciones en la salud de los trabajadores, de forma que un horario de trabajo muy largo incrementa el riesgo de trastornos cardiovasculares, reducción del sueño, diabetes, fatiga y empeora la salud percibida (Doyle et al., 2005). Una reciente revisión y metaanálisis (Rivera et al., 2020) ha encontrado que turnos largos y rotativos se relacionan con un mayor riesgo de cáncer de pecho y accidente cerebrovascular. Igualmente, se ha observado un empeoramiento del rendimiento cognitivo, especialmente de la memoria de trabajo, a través del estrés oxidativo que provocan los turnos rotativos (Özdemir et al., 2013).

Por su parte, la incertidumbre sobre la continuidad del propio trabajo también se ha relacionado con un peor estado de salud (Mantler et al., 2005). Concretamente, tras analizar conjuntamente 56 estudios sobre este efecto, se vio que la seguridad laboral estaba asociada a un mayor bienestar psicológico y/o emocional, satisfacción vital, y a una menor presencia de síntomas ansiosos y depresivos (Llosa et al., 2018). También la

seguridad, junto con la capacidad de mantener un balance vida-trabajo, se ha relacionado con una menor probabilidad de solicitar una baja por enfermedad (Antai et al., 2015).

En el caso de los trabajadores mayores, la relación entre el empleo y la salud debe tener en cuenta otras consideraciones, pues se encuentran en diferentes condiciones en lo que a nivel laboral, económico, social y de salud respecta. La salud física y mental comienza a deteriorarse con la edad y, con ella, la capacidad para trabajar (Doyle et al., 2005), por lo que son el principal objetivo de las políticas de promoción de la salud laboral (Ahonen, 2015). Además, en esta población, la inseguridad laboral está más estrechamente relacionada con la disminución del bienestar psicológico y la reducción de la salud física.

No obstante, a medida que el momento de la jubilación se va acercando, los trabajadores mayores prefieren realizar tareas más diversas, dedicarse a mentorizar a trabajadores jóvenes, tener más flexibilidad en el horario y buscar la motivación en aspectos emocionales, lo que puede tener un efecto favorable en el bienestar mental (Rau & Adamas, 2005).

1.3. Influencia del empleo en el rendimiento cognitivo

El empleo, junto con la educación y las actividades sociales, se ha venido considerando desde hace tiempo como uno de los mayores facilitadores del funcionamiento cognitivo (Ikanga et al., 2016; Schooler et al., 1999; Stern et al., 1995, 2006).

El hecho de que el trabajo movilice los recursos cognitivos de las personas y así los estimulen, podría explicarse por el hecho de que un ambiente laboral complejo lleva a los individuos a confrontar nuevas situaciones y dificultades, de manera que tienen que poner en marcha sus habilidades para ofrecer nuevas respuestas y soluciones que

satisfagan esas necesidades (Russo, 2016). Este desarrollo cognitivo, además, se transferiría a otros contextos debido a que el aprendizaje informal por medio del empleo se obtiene a través de la experiencia directa, a la cual se le atribuye un significado (Garrick, 1998).

A pesar de estos razonamientos, algunos autores vienen discutiendo desde hace tiempo la posibilidad de que la relación entre un trabajo estimulante y la cognición se deba a que las personas con mejores habilidades cognitivas generalmente tienen niveles educativos más altos y, por tanto, un mayor acceso a trabajos clasificados como más estimulantes (Hyllegard & Lavin, 1992; Oltmanns et al., 2017). En este sentido, existen algunos estudios que han controlado el nivel de habilidad cognitiva previa a la consecución del trabajo. En el caso de Fujishiro et al. (2019) lo que observaron fue que el trabajo tuvo un efecto mayor en aquellas personas con nivel educativo más bajo. Además, estimaron que el nivel protector atribuido al nivel educativo se debe en un 11-22% a la complejidad laboral. Por su parte, Chapko et al. (2016) observaron que la ocupación tuvo un efecto directo en la cognición, independiente incluso del nivel de inteligencia en la infancia.

Con el objetivo de determinar cómo influye el empleo en el rendimiento cognitivo, se han estudiado fundamentalmente cinco características del trabajo (Hussenoeder et al., 2019): las demandas mentales, control laboral, carga mental, complejidad laboral y novedad en el trabajo.

1.3.1. Introducción a los conceptos de demandas mentales, control laboral, carga mental, complejidad laboral y novedad en el trabajo

Los conceptos de demanda mental, complejidad laboral y novedad en el trabajo se encuentran bastante relacionados. No obstante, cada uno de ellos hace hincapié en determinados aspectos y utiliza diferentes indicadores para evaluarse.

En primer lugar, el concepto de demanda mental es uno de los más utilizados en la literatura y hace referencia al grado en el que un trabajo requiere realizar actividades mentales. A lo largo de la literatura, los métodos para medirlo han resultado ser considerablemente heterogéneos. Generalmente, el grado de demandas mentales suele evaluarse mediante una serie de preguntas realizadas a los trabajadores relacionadas con la cantidad de oportunidades de formación, la riqueza intelectual del empleo y si éste permite aprender cosas nuevas y el desarrollo de habilidades, y con el esfuerzo cognitivo que se debe realizar en el trabajo (Marquie et al., 2010). Posteriormente, a elección de los autores, estas respuestas se recogen en un solo índice o se asocian con otras clasificaciones.

El control laboral refleja el grado en el que a un trabajador se le permite hacer uso de su valoración personal y controlar su trabajo, por ejemplo, en cuanto a la forma de hacer las tareas, administración del tiempo, o métodos. Este concepto está más relacionado con el estrés laboral que con las características del propio empleo que puedan realizar algún tipo de estimulación cognitiva. Uno de sus beneficios, es que puede aplicarse a trabajos más modernos en los que el ambiente y la realización de trabajos no está tan definida. Sin embargo, resulta más complicado de conceptualizar en el área de investigación y diferenciar adecuadamente sus efectos.

El término carga mental está relacionado con la carga cognitiva y generalmente se evalúa con el índice de la Carga de Tarea NASA (Hart, 2016) y se define como el grado en el que un trabajo requiere concentración, precisión, presión temporal y demandas mentales generales, con mucha o poca complejidad. Se trata de una medida más subjetiva basada en la percepción de las demandas y el impacto que tiene sobre el trabajador. Por ello, también se le critica su escasa especificidad para describir implicaciones concretas, así como es lo suficientemente subjetivo como para realizar generalizaciones.

La clasificación más utilizada es el modelo de la complejidad laboral "datos-personas-cosas", pionera en los estudios sobre los beneficios cognitivos del trabajo (Hussenoeder et al., 2019). El concepto de complejidad laboral hace referencia al grado en el que un empleo provee de tareas cognitivamente demandantes y de incentivos para desarrollar y mejorar las habilidades cognitivas, así como facilita oportunidades para interaccionar socialmente (Denier et al.,2017). Para determinar el grado de complejidad que tiene cada empleo, la Red de Información Ocupacional del Departamento de Trabajo de Estados Unidos emitió en 1939 una clasificación elaborada por analistas laborales basada en su observación de los diferentes empleos: el Diccionario de Títulos Ocupacionales (Miller et al., 1980). Desde entonces, esta clasificación ha sido actualizada y ampliada hasta el año 1991, en el cual fue reemplazada por la adaptación que realiza cada año la Red de Información Ocupacional (O*NET). La clasificación de complejidad laboral se compone de una lista de habilidades específicas que son requeridas en cada ocupación y están ordenadas en función del grado de complejidad en tres modalidades: complejidad con los datos, personas y cosas. La complejidad con datos hace referencia al grado en que una persona debe observar, interpretar o crear información, conocimiento

e ideas relacionados con palabras, números, ideas o conceptos. La complejidad del trabajo con personas se mide en función del tipo de interacción (asesoramiento, negociación, supervisión, servicio, etc.) que tiene que realizar con otros individuos en su trabajo. Por último, la complejidad laboral con cosas clasifica la interacción con herramientas, sustancias o productos según el grado de control y responsabilidad que tenga sobre ellos (crear, operar, manipular o manejar, entre otros).

Ante las críticas de que la complejidad laboral asume una mayor estabilidad en las actividades laborales y que no recoge de forma específica los procesos que están más relacionados con los procesos cognitivos, estudios recientes han propuesto el concepto del procesamiento de la novedad en el trabajo (Oltmanns et al., 2017). Este concepto evalúa el grado en el que un trabajo se aleja de la rutina, teniendo que aprender nuevas habilidades o lidiar con nuevos materiales. Esta propuesta propone crear una medida más relacionada con procesos cognitivos específicos de aprendizaje y flexibilidad, entendiendo que incluso los trabajos menos complejos pueden tener un efecto protector del rendimiento cognitivo. Para medirlo, sus creadores también han utilizado índices de la Red de Información Ocupacional (O*NET) del Departamento de Trabajo de Estados Unidos, aunque utilizando otros indicadores que hacen referencia a procesos mentales más concretos implicados en cada empleo.

1.3.2. Evidencias de la influencia del empleo en el rendimiento cognitivo

A pesar de encontrar una amplia literatura acerca de las diferentes medidas del grado de demanda y complejidad laboral, los resultados sobre cómo afectan al rendimiento cognitivo de los trabajadores sanos no son tan numerosos, pues han sido mayormente estudiados con relación al rendimiento cognitivo en la vejez (Andel et al., 2016, 2017; Lane et al., 2017; Nexø et al., 2016).

Aun así, existen evidencias de que un nivel mayor de demandas en el trabajo se ha asociado a un mejor funcionamiento cognitivo, y a un menor riesgo de declive cognitivo y demencia en la vejez (Potter et al., 2008; Schooler et a., 1999; Then et al, 2014). De forma más específica, Marquie et al. (2010) encontraron que, en trabajadores entre 32 y 62 años, un mayor nivel de demandas cognitivas en el trabajo estaba asociado a mayores niveles de rendimiento cognitivo y a un cambio más favorable a lo largo de 10 años de seguimiento. Todo ello controlando los efectos de la edad, educación y variables médicas y psicosociales. Por otro lado, un estudio que ha evaluado el rendimiento cognitivo en personas de entre 32 y 84 años representativas de la población estadounidense (Grzywacz et al., 2016), ha encontrado que aquellas que tenían un empleo donde se requería identificar problemas complejos, evaluarlos e implementar soluciones, mostraron mejor memoria episódica y funcionamiento ejecutivo. En esta línea, también se ha observado un menor rendimiento en tareas de control de cambio y una menor actividad electrofisiológica en trabajadores, de entre 18-30 y 48-58 años, que tenían empleos menos complejos (Gajewski et al., 2010). Otro estudio longitudinal con trabajadores de entre 42 y 56 años halló que una mayor complejidad laboral acumulada lo largo de la vida laboral estaba asociada a una mejor velocidad de procesamiento y flexibilidad cognitiva (Kraup et al., 2018), controlando factores sociodemográficos, educación y estado de salud. Por su parte, Fisher et al. (2014) también observaron en trabajadores mayores un mayor rendimiento cognitivo, antes de la jubilación, asociado a altos niveles de demanda mental.

En cuanto a la complejidad laboral, recientemente, Sörman et al. (2019) observaron que en trabajadores de entre 50-75 años, un mayor grado de complejidad

laboral con datos se relacionaron con una mejor memoria de trabajo, y una mayor complejidad laboral con personas se asoció a una mejor flexibilidad cognitiva.

Por último, en cuanto a los resultados relacionados con el procesamiento de novedad en el trabajo, en un estudio donde se analizó la trayectoria de trabajadores durante 17 años, se vio que mayores niveles de novedad se asociaron a un mayor rendimiento de la velocidad de procesamiento y memoria de trabajo (Oltmanns et al., 2017). Además, también estuvo relacionada con un mayor volumen de la materia gris en regiones estriatales, frontales e insulares. De forma más reciente, Staudinger et al. (2020) encontraron que la exposición a la novedad en el trabajo durante 14 años atenuó el declive de la memoria inmediata y atención en trabajadores mayores de 50 años.

No obstante, todavía no se cuenta con suficiente información sobre cuáles son las características específicas del empleo que más relevancia tienen, así como cuáles son las características de los trabajadores que más pueden beneficiarse de entornos laborales complejos. Igualmente, aún no se ha alcanzado un consenso sobre cuáles son, y cómo funcionan, los mecanismos que hacen que la complejidad del trabajo module el rendimiento cognitivo.

1.3.3. Modelos explicativos de la influencia del empleo en el funcionamiento cognitivo

a) Teoría de la complejidad ambiental: la estimulación

Esta teoría fue propuesta por Schooler (1984) basándose en los resultados de una investigación sobre la personalidad y el trabajo, así como por hallazgos sobre los efectos de ambientes complejos en entornos laborales, sobre ambientes enriquecidos en niños y mayores, así como en resultados de estudios animales y de psicología social. De acuerdo con esta teoría, un ambiente es complejo si los estímulos son diversos, requieren tomar decisiones, proporcionan una gran variedad de información entre la que decidir y los

posibles resultados son contradictorios y poco predecibles. Además, si ese entorno recompensa el esfuerzo cognitivo, las personas estarían más motivadas y condicionadas para desarrollar sus capacidades cognitivas y generalizar esas habilidades a otras situaciones.

b) El trabajo como estimulador de la salud cerebral

Según Vance et al. (2016), el trabajo puede producir un efecto positivo en las habilidades cognitivas gracias a la plasticidad cerebral, incrementando la reserva cognitiva. Concretamente, basándose en la literatura previa, Vance et al. (2016) establecen que hay cinco características del trabajo que pueden mediar el mantenimiento y mejora de la cognición: la participación social, la rutina, el establecimiento de objetivos y su significado, los ingresos económicos y, por último, el aprendizaje de nuevas habilidades.

La participación social, por su relación con la interpretación del lenguaje no verbal, por la transmisión e interpretación de mensajes informativos y emocionales, la anticipación de las respuestas de los demás o el recuerdo de detalles de información personal y de conversaciones pasadas, se puede considerar una fuente de estimulación cognitiva. En este sentido, se ha observado que personas con mayores redes sociales tienen un mejor rendimiento de memoria de trabajo, memoria episódica y velocidad de procesamiento (de Frias & Dixon, 2014; Jedrziewski et al., 2014). Igualmente, una reducción de las relaciones sociales se ha asociado a mayor riesgo de deterioro cognitivo (Evans et al., 2019; Saczynski et al., 2006) y peor salud mental (Rohde et al., 2016).

La rutina permite llevar un estilo de vida más saludable, pues organiza la alimentación, el horario de sueño o la actividad física. Estos hábitos que son beneficiosos

para la salud cerebral se reflejarían en un mejor rendimiento cognitivo, como han indicado estudios previos (Erickson et al., 2019; Lo et al., 2016; Spencer et al., 2017).

El establecimiento de objetivos y el significado que tiene el trabajo proporciona a las personas una perspectiva interna que influencia la percepción sobre los factores estresante de la vida diaria, ayudándoles a desarrollar una mayor resiliencia para enfrentar los obstáculos (Matuska, 2013). En un estudio realizado por Hakanen y Wilman (2012) se encontró que aquellos trabajadores que daban un mayor significado a sus empleos presentaban menor estrés ocupacional. Esta menor respuesta al estrés provoca que los trabajadores se vean menos afectados por los efectos nocivos de éste. Es decir, esta resistencia al estrés resulta en una mayor protección cerebral debido a una menor producción de cortisol. (Thogersen-Ntoumani et al., 2017; García-León et al., 2019).

Por su parte, la obtención de ingresos proporciona una seguridad económica que también puede actuar como amortiguadora o protectora del estrés. En estudios previos se ha encontrado que la preocupación financiera deteriora el rendimiento cognitivo. Por un lado, de forma indirecta, las dificultades económicas se asocian a un mayor nivel de estrés (Mucci et al., 2016; Sturgeon et al., 2016) y a hábitos menos saludables (Fakuda & Morimoto, 2001; Pampel et al., 2010). Y, de forma directa, algunos autores han indicado que los recursos atencionales que absorben las preocupaciones económicas dificultan el mantenimiento de un rendimiento cognitivo óptimo (Mani et al., 2013).

Por último, el trabajo es un entorno que se acompaña, inevitablemente, de la adaptación y del aprendizaje de nuevas habilidades. Por ejemplo, aprender a utilizar una nueva herramienta, ajustarse a unas nuevas condiciones del mercado o familiarizarse con un nuevo producto de la propia empresa. Así, la adquisición de nuevas habilidades ha demostrado ampliamente en la literatura que conlleva una serie de cambios

estructurales y funcionales en el cerebro que se relacionan con un mejor rendimiento cognitivo (Chein & Schneider, 2005; Zatorre et al., 2012).

En definitiva, el empleo es una actividad fundamental en la vida de las personas adultas, pues permite desarrollar la identidad, obtener recursos económicos, ampliar y desarrollar las relaciones personales, así como motivar el aprendizaje y despliegue de las habilidades intelectuales, sociales y manuales. En cuanto al desarrollo de estas habilidades, cada empleo demanda un grado diferenciado de complejidad. La influencia de esta complejidad en el rendimiento cognitivo de las personas ha sido estudiada previamente, encontrándose que un mayor nivel de complejidad se asocia a un mejor rendimiento. Esto, podría deberse a que el empleo proporciona un ambiente complejo en el que las personas adaptan sus recursos para responder adecuadamente, así como el trabajo proporciona una serie de beneficios que mejoran la salud cerebral.

Capítulo 2.
La transición a la jubilación y su influencia en el envejecimiento cognitivo

Algunos fragmentos este capítulo han sido traducidos y adaptados de Vélez-Coto, M., Andel, R., Pérez-García, M., & Caracuel, A. (In press). Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement. *Psychology and Aging.* https://doi.org/10.1037/pag0000584

2.1. La experiencia vital de la jubilación

La jubilación es considerada una de las transiciones vitales más importantes en la vida de las personas y tiene unas características que la hacen diferente de otras transformaciones de la vida laboral (Adams et al., 2002). Significa poner fin a la carrera profesional de forma imperativa y además marca el paso a una de las últimas etapas de la vida. Para el individuo, la jubilación es el momento de revisar el uso de su tiempo, las experiencias físicas, el significado de su nuevo rol, así como de su ocupación intelectual (Zorzo, 2014). Es decir, la jubilación significa enfrentarse a muchos cambios en varias áreas que se producen en un corto período de tiempo.

Según la teoría de rol (George, 1993), el fin de la vida laboral puede desembocar en dos posibilidades. Por un lado, puede que terminar una actividad ocupacional que estaba caracterizada por un alto nivel de demandas y estrés suponga una reducción de tensión y sobrecarga, mejorando la calidad de vida. Por otro, puede que finalizar definitivamente la actividad ocupacional, con la pérdida ambiental que le acompaña, dé lugar a una disminución del bienestar y a una crisis personal (Teuscher, 2010).

No obstante, la jubilación es un proceso dinámico en el que se experimentan una serie de etapas. Según Atchley (1982), existen cinco fases en la adaptación a la jubilación, aunque no todas las personas pasan necesariamente por cada una de ellas:

- La prejubilación. La persona se comienza a plantear cómo será su jubilación y se fija una serie de objetivos.
- La jubilación. Puede experimentarse con una sensación de euforia ante la posibilidad de hacer todo lo que no pudo en años anteriores, entrando en una rutina de actividades y grupos estables, o bien vivirla en modo “descanso” reduciendo el nivel de actividad.

- Fase de desencanto. Tras la fase inicial puede darse una etapa de desilusión, acompañada de sentimientos negativos si siente que la jubilación no cumple con sus expectativas.
- Fase de reorientación. Se reevalúa su percepción sobre la jubilación, se asumen las nuevas circunstancias y se orienta a una visión más realista basada en sus posibilidades y limitaciones.
- Estabilidad. Tras la adaptación a la jubilación se desarrolla un estilo de vida rutinario que, generalmente, se vive de forma positiva y se adapta al nuevo rol.

El estudio cualitativo de Eagers et al. (2018) puso de manifiesto que el paso por las distintas fases está condicionado por factores personales, sociales, el compromiso con una ocupación significativa, así como el vínculo con el trabajo y la jubilación. En este sentido, Aymerich et al. (2010) encontraron que aproximadamente el 40% de los individuos pasan directamente a la fase de desencanto. Igualmente, las etapas más experimentadas (un 70% de las personas) parecen ser la de reorientación y estabilidad. Estos hallazgos claramente indican que la jubilación no es similar para todas las personas., sino que se trata de un proceso en el intervienen las características personales.

Entre esas características personales, se ha observado que el nivel educativo es uno de los determinantes de la experiencia de la jubilación. Algunos autores han sugerido que las personas con mayor nivel educativo son más propensas a aceptar de forma positiva la jubilación, mostrándose más libres e implicados en actividades sociales que quienes tienen menor nivel educativo (Fischer & Sousa-Poza, 2006; Henkes & Siegers, 1994). Por otro lado, se ha encontrado que los jubilados con menor nivel educativo presentan mayores problemas de adaptación (Martínez et al., 2003). En relación con el

nivel educativo, también se ha observado que la jubilación se experimenta de forma diferencial según la categoría profesional a la que pertenecía su empleo. En este sentido, los resultados sugieren que personas que desempeñaban trabajos de mayor categoría laboral muestran una mayor satisfacción, un mayor nivel de actividad y una vivencia más positiva (Bueno & Buz, 2006; Lund & Villadsen, 2005).

2.2. Influencia de la jubilación en la salud

El estudio del efecto de la jubilación en la salud resulta complejo debido a que existen muchos factores implicados que tienen que ver con las razones y condiciones en las que se produce la jubilación. Esto se refleja en los resultados heterogéneos y contradictorios que presenta la literatura, donde se encuentran mejoras, declives o la ausencia de cambio en aspectos emocionales y físicos de la salud (Horner & Cullen, 2016; Latif, 2013; van der Heide et al., 2013).

En un estudio realizado en Europa con 5282 personas (Coe & Zamarro, 2011), se encontró que la jubilación tiene un efecto protector y beneficioso para la salud en general, disminuyendo en un 35% la probabilidad de que las personas reporten un estado de salud medio, malo o muy malo. Además, se observó una mejora de casi una desviación estándar en el índice de salud, el cual combina medidas subjetivas y objetivas. También Eibich (2015) encontró que la jubilación aumentaba la probabilidad de indicar un mejor estado de salud física y mental, y reducía el número de visitas médicas. Insler (2014) encontró que la jubilación se asoció a la reducción del consumo de tabaco, aumento de la actividad física y, en general, a la práctica de hábitos más saludables. Estos cambios comportamentales condujeron, posiblemente, a la mejora en la salud percibida que manifestaron los participantes. Según el estudio de Mazzonna y Peracchi (2014) la salud percibida de su muestra empeoró tras la jubilación, excepto para los que se jubilaron de

trabajos más estresantes, en los que se observó una mejora. Según sus hallazgos, la jubilación podría mejorar la salud debido a que alivia el estrés laboral, permite aumentar la duración del sueño y se hace uso del tiempo libre para tener un estilo de vida más activo y saludable.

Por el contrario, algunos estudios han observado un efecto nocivo de la jubilación. Se ha encontrado que la jubilación lleva a un incremento de entre un 5-16% en las dificultades de las actividades en la vida diaria, a un 5-6% de aumento de las enfermedades y un 6-9% de empeoramiento de la salud mental (Dave & Spasojevic, 2007). Behncke (2012) encontró que la jubilación estaba asociada a un mayor riesgo de ser diagnosticado de una enfermedad crónica, como el cáncer o trastorno cardiovascular, a un aumento del índice de masa corporal, colesterol y presión sanguínea. Además, se observó un empeoramiento de la salud percibida en comparación a un grupo de mayores aún no jubilados. En una encuesta realizada por Alavinia y Burdof (2008) también encontraron que la ausencia de empleo en mayores se relacionaba con un peor estado de salud percibida respecto al período anterior a la jubilación. No obstante, parece ser que los efectos de la jubilación en la salud estén condicionados indirectamente por las requisitos legislativos y políticos de la jubilación (Rohwedder & Willis, 2010). Por ejemplo, los que determinan la edad de jubilación.

En vista de esta variedad de resultados, Voss et al. (2020) basándose en un análisis de los estudios previos, hacen referencia a tres perfiles de jubilados en los que el efecto sobre la salud sería diferente. Primero, las personas que se jubilan antes de lo previsto, de forma planeada y voluntaria, verían mejorada su salud e incrementarían sus comportamientos saludables. En segundo lugar, aquellos que de forma involuntaria se ven obligados a trabajar durante más tiempo, empeorarían su salud. Y, por último,

aquellas personas que aun habiéndose jubilado de forma reglamentaria e involuntariamente y que deseaban continuar trabajando, ven disminuido su nivel de satisfacción vital, lo cual también se ha relacionado con un impacto negativo en la salud.

En este sentido, parece ser que la relación entre la jubilación y la salud podría estar determinada por la edad de jubilación, la decisión que le haya llevado a hacerlo e incluso, los recursos para llevar a cabo un estilo de vida saludable. Igualmente, la etapa vital en la que se produce la jubilación también está caracterizada por un deterioro de la salud natural que podría influenciar este cambio, así como se ha observado que la propia transición podría afectar a la salud. Por tanto, la jubilación y su relación con la salud también ocupa el debate de la causalidad inversa. De esta manera, se plantea la posibilidad de que una jubilación temprana venga determinada por un peor estado de salud (Kuhn, 2018).

2.3. Envejecimiento cognitivo

A la hora de hablar de envejecimiento se suele diferenciar entre envejecimiento normal y envejecimiento patológico (Ballesteros, 2016). El envejecimiento normal hace referencia a aquel que se produce sin la incidencia de enfermedades y grandes patologías. Por el otro lado, se denomina envejecimiento patológico al que produce cambios significativos debido a patologías o malos hábitos. En este caso, a nivel cognitivo, dos enfermedades que pueden dañar considerablemente la calidad de vida de los mayores son la Enfermedad de Alzheimer o el Deterioro Cognitivo Moderado (Tochel et al., 2019). No obstante, en el envejecimiento normal también se produce un declive de las funciones cognitivas. De forma resumida, los cambios que se producen son (Harada et al., 2013):

- Empeoramiento de la velocidad de procesamiento.

- Reducción del *span* atencional y dificultades de atención dividida y selectiva en tareas complejas.
- Deterioro de la memoria episódica y capacidad de aprendizaje.
- Dificultad en la denominación de objetos a partir de los 70 años.
- Empeoramiento de las habilidades visuoespaciales constructivas.
- Declive en el funcionamiento ejecutivo: peor memoria de trabajo, menor flexibilidad cognitiva, organización, razonamiento y resolución de problemas.

A pesar de que el deterioro se produce de forma natural debido a los cambios estructurales y funcionales en el cerebro, factores sociales, de salud y estilo de vida pueden modular su evolución y su manifestación en cada individuo (Lezak et al, 2012; McDaniel et al., 2008).

Entre los factores que más atención han recibido se encuentran el estado general de salud, factores genéticos, actividad física, características sociodemográficas (como la educación) (Correia et al., 2018), actividades de ocio y actividades sociales (Martin, 2010).

El papel de la educación se presenta como un factor protector de la función cognitiva en la vejez, incluso para el inicio de las manifestaciones de trastornos neurodegenerativos (Dekhtyar et al., 2015). No obstante, parece que el efecto de la educación en el envejecimiento cognitivo no actúa en la misma medida para todas las funciones (Zhang et al., 2019). En esta relación, puede ser que haya cambios similares para las personas de todos los niveles educativos, que los cambios cognitivos sean menores en las personas con mayor nivel educativo, o bien que el rendimiento de los de alta y baja educación converjan en un determinado punto.

Las actividades de ocio están suscitando un gran interés en cuanto a su posible carácter protector de las funciones cognitivas, ya que éstas son más fácilmente

modificables a diferencia del el nivel educativo o las características genéticas. Éstas podrían mantener el rendimiento habitual si estimulan las funciones cognitivas. Por ejemplo, estudiar un idioma extranjero, aprender a tocar un instrumento o hacer crucigramas (Martin, 2020). Aunque los resultados aún son heterogéneos, parece que implicarse en actividades sociales y de ocio estimulantes ayuda a mantener, e incluso mejora, las habilidades cognitivas.

2.4. Influencia de la jubilación en el rendimiento cognitivo

Teniendo en cuenta lo mencionado en apartados anteriores en cuanto a posibles consecuencias de la jubilación sobre la salud, se pueden identificar dos campos de estudio en relación con los efectos específicos sobre el estado cognitivo (Denier et al., 2017). Por un lado, aquellas investigaciones que estudian si la jubilación lleva está asociada a un declive cognitivo por sí misma. Por otro, las que están más orientadas a comprender cómo la jubilación incide en el envejecimiento cognitivo relacionado con la edad.

En cuanto al efecto de la jubilación en sí misma, se ha encontrado que en personas jubiladas europeas y norteamericanas (Rohwedder & Willis, 2010) su condición de retirados estaba asociada a una disminución del 37% en su capacidad de memoria inmediata y demorada. En esta línea, Bonsang et al. (2012) encontraron que se producía una reducción del 9% en la memoria verbal, aunque no de forma inmediata tras la jubilación. Por el contrario, también existen hallazgos de un efecto positivo de la jubilación sobre esa capacidad cognitiva (Bianchini & Borella, 2016).

En cuanto a cómo afecta la jubilación a la trayectoria del envejecimiento cognitivo, se ha observado de forma general un mayor deterioro tras la jubilación. Wickrama y O'Neil (2013) encontraron que el cambio de estar empleado a retirarse

agravó el declive de la capacidad de aprendizaje verbal, pero no de la memoria. Este resultado también se vio apoyado por Celidoni et al. (2017), quienes hallaron que llevar más tiempo jubilado/a se asociaba con un incremento del más del 20% de la probabilidad de presentar declive en la capacidad de aprendizaje. En la misma línea, Xue et al. (2018) analizaron el funcionamiento cognitivo de 3.433 personas antes y después de la jubilación, encontrando que, aunque el razonamiento abstracto, la fluidez verbal y semántica y la memoria verbal empeoraban con el tiempo, la jubilación sólo tuvo un impacto en el declive de la memoria verbal. Ésta se redujo un 38% más rápido después de la jubilación. También Hamm et al. (2020) encontraron que los adultos mayores que se jubilaron mostraban un declive mayor de la memoria durante los nueve años posteriores a la jubilación que aquellos que continuaron trabajando. Por otra parte, Mazzonna y Peracchi (2012, 2014), analizando datos de una muestra europea, observaron que las personas jubiladas entre 50 y 70 años mostraron un mayor declive cognitivo, especialmente en fluidez y aritmética.

Estos resultados sugieren un efecto generalizado de la jubilación en el envejecimiento cognitivo. No obstante, es posible que esté condicionado por características personales y del empleo que realizaban antes de jubilarse.

2.4.1. Influencia de la complejidad laboral en el envejecimiento cognitivo tras la jubilación

El concepto de complejidad laboral hace referencia al grado en el que un empleo proporciona y requiere tareas cognitivamente demandantes e incentivos para desarrollar y mejorar las habilidades cognitivas, así como promueve las interacciones sociales (Denier et al., 2017). Los hallazgos de los estudios que han analizado la influencia de la complejidad ocupacional anterior a la jubilación en el envejecimiento cognitivo suelen

mostrar dos patrones: la diferenciación preservada y la preservación diferenciada (Salthouse, 2006) (Figura 1). Se ha denominado diferenciación preservada al hecho de que las personas expuestas a una mayor complejidad parten de un mejor rendimiento cognitivo más alto en el momento de la jubilación que los de baja complejidad, y esa diferencia se mantiene a lo largo del tiempo debido a que ambos muestran patrones similares y paralelos de declive. Por su parte, la preservación diferenciada hace referencia a un patrón de evolución cognitiva desigual entre las personas jubiladas de trabajos más complejos y las jubiladas de trabajos menos complejos. Así, las primeras presentan un mejor rendimiento cognitivo en el momento de la jubilación y además muestran un patrón de declive menos pronunciado que el mostrado por los jubilados de trabajos de baja complejidad. Este patrón se ha expresado también en términos de riesgo, encontrándose que el hecho de retirarse de un trabajo más complejo está asociado a un menor riesgo de deterioro cognitivo (Andel et al., 2017; Boots et al., 2015) y de desarrollo de la Enfermedad de Alzheimer (Andel et al., 2005).

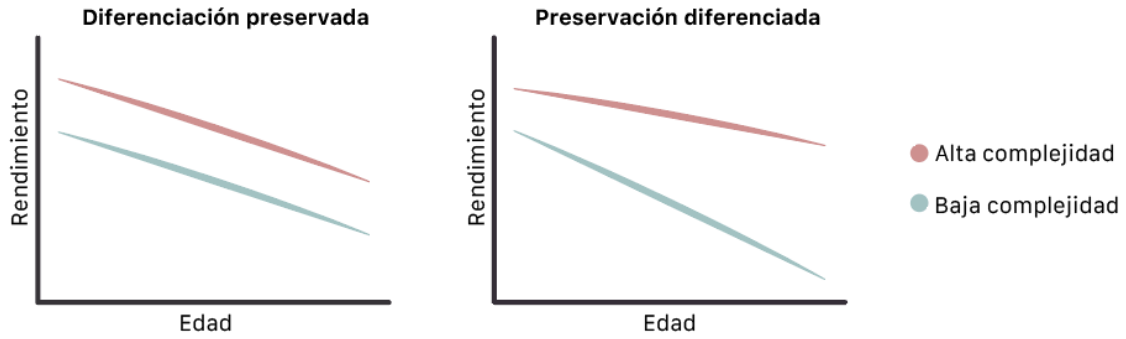
Fisher et al. (2014) observaron un patrón de preservación diferenciada en el que, antes de la jubilación, los trabajadores con alta complejidad laboral presentaban mayor nivel de funcionamiento ejecutivo y una tasa de declive más lenta después de la jubilación.

De forma específica en cuanto a los tipos de complejidad laboral, Andel et al. (2016) encontraron que una mayor complejidad en el trabajo con personas preservó el envejecimiento cognitivo tras la jubilación. Concretamente, se asoció con un declive más atenuado de las habilidades verbales, memoria episódica y velocidad de procesamiento, controlando la edad, el sexo y el nivel educativo. Igualmente, Kröger et al. (2008)

encontraron que trabajar más de 23 años en un trabajo complejo en el manejo de personas reduce el riesgo de demencias un 64%.

Figura 1

Diferenciación preservada y preservación diferenciada aplicado a la relación entre la complejidad laboral y envejecimiento cognitivo.



A diferencia de estos resultados, Finkel et al. (2009) encontraron patrones diferentes en función de la habilidad cognitiva que evaluaban. En el caso de la velocidad de procesamiento, observaron un patrón de diferenciación preservada en el que las personas con un empleo de mayor complejidad con personas presentaban un mejor rendimiento en el momento de la jubilación mantenido en años posteriores. En cuanto a las habilidades espaciales, ambos grupos mostraron un declive paralelo hasta el momento de la jubilación, siendo peor el rendimiento del grupo de baja complejidad con personas. En cambio, tras la jubilación, el declive de esta habilidad fue más pronunciado para aquellos de alta complejidad. También se encontró un efecto sobre las habilidades verbales, las cuales mejoraron hasta el momento de la jubilación para aquellos con un empleo de alta complejidad con las personas. Sin embargo, la influencia en la tasa de declive después de la jubilación no fue significativa. Así como tampoco se obtuvieron resultados significativos para el componente de memoria, ni para las complejidades ocupacionales con datos y cosas. Igualmente, Lane et al. (2017) vieron que la complejidad

laboral con datos se relacionaba con un mejor rendimiento cognitivo general, en memoria, y en velocidad de procesamiento, pero no estaba relacionada con la tasa de declive después de la jubilación.

En resumen, los resultados apuntan a la existencia de un efecto modulador de la complejidad laboral en el rendimiento y envejecimiento cognitivo en jubilados. No obstante, los resultados aún son lo suficientemente escasos y heterogéneos como para llegar a una conclusión y conocer los mecanismos y características específicas de esta relación.

2.4.2. *Modelos explicativos de la influencia de la jubilación y la complejidad laboral en el rendimiento y envejecimiento cognitivo*

a) Hipótesis del estilo de vida desconectado

Esta hipótesis fue propuesta por Rohwedder y Willis (2010) para explicar de forma específica la relación entre la jubilación y el declive cognitivo, y plantea que los jubilados disponen de menos oportunidades de realizar tareas desafiantes cognitivamente que los trabajadores, quienes se encuentran en ambiente más estimulantes. Este descenso en el nivel de actividad llevaría, según los autores, a una especie de "jubilación mental" y, consecuentemente, a un empeoramiento del rendimiento cognitivo.

b) Teorías de la cognición preservada: Reserva cognitiva

Este conjunto de teorías tratan de dar explicación al mantenimiento del rendimiento cognitivo y a las diferencias interindividuales en la susceptibilidad al envejecimiento cognitivo, patología, o daño (Scarmeas & Stern, 2003; Stern, 2009). Entre ellas se encuentran: la del mantenimiento cerebral, el andamiaje neurocognitivo, la reserva cerebral y la reserva cognitiva (Barulli & Stern, 2013). La primera plantea que ciertos factores genéticos y experiencias provocan a un mejor mantenimiento del

cerebro y sus funciones (Nyberg et al., 2012). Sin embargo, no explica adecuadamente por qué algunas personas resisten mejor los cambios cognitivos producidos de forma natural por el envejecimiento. La teoría del andamiaje cognitivo apunta que el rendimiento cognitivo puede mantenerse gracias al reclutamiento de circuitos y redes neuronales cuando las redes primarias se han dañado o no se muestran lo suficientemente eficaces (Park & Reuter-Lorenz, 2009).

La reserva cerebral postula que son unas determinadas características cuantitativas y cualitativas del cerebro, como el tamaño cerebral o el número de neuronas, los que explican las diferencias en la susceptibilidad al deterioro cognitivo (Stern et al., 2019).

Por último, la reserva cognitiva hace referencia a la capacidad del cerebro para tolerar los cambios funcionales y estructurales producto del envejecimiento o alguna patología o daño (Stern, 2009). Así, esta teoría sugiere que las diferencias interindividuales en las trayectorias cognitivas vienen determinadas por la influencia de factores ambientales y otras actividades intelectuales realizadas a lo largo de la vida, de manera que aportarían una ventaja cognitiva a aquellas personas que acumularan más reserva (Stern et al., 2018). Estas diferencias funcionales consisten, concretamente, en diferencias en la eficiencia, la capacidad y la flexibilidad cognitivas, procesos que se moldearían a través de la experiencia. En este sentido, la reserva cognitiva es una perspectiva activa en tanto que sugiere que los factores que ajustan la actividad y funcionalidad neuronal se pueden modificar (Barulli & Stern, 2013). Para medir la reserva cognitiva se utilizan indicadores que han demostrado estar relacionados con un mayor o menos declive cognitivo en el envejecimiento. Principalmente, son: los años de educación o nivel educativo, número de actividades de ocio intelectualmente estimulante, estatus

socioeconómico, vocabulario o conocimientos, ejercicio físico, actividades sociales y la categoría laboral el grado de complejidad laboral.

c) Teoría del desuso

Salthouse (2006, 2009) propuso una teoría complementaria y relacionada con la teoría de la reserva cognitiva, denominada teoría de la dependencia del uso o teoría del desuso. Para esta teoría, la resistencia al envejecimiento cognitivo, normal y patológico resulta no sólo de las experiencias previas acumuladas, sino que dependen de que los individuos continúen realizando actividades cognitivamente estimulantes ininterrumpidamente (especialmente en la vida tardía). Así, quienes no realizaran de forma continua actividades estimulantes, verían disminuir su rendimiento cognitivo o se verían más afectados por el envejecimiento o una patología.

d) Teoría de la Continuidad

Esta teoría propone que, ante situaciones de cambio, las personas mayores y de mediana edad intentan preservar y mantener sus actitudes y preferencias aplicando o realizando conocimientos, habilidades y actividades que han manifestado a lo largo de toda su vida (Diggs, 2008). Esta teoría, planteada por George Maddox en 1968, fue por primera vez aplicada e investigada en la jubilación por Robert Atchley (Atchley, 1971, 1989; Lynch et al., 2016; Maddox, 1968). El autor propuso que, tras la jubilación, las personas continúan manteniendo las actitudes y realizando las actividades que estaban presentes antes del retiro laboral. El mantener esta coherencia antes y después de la jubilación ayudaría a mantener el nivel de satisfacción. Por tanto, una premisa fundamental de esta teoría es que, ante una crisis de identidad, la elección más adaptativa sería involucrarse en actividades similares a las que realizaba antes de la jubilación. En este sentido, se podría especular que aquellas personas que se jubilan de

trabajos más complejos estarían más motivadas a mantener o comenzar actividades intelectualmente estimulantes no laborales.

En definitiva, la jubilación constituye un cambio vital a nivel personal, laboral y social. Esta puede tener efectos considerables en la salud física, emocional y cognitiva, aunque en determinados casos también se han observado mejorar. Además del envejecimiento cognitivo, parece ser que la jubilación y, concretamente la complejidad del trabajo realizado puede afectar al rendimiento cognitivo al final de la vida. En este sentido, existen dos vertientes en los estudios realizados en esta población. Aquellos que determinan si la jubilación incide directamente en el funcionamiento cognitivo, y los que tienen como objetivo comprender cómo afecta la estimulación recibida a lo largo de la vida en el cambio cognitivo. No obstante, aún son necesarios más estudios que aporten información sobre qué factores intervienen en dicho proceso.

Capítulo 3.
El desempleo y sus consecuencias

Parte de este capítulo ha sido extraído del capítulo de libro: Vélez-Coto, M., Valls-Serrano, C., & Caracuel, A. (2019). Estrés en el desempleo: Ni oficio, ni beneficios. En M. I. Peralta-Ramírez (Ed.), *Un villano llamado estrés* (pp. 383–420). Pirámide.

3.1. Concepto de desempleo y contextualización del problema

El desempleo se define como la situación en la que no se dispone de un trabajo remunerado a pesar de encontrarse en edad y disposición de trabajar, así como de estar llevando a cabo estrategias concretas para encontrar un empleo (Organización para la Cooperación y Desarrollo Económicos, OECD, s.f.).

Según las causas que propician el fenómeno del desempleo, se pueden diferenciar cuatro tipos (Yánez & Cano, 2012): estructural, estacional, friccional y cíclico. El primero tiene lugar cuando las necesidades de los demandantes de empleo no se ven cubiertas por las características de las ofertas de trabajo, o bien porque de forma más o menos general no encajan en el perfil buscado por los empleadores. Por ejemplo, esto puede ocurrir si a los posibles trabajadores no les ha dado tiempo a adquirir nuevas habilidades tras un rápido cambio tecnológico. En segundo lugar, el desempleo estacional surge por la fluctuación entre la demanda y la oferta en determinadas estaciones, por el ejemplo, como ocurre en el sector de la agricultura. El friccional es el que se produce cuando las personas se encuentran buscando el primer empleo o transitando de un trabajo a otro. Por lo tanto, este desempleo se produce de forma natural y es difícilmente evitable. Por último, el desempleo cíclico es el que surge a raíz de cambios drásticos en la actividad económica de un país, la cual conlleva una mayor demanda de empleo que de oferta. Por lo tanto, es este desempleo cíclico es el que incrementa cuando tienen lugar crisis económicas.

Alrededor del año 2003 se originó en Estados Unidos una crisis financiera que recibió el nombre de Gran Recesión. Esta crisis, debido a la globalización, se expandió velozmente por todo el mundo provocando el mayor incremento en las cifras de desempleo que se había registrado desde el *Crack* del 29 (Carballo-Cruz, 2011; Wanberg,

2012). Debido a ello, en el año 2010 había 210 millones de personas desempleadas en el mundo.

La Unión Europea no se quedó fuera de la crisis y sus países del sur (Italia, Irlanda, Grecia, Portugal y España) fueron los más afectados. Concretamente, en España la situación se vio agravada por el estallido de otra crisis nacional en el mismo año producto de una burbuja inmobiliaria (Carballo-Cruz, 2011). Así, la unión de ambas crisis llevó a España a pasar de un 8,2% de tasa de desempleo en el año 2007, a un 26,4% en 2013 (Eurostat, 2018).

A pesar de que recientemente se ha logrado reducir significativamente estas cifras, en muchos países aún no se han alcanzado los niveles previos a 2008. En el año 2019, el desempleo afectaba a un 5,4% de la población mundial (Statista, 2020), un 7,4% a la población europea y un 13,9% a España (Eurostat, 2020).

Desafortunadamente, en el año 2020 se está desarrollando otra crisis mundial debido al impacto de la pandemia por el COVID-19. Según los expertos, las tasas de desempleo para el año 2021 podrían alcanzar hasta el 10% a nivel mundial (OECD, 2020), un 9% en la Unión Europea (European Comission, 2020) y entre el 19% - 34% en España (Sempere, 2020). Además de tener un impacto en la economía o política, las tasas de desempleo, y el desempleo en sí, tienen una serie de consecuencias directas e indirectas sobre la vida y la salud de las personas, tanto empleadas como desempleadas (Neffa, 2015).

3.2. Debate de la causalidad entre el desempleo y la salud

La causalidad en la relación entre el desempleo y la salud ha sido ampliamente debatida (Novo, 2000; Wanberg, 2012). Por un lado, la hipótesis de la selección o de la causalidad inversa considera que quienes presentan determinadas características

psicológicas o problemas de salud tendrían problemas ya presentes en el trabajo. Por ejemplo, de asistencia, bajas laborales o reduciendo su productividad. Esta situación les haría más propensos a perder su empleo y, además, a verse en desventaja para encontrar un nuevo trabajo y mantenerlo.

Por otro lado, la hipótesis de la exposición o causalidad directa sugiere que es la exposición al desempleo, y todos sus inconvenientes, lo que lleva a un deterioro de la salud o malestar psicológico (McKee-Ryan et al., 2005; Paul & Moser, 2009; Schröder, 2013).

Hasta el día de hoy, las evidencias acumuladas apoyan ambas hipótesis, por lo que sería viable un modelo integrador y bidireccional entre el desempleo y la salud (Schuring et al., 2009). Un relevante metaanálisis que analizó los resultados de 87 estudios longitudinales mostró que el desempleo provoca de forma directa un decremento del bienestar psicológico. Su efecto fue el doble del encontrado para el efecto de selección atribuible al estado de salud (Paul & Moser, 2009). Este efecto había sido previamente también observado por Fergusson et al. (2001), quienes encontraron cómo una mayor duración del desempleo en adultos jóvenes se asociaba con un mayor índice de depresión, ideas suicidas, abuso de sustancias y crímenes y condenas. Además, analizaron si el estado psicológico previo predecía a su vez el desempleo posterior, y los resultados también fueron significativos.

Posteriormente, un estudio analizó la doble direccionalidad y encontró que el efecto del desempleo sobre la salud era más fuerte que a la inversa, estando parcialmente mediado por la pérdida del estatus social percibido (Krug & Eberl, 2018). Otro estudio con el mismo objetivo (Olesen et al., 2013), encontró que tanto la duración del desempleo estaba relacionada con el nivel de salud mental. En cambio, en este caso,

el valor predictivo de la salud sobre el tiempo que se prolongaría dicha situación de desempleo fue más fuerte.

En el estudio de la direccionalidad de la relación entre desempleo y salud es esencial tener en cuenta otros factores, por ejemplo, de tipo socioeconómico, como la tasa de desempleo en el contexto estudiado. En este sentido, se ha encontrado que, en circunstancias de aumento de la tasa de desempleo nacional, la probabilidad de encontrar un trabajo para las personas con peor salud menor era menor que la de las que mostraban buena salud (Nilsson, 2015). Por otro lado, un estudio realizado en España (Farre et al., 2018) encontró que la salud de las personas desempleadas empeoraba 3 puntos si se producía un incremento del 10% en las tasas de desempleo.

Con todo ello, no cabe duda de que el desempleo y su relación con la salud es un entramado complejo con influencia de múltiples variables que se manifiesta en una gran heterogeneidad en cuanto a síntomas encontrados y áreas afectadas.

3.3. Consecuencias del desempleo en la salud física

Ante una situación percibida como estresante, como ha demostrado ser el desempleo (Sumner & Gallagher, 2017), el cuerpo reacciona produciendo cambios orgánicos que lo preparen para afrontar el reto de la mejor forma posible. Para ello, el eje Hipotalámico-Pituitario-Adrenal (HPA) se activa y desencadena la secreción de la hormona cortisol. Esta reacción constituye una respuesta natural y adaptativa y se caracteriza por un incremento súbito de los niveles y una bajada posterior más gradual. Sin embargo, la exposición repetida a una situación estresante puede provocar alteraciones del eje HPA y, por lo tanto, en la regulación del cortisol (Zorn et al., 2017). Estas alteraciones neuroendocrinas han sido ampliamente estudiadas y están relacionadas con trastornos como obesidad (Incollingo-Rodríguez et al., 2015; Zorn et al.,

2017), diabetes tipos 2 (Novak et al., 2013; Virtanen et al., 2014) o hipertensión (Hamer & Steptoe, 2012).

El desempleo se encuentra entre los factores que han sido relacionados con alteraciones neuroendocrinas. Recientemente, un metaanálisis ha concluido que durante el desempleo se producen alteraciones en los patrones de secreción de cortisol (Sumner & Gallagher, 2016), consistentes en curvas anómalas de crecimiento y decrecimiento. Se han observado variaciones en estos patrones en función de la edad, el sexo o la duración del desempleo. El ritmo de crecimiento del nivel de cortisol era diferente en jóvenes, en comparación a adultos y mayores (Maier et al., 2006). Mientras que en los jóvenes el cortisol seguía un ritmo de aumento progresivo a lo largo del período de desempleo, en los adultos la curva era más pronunciada durante los primeros seis meses y, posteriormente, se estabilizaba en un nivel alto. En cambio, las mujeres adultas, tras alcanzar el nivel máximo, a los seis meses al igual que los hombres, no se mantenía, sino que experimentaba un descenso hasta llegar al nivel de cortisol previo. En cuanto al factor de duración de desempleo, se ha encontrado que los niveles de cortisol eran mayores en las personas que llevaban más tiempo en desempleo (Dettenborn et al., 2010; Maier et al., 2006).

El desempleo se ha asociado también con otros biomarcadores del estrés, como las proteínas inflamatorias (Wright & Dyson, 2015). Se realizó un metaanálisis de 12 estudios longitudinales en los que comparaban las concentraciones de proteína C-reactiva y fibrógeno de personas desempleadas y con empleo. Así, controlando por edad, sexo, nivel educativo, presencia de enfermedades crónicas y mentales, consumo de tabaco y adiposidad, los niveles de las proteínas inflamatorias fueron mayores para las personas desempleadas. Igualmente, encontraron que tenían una probabilidad mayor

(OR = 1,39) de presentar niveles de C-reactiva superiores a 3mg/l, lo que significa un mayor riesgo de sufrir un trastorno cardiovascular.

En este sentido, el desempleo de larga duración también se ha relacionado con un mayor riesgo de infarto agudo de miocardio e ictus (Herbig et al., 2013). Esto también fue encontrado por Dupre et al. (2012), pero sólo durante el primer año de desempleo y según el número de pérdidas de trabajo acumuladas. En otro estudio, una larga duración de desempleo – 3 años o más – se relacionó con una probabilidad triplicada de ser hospitalizado por enfermedad coronaria (Ardito et al., 2016). Teniendo en cuenta la variabilidad de estos datos, deben ser interpretados con cautela y atendiendo a otros aspectos que pudieran modular esa relación, como la edad, el tipo de enfermedad u otros factores de riesgo, como la obesidad (Mandviwala et al., 2016).

El aumento o pérdida de peso también ha sido objeto de investigación en la población desempleada, observándose que los adultos que perdían su trabajo ganaron más peso que los que continuaron trabajando o se jubilaban. Además, esa ganancia se producía de forma proporcional al tiempo que permanecían desempleados (Monsivais et al., 2015). No obstante, este hallazgo no se encuentra en desempleados de bajo nivel educativo (Mohammad & Linsdtröm, 2006), quienes, a pesar de mostrar un nivel de actividad física menor, presentaron pérdida de peso. En el caso de Hughes y Kumari (2017) los resultados fueron contradictorios especialmente en los desempleados hombres de larga duración, pues vieron cómo se producía tanto aumento como pérdida de peso, independientemente del nivel de actividad física.

Otra alteración que se ha observado en personas desempleadas y que también está relacionada con la obesidad y trastornos cardiovasculares (Noble et al., 2011) es la diabetes tipo 2. Se ha observado que, ajustando para educación, estilo de vida e índice

de masa corporal (IMC), las personas desempleadas tenían mayor riesgo de presentar pre-diabetes y diabetes tipo 2. Concretamente, la relación entre la alta exposición al desempleo durante la vida laboral y el deterioro del metabolismo de la glucosa fue robusta para la muestra de hombres.

El desempleo también se ha asociado a un peor estado general de salud (McKee-Ryan et al., 2005; Urbanos-Garrido y López-Varcárcel, 2015). Aunque algunos autores atribuyen estos resultados a la pérdida de ingresos y, por tanto, a una menor asistencia médica, Schaller y Stevens (2015) encontrando que ésta no se asociaba con la reducción de la salud. Además, no encontraron relación del desempleo con indicadores de salud física, mientras que para el estado subjetivo de salud los resultados fueron subjetivos. Es decir, los desempleados perciben que su estado de salud empeora.

En definitiva, las evidencias señalan una relación entre el desempleo y un peor estado de salud general. Específicamente, muestran mayor riesgo de sufrir trastornos cardiovasculares, obesidad y diabetes. Aunque no se ha investigado de forma precisa, los hallazgos sugieren que las alteraciones en la salud son producto de alteraciones en los biomarcadores del estrés.

3.4. Repercusiones sociales: el desempleo a nivel comunitario e individual

Desde una perspectiva macrosocial, el desempleo se produce debido a los desequilibrios económicos de un país, provocando cambios en la sociedad de forma global, así como en la manera que tienen los individuos de relacionarse con su entorno (Monticelli et al., 2016). Por ello, en este apartado se abordarán estos aspectos, así como las características sociales que condicionan la manifestación de los efectos del desempleo a nivel individual.

En primer lugar, es necesario destacar que el trabajo es una actividad que, en la mayoría de los casos, se realiza en grupo. Por tanto, la pérdida del empleo conlleva una reducción de las redes y las interacciones sociales. Así, Monticelli et al. (2016) encontraron que las personas desempleadas reportan sentirse aisladas socialmente. A su vez, el aislamiento social se ha relacionado con un peor estado de salud y mayor riesgo de mortalidad (Holt-Lundstad et al., 2015). Con relación a la vida social, la pérdida de recursos se concibe como una dificultad añadida para realizar actividades con su grupo, hecho que se ha visto apoyado por un estudio que analiza la actividad social en desempleados de 21 países europeos (Dieckhoff & Gash, 2015). Consecuentemente, estas restricciones redujeron el número de contactos personales, así como dificultaron la capacidad de mantenerlos.

No obstante, la propia pérdida de recursos y la sensación de aislamiento podría servir al mismo tiempo como motivación para buscar un nuevo empleo o actividades similares y, de esta manera, reestablecer redes y amortiguar los efectos negativos de dichas carencias. En este sentido, parece que el apoyo social ofrecido por las personas cercanas es fundamental para atenuar las consecuencias negativas del desempleo. En el año 2011 se realizó un estudio con una muestra de 12.022 personas en el que se observó que las personas con escaso apoyo social tenían una mayor probabilidad de sufrir trastornos físicos y mentales (Kroll & Lampert, 2011). Esto podría deberse a que la sensación de apoyo mejora la capacidad percibida para enfrentarse al estrés, así como aumenta las expectativas de reempleo en desempleados (Maddy et al., 2015).

Esta reacción de resiliencia comunitaria dependería del tipo de crisis, de características individuales y de otros aspectos culturales y sociales (Carvalho & Mattar, 2014). En el caso de España y la crisis que se produjo en 2008, surgieron diversas

asociaciones de apoyo colectivo y reivindicación como la *Plataforma de Afectados por la Crisis* (PAC), la *Asociación Nacional de Desempleados* (ADESORG) o *Juventudes Sin Futuro* (JSF) (Morejón-Llamas, 2014).

Estos grupos de apoyo surgen especialmente en contextos de minorías sociales y personas en situación de desventaja, lo que agrava las consecuencias derivadas del empleo. Por ejemplo, Emeka (2009) encontró que el ser de raza blanca o negra explicaba más del 80% del desempleo – siendo la raza negra la más afectada. O bien, el ejemplo del estudio de Boydell et al. (2013) en el que se observó que personas desempleadas de raza negra y origen afroamericano o caribeño presentaban mayor tasa de episodios psicóticos que sus iguales blancos.

Uno de los mayores retos a los que se enfrenta la población desempleada es al estigma al que están sometidos (Gross et al., 2020; Karren & Sherman, 2012; Vishwanath, 2016). El desempleo, excepto bajo determinadas circunstancias, ha sido considerado como algo negativo. Las personas desempleadas han sido consideradas como vagas o perezosas (Dougherty et al., 2007) y, en consecuencia, se pueden encontrar con más dificultades para ser contratado cuanto más tiempo llevan en desempleo (Vishwanath, 2016). Además, estos estigmas variarían según la clase social. Por un lado, a los desempleados de clase alta se le estigmatiza por su condición de privilegiados, y por otro, a la clase baja por el simple hecho de pertenecer a esa clase social, dificultando así la posibilidad de cambiar su situación (Ho et al., 2011).

Las consecuencias del desempleo también han sido estudiadas a nivel de núcleo familiar. A diferencia de las relaciones con amigos o compañeros de trabajo, los vínculos familiares se caracterizan por ser más fuertes e interdependientes, por lo que los efectos del desempleo podrían manifestarse de una forma diferente. Sobre cómo afecta el

desempleo a los hijos de los afectados, se ha encontrado que presentan peor salud mental (Pieters & Rawlings, 2020; Sleskova et al., 2006) y peores expectativas en cuanto a su futuro laboral (Schliebner & Peregov, 1994). También se ha encontrado que la percepción del riesgo a perder el trabajo se relaciona con problemas familiares (Larson et al., 1994). En este sentido, podría ser que el efecto del desempleo en la familia esté moderado por variables como la clase social, el número de miembros que la componen, o los roles de género (Aguiar et al., 2020). El matrimonio puede actuar como un atenuante para la salud mental de las mujeres desempleadas, pero para los hombres es un agravante (Artazcoz et al., 2004). Los autores de este estudio atribuyeron estos resultados a los roles de género, por los cuales se ha considerado al hombre como principal proveedor y responsable de los recursos económicos (Artazcoz et al., 2004; Maddy et al., 2015). Esta hipótesis ha sido apoyada por un estudio que, analizando los índices de violencia física en el núcleo familiar en 31 países, encontró que un incremento del 1% en las tasas de desempleo en hombres aumenta la incidencia de violencia física hacia su pareja mujer en un 2,75% (Bhalotra et al., 2018). Por el contrario, un 1% más de desempleo en mujeres se asoció a una reducción del 2,87%. Igualmente, Tur-Prats (2017) observó cómo el aumento de mujeres desempleadas reducía el riesgo de ser agredidas por parte de sus parejas.

Resumidamente, el desempleo se ve agravado por factores sociales, como el estigma, los roles de género o las desigualdades sociales. Además, éste afecta a la forma en la que las personas tienen de percibir y relacionarse con el mundo.

3.5. Alteraciones en el bienestar psicológico y salud mental

Como se ha descrito en apartados anteriores, el desempleo está asociado al deterioro psicológico ya que priva a las personas de una serie de elementos que aportan

bienestar. Esta relación ha sido ampliamente estudiada y avalada por los hallazgos. Varias revisiones sistemáticas y metaanálisis han encontrado índices mayores de ansiedad, depresión, consumo de sustancias y malestar general en desempleados (McKee-Ryan et al., 2005; Nörstrom et al., 2014; Paul & Moser, 2009). También se ha visto que durante las crisis económicas las personas presentan niveles más elevados de estrés y solicitan en mayor medida los servicios de salud mental (Cortès-Franch & López-Varcárcel, 2014). Los niveles de estrés han sido investigados en diferentes grupos de desempleados. De forma específica, se ha encontrado que el estrés afecta a los desempleados de distintos grupos de edad. Una revisión de estudios concluyó que los jóvenes desempleados tenían más estrés que sus iguales estudiantes o trabajadores (Reneflot & Evensen, 2014). Otro estudio halló una relación positiva entre la cantidad de desempleo acumulado a lo largo de toda la vida laboral y el nivel de estrés a la edad de 50 años (Daly & Delaney, 2013), incluso controlando los niveles previos de estrés, otros problemas emocionales y conductuales en la infancia y el nivel de funcionamiento cognitivo temprano.

Los datos apuntan a que los niveles de estrés y deterioro psicológico varían en función de la duración del desempleo. Para analizar esta cuestión, von Scheve et al. (2017) estudiaron lo cambios en el bienestar emocional antes del desempleo y a lo largo del mismo. Estos autores encontraron que, a corto plazo, el bienestar afectivo disminuía y la ansiedad aumentaba, alcanzando sus máximos niveles durante los tres primeros meses, entre los siete y los nueve y, se estabilizaba a un alto nivel a partir de los dos años. Por su parte, el sentimiento de felicidad coincidía con este patrón, disminuyendo a los 7-9 meses y a partir de los 24. Igualmente, la satisfacción vital decreció de forma proporcional a lo largo de la situación de desempleo, hallazgo que se ha replicado otras veces en la literatura (Kamerāde & Bennett, 2017).

Además de estos indicadores de un mayor malestar psicológico, el desempleo también se ha asociado a un mayor riesgo de diagnósticos de trastornos mentales (Buffel et al., 2015; Thern et al., 2017), siendo sus efectos mayores cuanto más se prolonga la situación (Fergusson et al., 2014).

No obstante, parece ser que factores como la edad, el momento vital en el que se experiencia el desempleo, así como la evolución de la situación, modulan el proceso de deterioro. Tøge (2016) observó que las variaciones del estado de salud autoinformado eran independientes del nivel de ingresos. O bien, que esta percepción empeoraba entre un 22-67% en desempleados de larga duración y entre un 54-132% en los de muy larga duración (López del Amo González et al., 2018). Por su parte, en el estudio de Daly y Delaney (2013) los más afectados fueron los desempleados entre 30 y 34 años y los de entre 45 y 49 años. Igualmente, como se ha descrito en apartados anteriores, las crisis económicas y las tasas de desempleo pueden moderar la relación entre desempleo y salud. Un estudio sobre los efectos de la Gran Recesión vio cómo aquellos desempleados de mayor edad que perdieron su trabajo entre los años 2006 y 2010 vieron más deteriorada su salud psicológica que los que mantuvieron su empleo en esos años (Riumallo-Herl et al., 2014). En este caso, el efecto se mantuvo aun controlando el nivel de ingresos, comportamientos saludables y el estado funcional, de manera que la pérdida de trabajo se relacionó con un aumento del 4,78% de síntomas depresivos en Estados Unidos y un 3,35% en Europa.

El desempleo también se ha asociado a un aumento del consumo de sustancias psicoactivas. Concretamente, se ha observado un incremento del 40% en la probabilidad de consumir antidepresivos por primera vez (Bijlsma et al., 2017). Además, se ha indicado

un mayor consumo de cannabis y sedantes (Colell et al., 2015) y consumo y dependencia al alcohol (Fergusson et al., 2014; Henkel, 2011).

Hasta el momento, la mayoría de los resultados apuntan a un efecto nocivo del desempleo en constructos psicológicos que dependen de la experiencia personal, pero, aunque en menor medida, también se han encontrado cambios en aspectos considerados más estables, como es la personalidad. Boyce et al. (2015) estudiaron los principales rasgos de personalidad a lo largo de cuatro años en una muestra de desempleados y encontraron cómo la agradabilidad, extroversión y apertura variaban en función de la duración del desempleo. En ese período, fue la apertura la que mostró mayor variación de forma que, en el caso de los hombres, aumentó en torno a los dos años de desempleo para disminuir a partir del tercer año. En el caso de las mujeres, estos niveles disminuyeron de forma gradual a lo largo de los años.

En definitiva, el desempleo constituye una experiencia impactante en la vida de las personas en tanto que se asocia con una reducción de los niveles de bienestar psicológico y de salud mental. Especialmente, estos efectos son más pronunciados en determinados grupos, como es el caso de los jóvenes, y a partir del primer año de desempleo. No obstante, son las personas mayores las que, mostrando mayor riesgo de depresión, tienen una mayor probabilidad de contactar con los servicios de salud mental (Buffel et al., 2015).

La salud durante la situación de desempleo se entiende como un proceso dinámico en el que, además de intervenir un amplio espectro de factores, se pueden producir fluctuaciones. Algunos autores han tratado de describir distintas etapas del desempleo y de cómo la salud mental se ve afectada en cada una de ellas.

Kapuvari (2011) hizo referencia a los resultados de Arnetz et al. (1987) para clasificar el tránsito por el desempleo en cinco etapas: la fase de inseguridad laboral, la pérdida de trabajo, la "luna de miel", la fase de dificultades económicas y el desempleo estable y sin esperanza de encontrar un nuevo empleo. Estas fases se resumirían en un aumento de los niveles de estrés durante la primera y segunda fase, que va asociada a respuestas psicofisiológicas nocivas (como el exceso de secreción de cortisol). En la tercera etapa se produciría un equilibrio y aumento del bienestar. En la cuarta etapa volvería a comenzar a disminuir la calidad de vida y a aumentar el estrés, aislamiento social y comportamientos problemáticos. Por último, la quinta se caracterizaría por un el cual se estabilizaría en la cuarta etapa, para volver a deteriorarse en la última. En la quinta, tendría lugar un fenómeno inmuno-supresivo que estaría asociado a cambios severos en la salud y en el estado de ánimo.

3.5.1. Modelos explicativos del deterioro psicológico en el desempleo

Para comprender de manera general lo que supone la pérdida de un trabajo o el no poder ser capaz de encontrar un nuevo empleo para el funcionamiento psicológico de una persona, se han propuesto diversos modelos teóricos.

Entre los modelos más destacados se encuentra el de Jahoda (1982), también conocido como el Modelo de Privación. Es un modelo de los efectos psicosociales del desempleo que sugiere que el trabajo cumple una serie de funciones agrupables en dos tipos: manifiestas y latentes. Las funciones manifiestas del empleo hacen referencia a su carácter instrumental y consisten en la aportación de recursos económicos y materiales. Por otra parte, las funciones latentes son cinco: imponer una estructura temporal organizada a las actividades de la vida diaria, aumentar el alcance de las relaciones interpersonales, promover el establecimiento de metas y propósitos más allá de los

personales, definir el estatus social y la identidad personal y, por último, fomentar el desarrollo de una actividad. Según la autora, el desempleo provocaría la privación de una o varias de estas funciones, dando lugar a una crisis de identidad personal, desorganización existencial o aburrimiento que, en definitiva, causaría la insatisfacción de determinadas necesidades psicológicas y psicosociales.

Más tarde, Fryer y Payne (1986) formularon la Teoría de la Agencia como propuesta alternativa al modelo anterior. Esta teoría tiene en cuenta las funciones latentes y manifiestas del empleo, pero se centra en las características psicológicas de las personas. Para estos autores, el desempleo no sólo impide la satisfacción de ciertas necesidades, sino que además bloquea las acciones de las personas. En este sentido, el deterioro psicológico que se experimenta en situación de desempleo vendría dado por la frustración y dificultades cognitivas y conductuales que tiene la persona al enfrentar su nueva realidad. Es decir, ante el cambio de estado laboral, la persona tendría dificultades para planificar y reorientar su comportamiento hacia nuevos objetivos.

Paralelamente, Warr desarrolló su Modelo Vitamínico (1987), el cual sería considerado posteriormente uno de los más completos. El autor se inspiró en el funcionamiento y relevancia de las vitaminas para la salud, indicando que el entorno sociolaboral aporta 9 vitaminas psicosociales que intervienen en la salud mental: las oportunidades de control, oportunidades de uso de las habilidades y capacidades personales, establecimiento de objetivos externos, disponibilidad de recursos económicos, seguridad física, variabilidad de tareas, claridad ambiental, estatus social y oportunidades para establecer relaciones personales. Según este modelo, el deterioro psicológico por desempleo funcionaría como un déficit vitamínico. En este contexto, no

tener un empleo supondría una base para un ambiente empobrecido que tiene un efecto nocivo sobre la salud mental.

Janlert y Hammarström (2009) realizaron un estudio para evaluar la validez de los modelos anteriormente nombrados, entre otros. Para ello, evaluaron los factores considerados relevantes con relación al deterioro de la salud en el desempleo, analizando su asociación con síntomas somáticos, depresivos, percibidos y con problemas de estrés y ansiedad. El resultado obtenido situó al modelo propuesto por Jahoda (1982) como el más significativo para explicar la relación entre el desempleo y la salud. Concretamente, los factores más relevantes fueron las funciones de estructura del tiempo y la realización de una actividad regular.

Por otro lado, y de manera más específica, para entender los efectos negativos del desempleo sobre la salud, en los niveles social, físico y psicológico, es necesario referirse a los modelos de estrés (French & Kahn, 1962; Kagan & Levi, 1974). El desempleo, se ha considerado tradicionalmente un estresor psicosocial (Sumner & Gallagher, 2017) y como tal, junto con otros factores psicobiológicos, pone en marcha una respuesta de estrés que daría lugar a alteraciones en la salud. En este contexto, el modelo COPES (*Coping, Psychological and Unemployment Status*) propuesto por Waters (2000) y basado en el modelo de Lazarus y Folkman (1986) constituye una aproximación novedosa e integradora en cuanto al estudio del estrés y el afrontamiento durante el desempleo. Además, el modelo tiene en cuenta la relación del estrés con la salud y su efecto en el re-empleo. Para Waters, los estresores que debe afrontar una persona desempleada son: actualizar el currículum y realizar actividades para engrosarlo, buscar un nuevo empleo, enfrentarse a entrevistas de trabajo y sus posibles rechazos, limitaciones económicas, búsqueda y solicitud de ayudas sociales, problemas de

relaciones interpersonales y aburrimiento. En este modelo, el factor responsable de que la salud psicológica se vea afectada sería la evaluación cognitiva que hace la persona sobre su situación y las estrategias de afrontamiento de las que haga uso. Un aspecto destacable de este modelo es que las relaciones que se establecen entre todos los factores son bidireccionales. Es decir, el desempleo conlleva una serie de alteraciones en la salud que, a su vez, dificultan el proceso de reempleo.

3.6. Influencia del desempleo en el rendimiento cognitivo

Según la Organización Mundial de la Salud, la salud es un estado de completo bienestar físico, mental y social, y no sólo la ausencia de afecciones o enfermedad (Organización Mundial de la Salud, OMS, 1948). Como se ha expuesto en apartados anteriores, el desempleo se ha asociado a un deterioro significativo en esas tres áreas. Sin embargo, en el área de la salud mental, la relación entre el desempleo y el rendimiento cognitivo ha sido considerablemente menos estudiada que el resto.

En un estudio sobre dificultades cognitivas en desempleados con trabajadores entre 16 y 64 años, Fryer y Warr (1984) encontraron que la duración de desempleo se asoció un peor rendimiento cognitivo autoinformado, concretamente en la velocidad de procesamiento, agudeza mental, comprensión, memoria y alerta general. Más tarde, Haworth et al. (1990) replicaron ese estudio y encontraron los mismos hallazgos, pero además varias pruebas de evaluación cognitiva. Encontraron que los desempleados mostraron un peor rendimiento en razonamiento verbal y habilidad cognitiva general. También Košćec-Bjelajac et al. (2019) observaron un peor rendimiento cognitivo en desempleados procedentes de población rural, en comparación a empleados.

Los períodos de pobreza o falta de trabajo también se han asociado a un peor rendimiento en control cognitivo e inteligencia fluida (Mani et al., 2013), controlando

factores como el nivel de ansiedad, estrés o ejercicio físico. En el caso de desempleados mayores, Moraes et al. (2010) indicaron que aquellos mayores de 75 años que estaban trabajando rindieron mejor que sus iguales desempleados en la prueba MiniMental. Igualmente, se ha encontrado que una mayor cantidad de períodos de desempleo a lo largo de la vida laboral estuvo asociada a un mayor riesgo de deterioro cognitivo en la vejez (Leist et al., 2013), por encima de las bajas por enfermedad si se tenían en cuenta la edad, el género y factores de la infancia (nivel socioeconómico y rendimiento académico) y de la vida adulta (ingresos, categoría laboral, salud percibida y diagnóstico de enfermedades médicas). Por el contrario, Freitas et al (2012) no encontraron diferencias en el rendimiento cognitivo entre empleados y desempleados, jubilados o trabajadores domésticos cuando se tuvieron en cuenta la edad y el nivel educativo.

Teniendo en cuenta que el funcionamiento cognitivo es uno de los principales predictores del rendimiento laboral (Bertua et al., 2005; Ohme & Zacher, 2015) y que existen modelos teóricos que apoyan un posible detrimento de las habilidades cognitivas por la falta de trabajo, se plantea necesario estudiar mucho más en profundidad esta relación entre el desempleo y el funcionamiento cognitivo.

3.6.1. Modelos explicativos de las consecuencias en el rendimiento cognitivo

a) Modelo procesual del estrés

Sandín (1995) formuló el modelo procesual del estrés con el objetivo de cubrir ciertos déficits que presentaban los modelos tradicionales de estrés. Entre estos déficits se encontraba la falta de una explicación de los mecanismos por los que el estrés puede afectar a la salud de la persona que está viviendo la situación estresante. De acuerdo con este modelo, el estrés es un proceso interactivo que implica cuatro etapas y siete componentes básicos:

- Demandas o estrés psicosocial. Se refiere a los agentes externos causales, en un primer momento, del estrés. Estos incluyen tanto a los estresores ambientales (p. ej., calor o ruido), como a los estresores psicosociales (p. ej., perder el empleo).
- Evaluación cognitiva. Ante la presencia del estresor, el individuo realiza una evaluación que dependerá del tipo de amenaza del que se trata: pérdida, peligro o desafío. Asimismo, la evaluación está condicionada por las características de esta –su valencia positiva o negativa, la independencia hacia uno mismo, la predictibilidad y la controlabilidad– y por la valoración de los recursos disponibles para poder afrontar la amenaza.
- Respuesta de estrés. Una vez se ha interpretado al agente como una situación amenazante, se ponen en marcha las reacciones fisiológicas del estrés (activación del eje HPA y su consecuente liberación de cortisol y activación del sistema nervioso autónomo) y las respuestas emocionales del estrés. Estas respuestas son de tipo emocional, concretamente de ansiedad y/o depresión.
- Afrontamiento. Esta etapa, en la que el individuo realiza esfuerzos conductuales y cognitivos para hacer frente a las demandas estresantes y disminuir el malestar emocional, constituiría la última etapa del proceso de estrés como tal. Estos esfuerzos sirven para cambiar el significado de la situación o bien, para reducir los síntomas de estrés. Por lo tanto, se podría considerar el elemento esencial.
- Características personales. Este componente incluye a un conjunto de variables relativamente estables que pueden influir sobre las cuatro etapas anteriores. Por ejemplo, la personalidad, el sexo, la raza, la autoestima, resiliencia, etc.

- Características sociales. La más relevante en cuando al estrés es el apoyo social, el cual es considerado un recurso social de afrontamiento del estrés. En este se incluye la ayuda percibida y la ayuda recibida, siendo la primera más importante.
- Estado de salud. El último componente del modelo, más que una fase, constituye el resultado de todo el conjunto. El estado de salud resultante, físico y psicológico dependerá del funcionamiento de las etapas anteriores.

Según el modelo de Sandín (1995), un estresor psicosocial como el desempleo sería capaz de generar una respuesta de estrés que, bajo determinadas condiciones y características personales, dé lugar a alteraciones en la salud. Además, las respuestas fisiológicas del estrés (es decir, la activación del eje HPA y liberación excesiva de cortisol) han sido asociadas a cambios estructurales y funcionales del cerebro (Martín-Pérez et al., 2019). Concretamente, inhibiendo la génesis de nuevas neuronas y reduciendo el tamaño del hipocampo y de la corteza prefrontal. Por tanto, el estrés se ha relacionado con el empeoramiento de las habilidades cognitivas: funciones ejecutivas (Butler et al., 2017; Butts et al., 2011; Dias-Ferreria et al., 2009), memoria (Lupien et al., 2009), y atención y aprendizaje (Dominique et al., 2009; McEwen, 2001; Liston et al., 2009).

b) Teoría de la complejidad ambiental: cambio del ambiente

La teoría de la complejidad ambiental (Schooler, 1984) propone que cuando un ambiente es complejo, es decir, proporciona un entorno estimulante, y se recompensa el esfuerzo cognitivo, las condiciones para desarrollar las capacidades cognitivas son mayores, así como aumenta su motivación para mejorarlas. En el caso de ambientes sencillos, éstos no proveerían las recompensas ni los recursos necesarios para desarrollar o mantener los niveles más elevados de funcionamiento cognitivo. Por lo tanto, la exposición continua a éstos, o los cambios de un ambiente más complejo a otro menos

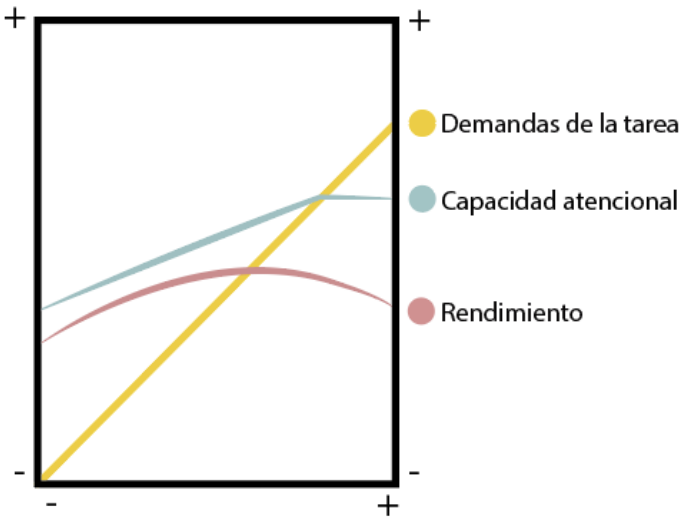
complejo, podría desembocar en un decremento del rendimiento y en cambios comportamentales para adaptarse a las demandas. En este sentido, teniendo en cuenta que el empleo es considerado un ambiente complejo, cabría esperar que, debido al cambio de entorno, se produjera una disminución del funcionamiento cognitivo en cualquier momento de la vida de un individuo.

c) Teoría de los recursos atencionales maleables (MART)

Esta teoría (Young & Stanton, 2002) sugiere que las tareas con bajas demandas llevan a la degradación del rendimiento cognitivo debido a la reducción de recursos necesarios. A pesar de que otros autores consideran que los recursos cognitivos son limitados y estables, los autores de la teoría MART sugieren que los recursos en realidad de acomodan en función de las demandas. Por lo tanto, en un contexto donde las demandas son bajas, los recursos implicados serían menos y, por tanto, el rendimiento se vería deteriorado. El modelo defiende que el efecto de las demandas en el rendimiento presenta la forma de una U invertida (Figura 1).

Figura 2

Relación entre las demandas de la tarea y el rendimiento ante un modelo de recursos atencionales maleables



De esta manera, en niveles altos de demandas (p. ej., alto estrés laboral), el rendimiento se deteriora. En niveles medios, el equilibrio entre recursos y demandas sería óptimo, y consecuentemente el rendimiento. Y, por último, en situaciones de bajas demandas, la capacidad de recursos y el rendimiento se reducen.

En resumen, el desempleo constituye una crisis de la vida laboral que afecta a todas las esferas de la vida de las personas, incidiendo en aspectos sociales, en su salud física, emocional y cognitiva. Mientras que la investigación ha sido extensa en los primeros aspectos, el estudio de las consecuencias en el rendimiento cognitivo ha sido menos exploradas, aun cuando puede afectar a la vida diaria y a la vuelta al mundo laboral. Por ello, resulta necesario seguir investigando la influencia del desempleo en la cognición de las personas, desde un punto de vista global que recoja el efecto de otras variables que puedan modular esta asociación.

II. JUSTIFICACIÓN, OBJETIVOS E HIPÓTESIS

Capítulo 4.
Justificación, objetivos e hipótesis

4.1. Justificación y objetivo general

El trabajo es la actividad que, además de para obtener una recompensa económica, sirve a las personas para cubrir otras necesidades: identidad, objetivos personales, conectividad social, estatus social y desarrollo de habilidades, entre otras (OIT, 1982; Neffa, 2015; Rosso, 2010). El desarrollo de estas habilidades se produce en diferentes niveles y es posible porque cada empleo requiere la realización de unas tareas específicas para las que son necesarias unas determinadas competencias intelectuales, sociales o manuales. El grado o intensidad con el que un trabajo a lo largo de los años promueve y recompensa el desarrollo de las capacidades personales se ha estudiado ampliamente con relación al rendimiento cognitivo. En este sentido, se ha encontrado que cuanto mayor es la complejidad de un puesto de trabajo, mejor es el funcionamiento cognitivo (Grzywacz et al., 2016; Marquie et al., 2010; Then et al., 2014; Sörman et al., 2019).

Gran parte de esta investigación sobre la influencia del empleo en el rendimiento cognitivo se ha centrado en el efecto que tiene la jubilación en el cambio o envejecimiento cognitivo en años posteriores. Sin embargo, aún falta investigación que estudie los efectos causales de la complejidad del puesto desempeñado a lo largo de la vida laboral en el cambio cognitivo después de la jubilación, especialmente con relación al funcionamiento ejecutivo y distinguiendo los subtipos de complejidad (con personas, datos y cosas).

Por otro lado, la trayectoria laboral puede verse interrumpida por períodos de desempleo, entendido como una situación caracterizada por la falta de trabajo y el deseo de tenerlo. La literatura científica ofrece toda una serie de hallazgos sobre cómo la ausencia de empleo afecta a las personas a nivel físico, cognitivo, emocional y social. En

cuanto a la díada desempleo-cognición, se ha hipotetizado que la falta de trabajo, aún más cuando ocurre por tiempo prolongado, podría tener un efecto directo en el rendimiento cognitivo de las personas debido a la falta de estimulación y la adaptación a las nuevas demandas (Schooler, 1984; Young & Stanton, 2002). Sin embargo, también existen evidencias a favor de un efecto de causalidad inversa, según la cual sería el rendimiento cognitivo el factor que podría predecir el estado laboral de una persona (Bertua et al., 2005; Ohme & Zacher, 2015). En este punto se hace necesario un estudio meta-analítico del conjunto de datos disponibles para obtener resultados que apoyen una u otra hipótesis.

Además, el estudio de las relaciones de causalidad desempleo-cognición debería integrar otras variables que han mostrado estar implicadas, como las emocionales y de salud física. Se ha observado una asociación entre el desempleo y el desarrollo o aumento de síntomas emocionales, como estrés, depresión o ansiedad (Nörstrom et al., 2014; Paul & Moser, 2009; Sumner & Gallagher, 2016), problemas de salud física (Wright & Dyson, 2015; McKee-Ryan et al., 2005) y dificultades sociales (Monticelly et al., 2016; Gross et al., 2020). Especialmente, los síntomas de malestar emocional se han asociado a un empeoramiento del rendimiento cognitivo, posiblemente debido al efecto del estrés crónico (Butler et al., 2017; Dettenborn et al., 2010; Lupien et al., 2009). A los hallazgos disponibles hasta el momento se deberían incorporar nuevos resultados que nos permitan hacer propuestas de modelos integrales, los cuales faciliten una comprensión más amplia de las relaciones del desempleo con las diversas variables, tanto sociodemográficas y propiamente ocupacionales como cognitivas, emocionales y de salud física.

Teniendo todo esto en cuenta, resulta fundamental estudiar de una forma global el funcionamiento cognitivo en personas desempleadas. De este modo, se podrían desarrollar intervenciones más eficientes, ya que además de afectar al funcionamiento de la vida diaria de los individuos, el empeoramiento de la cognición durante el tiempo de desempleo podría condicionar sus posibilidades de conseguir y mantener un nuevo empleo (Ohme & Zacker, 2015, Olesen et al., 2013).

Así, el objetivo general de esta Tesis Doctoral será estudiar la relación entre la ausencia de empleo, por desempleo y jubilación, y el rendimiento cognitivo, así como la intervención de variables moduladoras.

4.2. Objetivos específicos e hipótesis

Objetivo 1. Analizar la influencia de la complejidad laboral en el rendimiento cognitivo de trabajadores mayores.

> ***Hipótesis 1.*** La complejidad laboral relativa al manejo de datos y personas estará relacionada de forma positiva con el rendimiento cognitivo de los trabajadores.

Para comprobar esta hipótesis se llevó a cabo el estudio 1 (ver Capítulo 5), publicado en:

Vélez-Coto, M., Andel, R., Pérez-García, M., & Caracuel, A. (In press). Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement. *Psychology and Aging*.

Objetivo 2. Determinar el efecto a largo plazo de la complejidad laboral en el cambio cognitivo tras la jubilación.

Hipótesis 2. Tras la jubilación, se mostrará un declive en el rendimiento cognitivo.

Hipótesis 3. Las personas que se jubilan de un trabajo más complejo presentarán una trayectoria de envejecimiento cognitivo más atenuada.

Para comprobar las hipótesis 2 y 3 se realizó el estudio 2 (Capítulo 5), publicado en: Vélez-Coto, M., Andel, R., Pérez-García, M. & Caracuel, A. (In press). Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement. *Psychology and Aging*.

Objetivo 3. Analizar y determinar la fuerza de la relación entre el desempleo y la cognición.

Hipótesis 4. La literatura previa aportará evidencias tanto de un efecto negativo del desempleo en el rendimiento cognitivo, como de un efecto de selección por el que las variables cognitivas determinen el estado laboral.

Hipótesis 5. En la asociación entre el desempleo y la cognición intervendrán factores sociodemográficos y también ocupacionales.

Para comprobar las hipótesis 4 y 5 se llevó a cabo el estudio 3 (ver Capítulo 6), el cual se encuentra actualmente en revisión:

Vélez-Coto, M., Rute-Pérez, S., Pérez-García, M., & Caracuel, A. (Under review). Unemployment and cognition: A systematic review and meta-analysis. *Journal of Economic Psychology*.

Objetivo 4. Comprobar la validez de un modelo integral sobre la relación del desempleo con el estado cognitivo y emocional en adultos sanos.

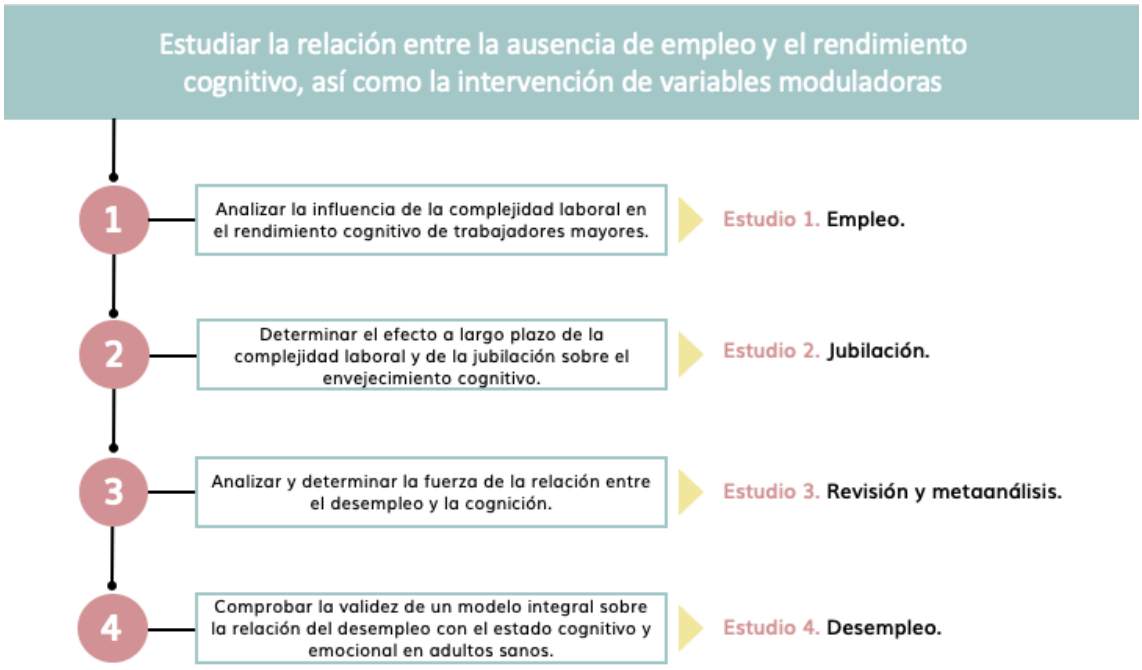
Hipótesis 6. El nivel educativo, la duración del desempleo y la complejidad del trabajo previo predecirán el rendimiento cognitivo en desempleados.

Hipótesis 7. El desempleo influirá en el rendimiento cognitivo de forma indirecta, mediado por la salud emocional.

Para comprobar las hipótesis 6 y 7 se llevó a cabo el estudio 4 (ver Capítulo 7), el cual se encuentra actualmente pendiente de revisión:

Vélez-Coto, M., & Caracuel, A. (Submitted). Modulatory variables of cognitive performance during unemployment. *Journal of Vocational Behavior.*

De modo gráfico, la estructura de los objetivos y de los estudios realizados es la siguiente:



III. MEMORIA DE TRABAJOS

Capítulo 5.
Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement

(Estudios 1 y 2)

Vélez-Coto, M., Andel, R., Pérez-García, M., & Caracuel, A. (In press). Complexity of Work with People: Associations with Cognitive Functioning and Change after Retirement. *Psychology and Aging.* https://doi.org/10.1037/pag0000584

Abstract

Retirement has been associated with cognitive decline. However, the influence of specific job characteristics like occupational complexity on post-retirement cognitive outcomes is not well understood. Data from the Midlife in the United States (MIDUS) study were used to examine occupational complexity in relation to cognitive performance and cognitive change after retirement. Initial sample included 471 workers between 45 and 75 years of age. At 9-year follow-up (T2), 149 were retired and 322 were still working. All six tasks from the Brief Test of Adult Cognition by Telephone were used. Hierarchical regression with workers at T1 indicated that, controlling for sociodemographic variables, complexity of work with people significantly contributed to explaining variance in overall cognitive performance (1.7%) and executive function (2%). In latent change score (LCS) models, complexity of work with people was the only significant predictor of cognitive change in retirees, with those retiring from high complexity jobs showing less decline. In conclusion, high complexity of work with people is related to better executive functioning and overall cognition during working life and slower decline after retirement. The finding that more intellectually stimulating work carries cognitive advantage into retirement fits the cognitive reserve concept, where earlier intellectual stimulation brings about lower risk of cognitive problems later. Study results also go along with the unengaged lifestyle hypothesis, whereby people may slip into so called “mental retirement”, leading to post-retirement cognitive loss, which may be most apparent among those retiring from jobs with low complexity of work with people.

Keywords: retirement, occupational complexity, complexity of work with people, cognitive change, executive functioning

5.1. Introduction

Cognitive functioning is influenced by many factors including age, years of education, health, or activity engagement (Brewster et al., 2014). Among these influencing factors, cognitive stimulation associated with environmental complexity during adulthood, including occupational complexity, is often highlighted as a leading contributor to maintenance of cognitive function in older adulthood (Schooler et al., 1999). In that sense, retirement has been associated to cognitive decline (Bonsang et al., 2012). This decline might be explained according to the "unengaged lifestyle hypothesis" (Rohwedder & Willis, 2010). The hypothesis proposes that work context provides more cognitively stimulating and challenging conditions than a non-work environment. Workers are more involved in regular "mental exercise" than retired individuals, who sometimes engage in "mental retirement", whereby retirement becomes synonymous with low activity and a drop in cognitive performance (Rohwedder & Willis, 2010). Taken together, there are reasons to believe that there would be a decline in cognitive performance due to retirement and the accompanying loss of stimulation through occupational activities.

Retirement has been associated with accelerated of loss in processing speed and spatial skills (Finkel et al., 2009) and a negative lagged effect in memory and working memory (Bonsang et al., 2012). Compared to working peers, retirees show greater loss of learning, memory and inductive reasoning (Celidoni et al., 2017; Hamm et al., 2020; Roberts et al., 2011; Ryan, 2008; Wickrama et al., 2013; Xue et al., 2018). Thus, it is possible that delayed retirement would relate to better maintenance of cognitive abilities, decreasing the risk of cognitive impairment and cognitive aging, and potentially reducing social and health costs (Dufouil et al., 2014; Grotz et al., 2016).

The opposite effect of retirement on cognition has been found, noting that retirees show better verbal memory and abstract reasoning than workers (Bianchini & Borella, 2016; Denier et al., 2017), and a slightly decreased rate of decline in episodic memory post-retirement (Andel et al., 2016; Fisher et al., 2014), especially when paired with pre-retirement higher mental demands at work or less work-related stress. These positive outcomes have been explained by the effect of the mental stimulation at work that act as a boost for cognitive reserve (Andel et al., 2016; Denier et al., 2017; Fisher et al., 2014).

The cognitive reserve hypothesis (Stern, 2009; Stern et al., 2018) suggests lifetime intellectual activities and other environmental factors, such as occupational tasks, may protect brain function from aging (Barulli & Stern, 2013). Mounting evidence suggests occupational characteristics can play a substantial role in the development and maintenance of cognitive reserve, thus supporting normal cognitive function even in the face of underlying age-associated brain pathology (Stern et al., 2018). These effects seem to persist through older adulthood, as evidenced by research suggesting that work complexity is significantly associated with reduced risk of dementia (Andel et al., 2005; Dekhtyar et al., 2016; Karp et al., 2009; Kröger et al., 2008; Then et al., 2014). Complexity of work refers to the extent to which occupations provide cognitively demanding tasks and incentives to train and improve cognitive skills, as well as promotes opportunities for social interaction (Denier et al., 2017). Complexity of work and its three different types - in the management of data, people or things – might shed light on relationships between occupational activities and cognitive performance during working life and retirement (Nexø et al., 2016). Regarding the effect of occupational complexity on workers, evidence in favor of the environmental complexity theory shows that the more complex the job,

the greater the cognitive stimulation (Schooler et al., 1999; Then et al., 2014). Studies have associated high occupational complexities with better specific cognitive performance during working life. For instance, a recent longitudinal study found that, even after controlling for demographics, education and health, higher occupational complexity was associated with a better processing speed and cognitive flexibility in workers aged between 42 and 56 (Kraup et al., 2018). A cross-sectional study using the Midlife in United States (MIDUS) study's database found that workers in higher complexity occupations had better episodic memory and executive function (Grzywacz et al., 2016). In terms of the associations of each type of work complexity and effects on cognition, individuals retiring from jobs with high complexity of work with data showed better general cognition (Correa Ribeiro et al., 2013; Andel et al., 2007; Andel et al., 2016; Finkel et al., 2009) and memory, and faster processing speed (Lane et al., 2017) at the moment of retirement. Still, little is known as to how specific work characteristics, like work complexity, affect the various aspects of cognitive function when retirement and complexity are considered within the same longitudinal model.

In a complementary way, the "disuse hypothesis" (Salthouse, 2006) asserts that rate of age-related decline in cognitive measures is less pronounced for those people that are less mentally active. Given the extent of exposure to work environment across the life course for a large proportion of adults, and the variability of job tasks across the different occupations, it is likely that work characteristics, like occupational complexity, contribute substantially to the assumptions that underlie the disuse hypothesis. Specifically, it is possible that high occupational complexity can buffer against age-related decline whereas low occupational complexity can exacerbate decline. What is less known is how retirees respond cognitively when exposure to mentally engaged work

environment is removed. Based on the continuity theory of aging (Atchley, 1989), individuals are innately motivated to maintain their behaviors as they get older. The identity continuity and identity crisis theories (Atchley, 1971) further posit that retirement can lead to an identity crisis that can be resolved by engagement in similar activities, or similar activity level, as before retirement. Evidence showing the association between greater work complexity and lower risk of dementia many years after retirement (Andel et al., 2005; Karp et al., 2009) supports this notion.

However, research properly investigating occupational complexity and cognitive aging in the context of retirement is still sparse. Findings show mainly two patterns: the preserved differentiation and the differential preservation (Salthouse, 2006). The preserved differentiation pattern shows that at the time of retirement, individuals with higher complexity of work exhibit higher cognitive performance than those with lower occupational complexity but show similar and parallel rates of cognitive decline over time. On the other hand, differential preservation pattern shows that, at the time of retirement, individuals with higher complexity of work exhibit higher cognitive performance than those with lower complexity of work and show reduced decline compared to those retiring from less complex jobs. In terms of types of complexity, higher complexity of work with people has been associated with a faster rate of decline after retirement more consistently, although complexity of work with data shows similar patterns (Finkel et al., 2009; Grotz et al., 2018). Studies that applied an overall measure of complexity without differentiating between the three types of complexity (i. e., data, people, things) found that higher complex jobs were associated with slower cognitive aging (Fisher et al., 2014) and lower risk of cognitive impairment (Andel et al., 2017; Boots et al., 2015) post-retirement. For example, spending more than 23 years in a job of high

complexity with people and with things was found to reduce the risk for dementia 64% and 55%, respectively (Kroger et al., 2008).

In summary, more research studying the effect of the different types of occupational complexity on cognition during working life and retirement is needed. In addition, a recent systematic review suggested that factors that explain the association between retirement and cognition should be studied more extensively (Meng et al., 2017). Baldivia et al. (2008) also suggested that complexity of work seems to be one of the main mechanisms why occupation may modulate cognitive reserve. Regarding the research designs used to achieve that aim, there is a need for longitudinal studies about the effect of retirement and occupational complexity on cognitive performance, especially on executive functioning (Sörman et al., 2019). Some authors suggest that measurement of cognitive change should be the primary focus of longitudinal aging research (Sliwinski & Buschke, 2004). Moreover, cross-sectional studies comparing retirees with working adults might be needed as well.

To our knowledge, this is the first study using Latent Change Score modeling for the purpose of comparing the influence of complexity of work on the rate of cognitive change in the retirement transition comparing with older workers, while controlling for covariates commonly associated with cognition such as age, education, and health. The current study selected a specific age range to explore the association between cognitive performance and occupational complexity at a time close to retirement, as a first step to examine the rate of cognitive change. Therefore, our aims were (1) to examine the relationship between cognitive performance and occupational complexity in a sample of workers aged between 45 and 75, and (2) to examine the effect of complexity at work on cognitive change after retirement, while controlling for age, educational level, health.

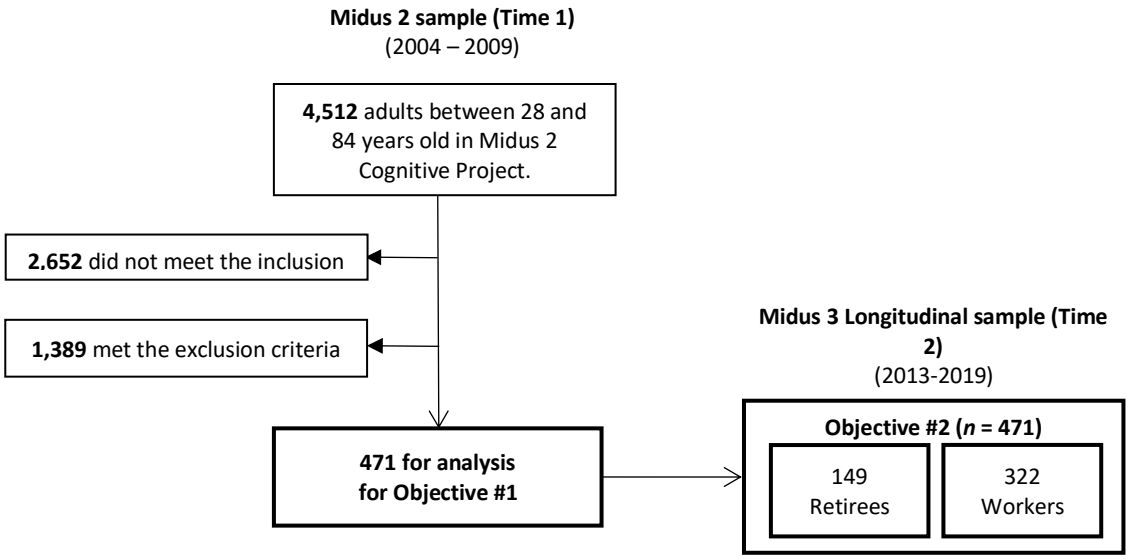
5.2. Method

Participants and Procedure

The Midlife in the United States (MIDUS) study (http://midus.wisc.edu/) was the first North American longitudinal study conceived to investigate the role of psychological, behavioral and social factors in health and well-being in midlife. The first wave, MIDUS-1 (1995-1997) was the baseline and included demographics, psychosocial and information about daily life health information. MIDUS-2 (M2) (Time 1) (2004–2009) was the follow-up and added cognitive, biomarker and neuroscience assessments. MIDUS-3 (M3) (Time 2) (2013-2019) was the second follow-up. The current study was conducted with samples from the MIDUS-2 and 3 (Figure 1). In order to select a suitable sample for both study aims (i.e. to explore the association of cognitive performance and complexity of work in workers, and to study how occupational complexity influence change in cognition during the retirement transition) an age range eligibility criteria had to be set at Time 1 (T1) so part of the sample were retired at Time 2 (T2).

Figure 1

Flow chart of the sample selection



Age criteria for M3 sample was set 15 years above and below the average retirement age (60±15) (Gallup Inc, 2013). Therefore, the following inclusion criteria were applied in M2: being employed and aged between 45 and 75 at T1. The exclusion criteria were (a) previous history of stroke, Parkinson's disease, head injury or other neurological disorder, (b) current clinical depression, (c) incomplete cognitive assessment in M2, (d) incomplete occupational information in order to obtain the complexity of work scores, and (e) incomplete cognitive assessment in M3.

Table 1

Descriptive data of the sample for objective #1 (Time 1)

	Workers		
	n = 471 *M* (*SD*) or *n* (%)	Skewness	Kurtosis
Age	54.15 (6.09)	0.56	-0.16
Age range	45-75		
Gender			
Male	217 (46.1%)		
Female	254 (53.9%)		
Educational level (U.S. Department of Education)			
Less than high school	9 (1.9%)		
High school competition	114 (24.2%)		
Some college, no degree	81 (17.2%)		
Associate degree	34 (7.2%)		
Bachelor's or higher degree	233 (49.5%)		
Complexity of work with data	4.18 (1.34)	-1.49	2.16
Complexity of work with people	3.65 (2.49)	0.25	-1.46
Complexity of work with things	1.88 (2.39)	0.69	-1.19
Physical health	3.88 (0.82)	-0.45	0.11
BTACT Composite at T1	0 (1)	-0.01	0.12
Memory factor at T1	0 (1)	0.52	0.43
Executive function factor at T1	0 (1)	0.00	0.37

Note. *M* = Mean; *SD* = Standard Deviation.

From the initial population of 4,512 people in T1, 2,652 people did not meet the inclusion criteria, and 1,389 met the exclusion criteria, leaving a sample for analysis of 471 subjects. Mean age was 54.12 (*SD* = 6.07) and 54% were women (Table 1). In T2, the

majority of participants (*n* = 315) were still working, whereas the remaining were retired (*n* = 144) (Table 2).

Table 2

Descriptive data for objective #2 (Time 2)

	Retirees	Workers			
	n = 149 *M* (SD) or *n* (%)	*n* = 322 *M* (SD) or *n* (%)	*t* (*p*) or χ2 (*p*)	Skewness	Kurtosis
Age at T2	67.27 (5.32)	61.35 (5.49)	10.97 (<.001)	0.56	-0.16
Gender			2.31 (.128)		
Male	61 (40.9%)	156 (48.4%)			
Female	88 (59.1%)	166 (51.6%)			
Physical health	3.73 (0.82)	3.95 (0.82)	-2.58 (.010)	-0.45	0.11
Educational level (MIDUS interviews)			20.65 (.037)		
No school/Some grade school	2 (1.3%)	1 (0.3%)			
Eighth grade/Junior high school	2 (1.3%)	2 (0.6%)			
Some high school	47 (31.5%)	3 (0.9%)			
GED	23 (15.4%)	1 (0.3%)			
Graduated from high school	3 (2%)	64 (19.9%)			
1 to 2 years of college, no degree yet	14 (9.4%)	42 (13%)			
Three or more years of college, no degree yet	22 (14.8%)	13 (4%)			
Graduated from 2-year college or Associate degree	3 (2%)	20 (6.2%)			
Graduated from 4- or 5-year college or bachelors degree	25 (16.8%)	79 (24.5%)			
Some graduate school	7 (4.7%)	11 (3.4%)			
Master's degree	2 (1.3%)	54 (16.8%)			
Ph.D, ED.D, MD, DDS, LLB… or other professional degree	2 (1.3%)	32 (9.9%)			
Complexity of work with data	3.84 (1.52)	4.34 (1.23)	-3.55 (<.001)	-1.49	2.16
Complexity of work with people	3.38 (2.54)	3.78 (2.46)	-1.64 (.101)	0.25	-1.46
Complexity of work with things	1.84 (2.34)	1.91 (2.42)	-0.29 (.767)	0.69	-1.19
BTACT Composite at T1	-0.28 (1.00)	0.13 (0.97)	-4.15 (<.001)	-0.01	0.12
Memory factor at T1	-0.09 (1.01)	0.04 (0.99)	-1.38 (.170)	0.52	0.43
Executive function factor at T1	-0.29 (0.99)	0.13 (0.97)	-4.75 (<.001)	0.00	0.37
BTACT Composite at T2	-0.31 (0.97)	0.14 (0.98)	-4.75 (<.001)	0.03	0.02
Memory factor at T2	-0.18 (0.99)	0.08 (0.99)	-2.69 (.008)	0.61	0.12
Executive function factor at T2	-0.29 (0.96)	0.14 (0.99)	-4.49 (<.001)	0.05	0.16

Note. *M* = Mean; *SD* = Standard Deviation.

Measures

The Brief Test of Adult Cognition by Telephone (BTACT)

The Brief Test of Adult Cognition by Telephone (BTACT) was administered by interviewers in M2 and M3 to assess cognitive performance. This instrument,

administered over the phone, allows valid assessment of cognitive areas that are sensitive to aging, so it can be administered to large population-based studies (Lachman et al., 2014).

The BTACT has an administration time of approximately 20 minutes and includes 6 tests: the Rey Auditory-Verbal Learning test (Lezak, 1995) (RAVLT) for assessing episodic verbal memory, the Backward Digit Span subtest from the WAIS-III (Weschler, 1997) for working memory, the Category Fluency test (Tombauh et al., 1999) for verbal category fluency, the Number Series (Salthouse & Prill, 1987) for reasoning, the 30-Seconds and Counting task (Backward Counting) for processing speed, and the Stop and Go Switch task (Switching task) for switching control. An exploratory analysis of the battery suggested two factors: Memory and Executive Functioning, and with good test-retest reliability (Lachman et al., 2014). The Memory factor includes the immediate and delayed recalls of the RAVLT. The remaining tests composed the Executive Function factor. Every factor is calculated as the mean of z-scores of the tests. A BTACT composite score, for general cognitive performance, is also available using the mean of *z*-scores of all tasks. The BTACT composite and the two factors were standardized as well (M = 0, SD = 1).

Occupational Complexity

Complexity of work scores have been widely used in research (Andel et al., 2005; Feldberg et al., 2016; Kroger et al., 2008; Smart et al., 2014). In the MIDUS study, respondent occupations were derived from three open questions in the M2 phone interview: a) what kind of business or company is this? b) what is your job title? and c) what are your most important activities or duties? Interviewers were trained to code occupations and worked in pairs to agree the final occupation code. Each respondent was assigned an occupation code using the 1990 Census Bureau occupational classification

scheme from the U.S. Department of Labor. This scheme was developed by job analysts based on their observation of jobs and it is available

Table 3

Rating scores and categories of occupational complexity with data, people and things from the Dictionary of Occupational Titles

Data		People		Things	
0	Synthesizing	0	Mentoring	0	Setting up
1	Coordinating	1	Negotiating	1	Precision working
2	Analyzing	2	Instructing	2	Operating-Controlling
3	Compiling	3	Supervising	3	Driving-Operating
4	Computing	4	Diverting	4	Manipulating
5	Copying	5	Persuading	5	Tending
6	Comparing	6	Speaking-Signaling	6	Feeding-Offbearing
		7	Serving	7	Handling
		8	Taking instructions-Helping		

Note. For this study, ratings have been reversed, meaning that the higher the score is, the higher the complexity.

in the Occupational Information Network (O*NET; http://www.onetonline.org/). Subsequently, for this study, codes of current occupations were assigned to the 2000 Dictionary of Occupational Titles (DOT) classification scheme, since the three middle digits in the codes represent complexity of work with data (4th digit), people (5th digit) and things (6th digit). The work complexity classification is composed of a list of particular skills that are required in every occupation and reflects the level of complexity in the management of data, people and things. Categories of the three dimensions of complexity at work are shown in Table 3. This scoring system makes it possible to quantify the complexity of working tasks required in a certain job, with lower scores indicating more complexity. For instance, counselling psychologist (code 045.107-026) has a complexity of work with data score of 1 (Coordinating), a complexity of work with people

score of 0 (Mentoring), and a complexity of work with things score of 7 (Handling). This would mean that a counselling psychologist would determine the sequence of actions to be taken on the basis of analysis of data, guide individuals to resolve problems based on clinical principles and handle devices with no responsibility to accomplish tasks.

As previous studies, in order to facilitate the interpretation of the analysis, each complexity score was reversed so a higher score reflects higher complexity.

Demographic and Health Measures From MIDUS

Age, highest educational level, and subjective physical health were extracted from MIDUS dataset. Highest educational level was recorded by interviewers and coded into 12 categories. In order to use dummy coding in the regression analysis, the 12 categories were recoded to five categories (Table 1), used by the U.S. Department of Education. The reference group for dummy coding was less than high school completion. The original 12 educational levels variable were used for the second objective (Table 2).

To obtain a measure of health status, the interviewers in the MIDUS study asked the participants to rate their physical health. Respondents rated their health as excellent (1), very good (2), good (3), fair (4), or poor (5). Score of this kind of assessment has been considered a good indicator of general objective health (Wu et al., 2013). For this study, health scores were reversed so higher scores reflect a better subjective health (5-excellent, 1-poor).

Statistical Analyses

For the first objective, bivariate correlations were calculated to assess association between cognitive outcomes and complexity of work, demographics, and health. Hierarchical linear regression analyses were conducted to estimate which complexity of work indices predicted better cognition. Age, dummy variables for education and

subjective health were introduced in the first block. Complexity of work with people, data and things were included in the following blocks separately according an evidence-based order. That is, both complexity of work with data and people have significant associations with cognition. However, complexity of people was entered in the first block after covariates due to the fact that there is greater evidence supporting the importance of complexity of work with people (Andel et al., 2005; Andel et al., 2016; Boots et al., 2015; Finkel et al., 2009; Karp et al., 2009; Kroger et al., 2008; Smart et al., 2014).

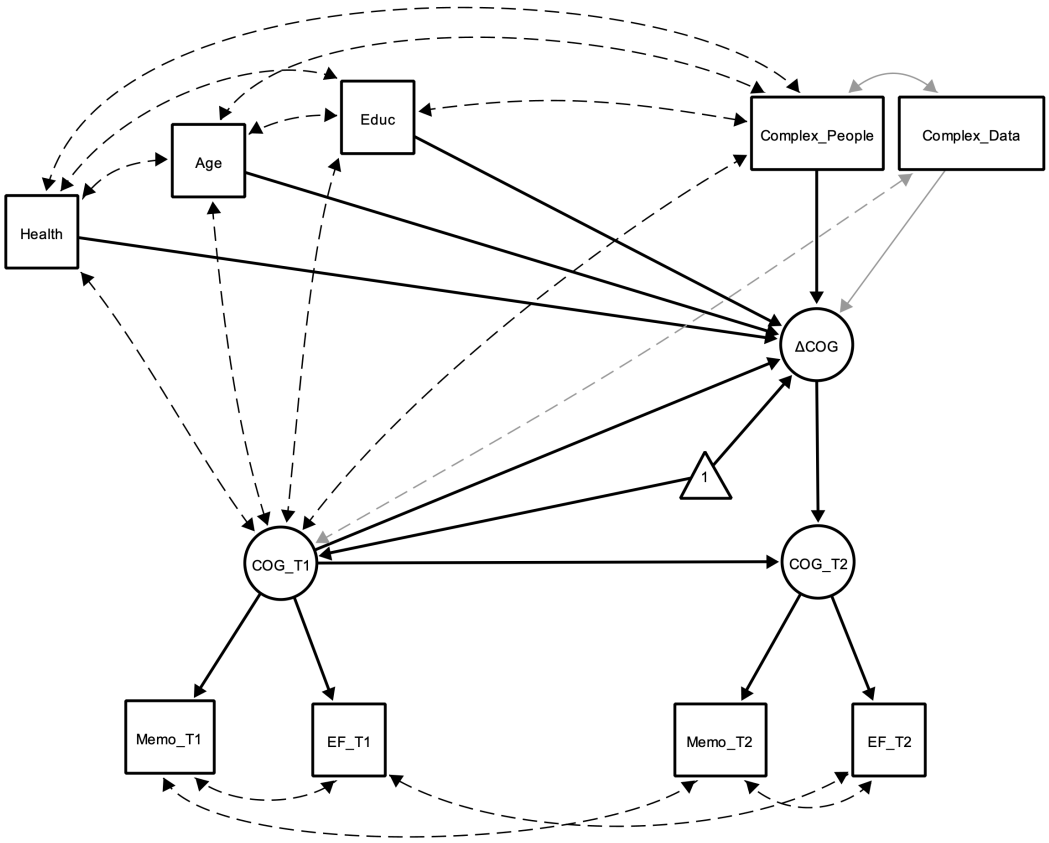
To accomplish the second objective, we fit two latent change score models for the general cognitive functioning (Kievit et al., 2018) (Figure 2). The latent change score (Δ) represents the rate of change between two measures in different times. This score is estimated in the model as a latent variable, allowing to attenuate influences of measurement error and variances and to reduce task-specific variance. According to the specifications of a multiple indicator univariate latent change score model (Kievit et al., 2018), variance of cognition at T1 was constrained to zero, cognition at T2 was regressed onto T1 (COG_T1) and Δ, and a covariance was set between same measures at different times. Parameters for Δ were set to one. Loadings of indicators of cognition variables were set to be equal over time in order to ensure obtain measurement invariance (Eid et al., 2012).

The first latent construct of general cognition was composed by the Memory and Executive factors in MIDUS-2 (T1), and the second latent construct included the same measures at MIDUS-3 (T2). In Model 1, change in cognition (Δ) was regressed on age, educational level, subjective health, and complexity of work with people. Covariances between all the independent variables and between cognition at T1 were set (Figure 2). Then, we tested the same model including complexity of work with data (Model 2).

Complexity of work with things was not included since it was not significant in the cross-sectional prediction of cognitive performance, and it has previously shown a weak reliability (Cain & Treiman, 1981; Kröger et al., 2008).

Figure 2

Simplified path diagram of the multivariate Latent Change Score model testing for latent change in general cognitive performance



Note. There is a latent variable at each time (T1 and T2) (represented by circles) and they are indicated by scores on each of the two BTACT factors: Memory (Memo_T1 and Memo_T2) and Executive Function (EF_T1 and EF_T2) and a latent change score (ΔCOG) is derived from them. The variables age, education, health and complexity of work with people are regressed on the change factor. Dashed lines are covariances. Grey lines represent the addition in Model 2.

Models were tested in a multi-group framework for workers (*n* = 322*)* and retirees (*n* = 149) simultaneously. Differences across groups were tested by comparing an equality-constrained model with a model where parameters were freely estimated in each group. If the model constrained to be equal in loadings, intercepts and regressions fit worse, this would mean that there are differences between groups.

Model fit was assessed by standards of χ^2 test (χ^2 / *df* < 2; *p* > .05), CFI (> .95), RMSEA (<.05) and SRMR (<.07) and GFI (>.09). For this purpose, RStudio (v. 1.2.5042) (2020) and lavaan package (Rosseel, 2012) were used, applying the robust Maximum Likelihood estimator (MLR). This estimator introduces corrections to offset the bias produced by non-normal distributions (Li, 2016). Moreover, the mean latent change score ($\mu\Delta$) indicates the reliable change between the two different times; the variance of the change ($\sigma^2\Delta$) represents the extent to which individuals differ in the change; and β can be assessed to interpret the extent to which change is dependent, or proportional, to the scores at time one (Kievit et al., 2018).

5.3. Results

Association Between Complexity of Work and Cognitive Performance in Workers

Results for the first objective showed significant correlations between cognitive measures and complexity of work and socio-demographic factors (Table 4). The highest correlation, though moderate, was between education and the BTACT composite and Executive Function factor (*r* = .37 and *r* = .36, respectively) (Cohen, 1988). Complexity of work with data correlated significantly with the three cognitive measures, as well as complexity of work with people. Complexity of work with things had significant correlations (*p* <.05) with the BTACT composite and the Executive Function factor.

Hierarchical regression analyses showed that complexity of work with people explained variance of the models of BTACT general composite and the Executive Function factor (Table 5). The models, including complexity with people, age, educational level and health, accounted for 21% and 19% of the variance, respectively. Additionally, a model with complexity of work with data was significant for the Executive factor (R^2 = .20, p < .001).

Table 4

Descriptive data and correlations of socio-demographics (a-c), complexity of work indices (d-f), and the Brief Telephone Adults Cognitive Testing (BTACT) measures (1-3)

	a	b	c	d	e	f	1	2
a) Age	-							
b) Educational level	-.10*	-						
c) Physical health	-.02	.21**	-					
d) Complexity with data	-.16**	.31**	.13*	-				
e) Complexity with people	-.09	.46**	.07	.45**	-			
f) Complexity with things	.05	-.21**	-.04	-.21**	-.50**	-		
1. BTACT Composite	-.18**	.37**	.20**	.28**	.29**	-.12*	-	
2. Memory factor	-.10**	.22**	.10**	.12**	.15**	-.06	.53**	-
3. Executive function factor	-.17**	.36**	.20**	.27**	.29**	-.12*	.97**	.30**

Note. Spearman rho bivariate correlations were calculated for educational level. Remaining refers to Pearson correlations (*r*).

** p < .01. * p < .05

Effect of Complexity of Work on Cognitive Change for Retirees and Workers

Regarding the second objective, the first model describing the influence of complexity with people on cognitive change between T1 and T2 showed optimum fit indices (Model 1: χ^2/df = 1.32, p = .175, Comparative fit index [CFI] = .994, robust Root

Mean Square Error of Approximation [RMSEA] = .037, Standardized Mean Square Residual [SRMR] = .048, Goodness of Fit [GFI] = 1.00) (Table 6). Estimates of rate of change were significant for the retiree group ($\mu\Delta$COG = 1.80, p = .037). Additionally, educational level and complexity of work with people showed significant covariance with cognition at T1. On the other hand, workers did not show a significant change (p = .097) and all covariates showed a significant association to cognition at T1.

Multi-group differences for retirees and workers showed that the model did fit the data significantly better than the one with loadings, intercepts and regressions constrained to be equal across groups ($\chi^2(13) = 183.68$, $p < .001$).

In the retiree group, the regression of complexity of work with people on the latent cognitive change was significant (p = .044), indicating better cognitive performance with increasing complexity of work with people. This association is illustrated in Figures 3 and 4. Specifically, Figure 3 shows means of cognitive scores of retirees at T1 and T2 by level of complexity of work with people.

Subgroups of level of complexity were made for illustrative purposes based on 1 standard deviation above the mean (high) and below the mean (low). Figure 3 shows that those retiring from jobs with higher complexity of work showed better cognitive performance than those retired from low-complexity jobs, both at T1 and T2. Moreover, it depicts that the latter showed a steeper cognitive decline.

Table 5

Hierarchical Regression Model Results for Cognitive Measures at Time 1

	Step	Predictor	*B*	*SE B*	β	R^2	ΔR^2
BTACT Composite	1	Constant	-0.38	0.49		.19***	.19**
		Age	-0.02	0.01	-.14**		
		Educ_2	0.82	0.32	.36*		
		Educ_3	0.90	0.32	.35**		
		Educ_4	0.97	0.35	.26**		
		Educ_5	1.34	0.32	.77***		
		Health	0.12	0.05	.10*		
	2	Constant	-0.56	0.49		.21***	.02**
		Age	-0.02	0.01	-.14**		
		Educ_2	0.81	0.31	.35*		
		Educ_3	0.83	0.32	.32**		
		Educ_4	0.90	0.34	.24**		
		Educ_5	1.28	0.32	.68***		
		Health	0.13	0.05	.10*		
		Complexity with people	0.06	0.02	.15**		
Memory factor	1	Constant	-0.79	0.51		.09***	.09***
		Age	-0.02	0.01	-.10*		
		Educ_2	1.30	0.33	.58***		
		Educ_3	1.45	0.34	.57***		
		Educ_4	1.22	0.36	.33***		
		Educ_5	1.65	0.33	.86***		
		Health	0.03	0.06	.03		
Executive Function factor	1	Constant	-0.14	0.50		.18***	.18***
		Age	-0.02	0.01	-.14**		
		Educ_2	0.49	0.33	.21		
		Educ_3	0.54	0.33	.20		
		Educ_4	0.71	0.35	.18*		
		Educ_5	1.17	0.32	.59***		
		Health	0.14	0.05	.11*		
	2	Constant	-0.33	0.50		.19***	.02**
		Age	-0.02	0.01	-.13**		
		Educ_2	0.47	0.32	.20		
		Educ_3	0.48	0.33	.18		
		Educ_4	0.64	0.35	.17		
		Educ_5	1.00	0.33	.50**		
		Health	0.14	0.05	.12**		
		Complexity with people	0.06	0.02	.15**		
	3	Constant	-0.61	0.52		.20***	.01*
		Age	-0.02	0.01	-.12**		
		Educ_2	0.45	0.32	.19		
		Educ_3	0.43	0.33	.16		
		Educ_4	0.57	0.35	.15		
		Educ_5	0.94	0.33	.47**		
		Health	0.14	0.05	.11*		
		Complexity with people	0.05	0.02	.11*		
		Complexity with data	0.08	0.04	.10*		

Note. *B* = Unstandardized Beta; *SE* = Standard Error; β = Standardized Beta; ΔR^2 = Change in R^2; Educ_2 = Dummy variable for high school completion; Educ_3 = Dummy variable for some college, no degree; Educ_4 = Dummy variable for associate degree; Educ_5 = Dummy variable for bachelors or higher degree. Models with no significant complexity of work with data or things are not shown in the table. *** p <.001. ** p < .01. * p < .05

Table 6

Model 1 Latent Change Scores Estimates by Groups (Retirees and Workers)

		B	*SE B*	β	*z* value	*p*
Retirees (*n* = 149)						
	Estimates of change					
	μΔCOG	0.57	0.28	1.80	0.28	.037
	σ^2ΔCOG	0.07	0.10	.71	0.70	.483
	Prediction of ΔCOG					
	Cognition at Time 1	-0.28	0.16	-.52	-1.73	.083
	Age	-0.02	0.01	-.26	-1.82	.069
	Education	-0.00	0.02	-.01	-0.08	.939
	Health	0.02	0.05	.04	0.38	.708
	Complexity with people	0.05	0.02	.38	2.01	.044
	Covariance with COG_T1					
	Age	-0.26	0.34	-.08	-0.76	.449
	Education	0.72	0.16	.48	4.58	<.001
	Health	0.11	0.06	.23	1.82	.069
	Complexity with people	0.73	0.16	.50	4.58	<.001
Workers (*n* = 322)						
	Estimates of change					
	μΔCOG	0.34	0.21	.77	1.66	.097
	σ^2ΔCOG	0.18	0.06	.93	5.62	<.001
	Prediction of ΔCOG					
	Cognition at Time 1	-0.18	0.03	-.20	-5.70	<.001
	Age	-0.01	0.01	-.15	-2.44	.015
	Education	-0.02	0.01	-.09	-1.22	.224
	Health	0.05	0.04	.09	1.26	.209
	Complexity with people	0.00	0.01	.02	0.25	.803
	Covariance with COG_T1					
	Age	-0.60	0.24	-.22	-2.49	.013
	Education	0.68	0.12	.53	5.72	<.001
	Health	0.11	0.04	.27	2.98	.003
	Complexity with people	0.40	0.11	.33	3.79	<.001

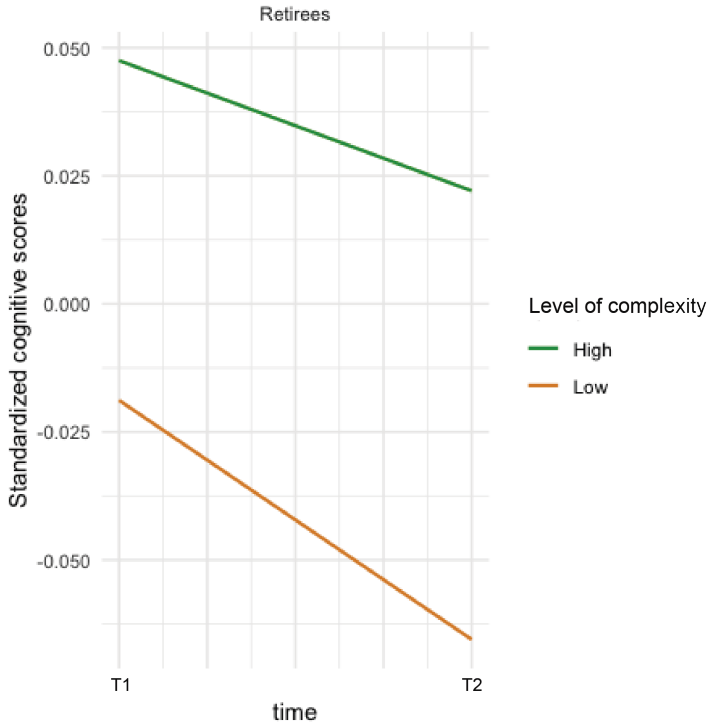
Note. ΔCOG = Rate of change; COG_T1 = Cognition at Time 1; *B* = Unstandardized coefficient; *SE* = Standard Error; β = Standardized coefficient. Fit indices: χ^2 = 21.1 (χ^2 Retirees = 8.2, χ^2 Workers = 12.8), *df* = 16, *p* = .175. CFI = .994, RMSEA = .037, SRMR = .048, GFI = 1.00, R^2 ΔCOG_R = .30, R^2 ΔCOG_W = .07.

Figure 4 illustrates the regression slope for the association between the continuum of complexity of work with people scores (X-axis) and cognitive change scores (Y-axis) (β = .38). The results are shown separately for retirees and workers at T2. Among retirees, those who retired from jobs with higher complexity of work with people showed less negative change (i.e. less cognitive decline) than those who retired from jobs with

lower level of complexity of work with people. Complexity of work with people did not influence cognitive change significantly among those still working at T2 (p = .803).

Figure 3

Means of standardized cognitive scores from Time 1 (T1) to Time 2 (T2) by level of complexity of work with people.



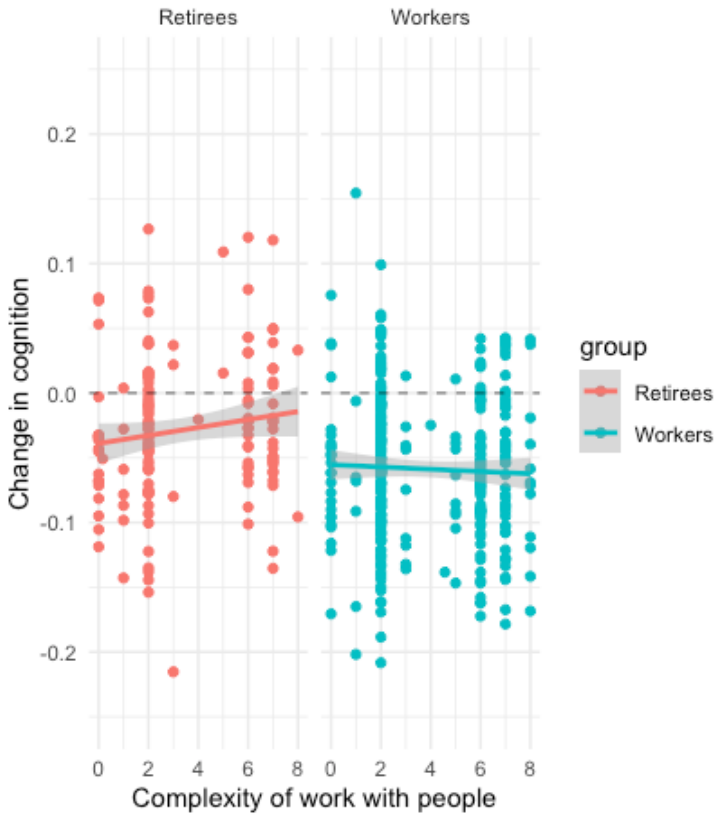
Note. Levels of complexity of work with people were calculated by scores one standard deviation above the mean (high complexity) and one standard deviation below the mean (low complexity).

Fit indices were also acceptable for the same model including complexity of work with data (Table 7) (Model 2: χ^2/df = 1.21, p < .232, CFI = .995, RMSEA = .030, SRMR = .048). In this case, retirees also showed a significant rate of change ($\mu\Delta$COG = 1.91, p = .045), but none of the independent variables were significant predicting the change. All covariates showed a significant association with cognition at T1 for workers and retirees, as well as complexity of work with people and with data. Multi-group differences showed

that the model did fit the data significantly better than the constrained model ($\chi^2(15) = 200.21$, $p < .001$).

Figure 4

Regression of complexity of work with people on the cognitive change between T1 and T2 by retirement status at T2.



Note. Change score = Time 2 cognitive scores minus Time 1 scores (ΔCOG). Scores above zero mean positive change, and negative scores (below zero) mean negative change (i. e. cognitive decline). The grey dashed line in the center represents the linear regression slope. Y-axis depicts the magnitude of individual cognitive change scores and the X-axis shows the continuum of complexity of work with people scores. Among T2 retirees, complexity of work with people had a positive effect on change in cognition between T1 and T2, where those retiring from high complexity jobs showed less negative change scores. Among T2 workers, complexity of work with people had an insubstantial negative effect on change in cognition.

5.4. Discussion

Association of Occupational Complexity with Cognitive Performance

The first objective of the study was to determine the relationship between cognitive performance and occupational complexity in workers between 45 and 75 years old. Correlation results showed significant and positive associations between workers' general cognitive ability, Memory and Executive Function factors and the complexity of work indices with data and people. Complexity of work with things showed a negative significant correlation with the BTACT composite and the Executive factor. However, the correlation between complexity of work with people and the general composite and executive performance was the closest to the critical level of .30 to be considered a moderate association (Cohen, 1988). These results are consistent with other observational studies that found a positive association between complexity with people and with data and better general status (Andel et al., 2016; Finkel et al., 2009).

The results of prediction models of workers' cognitive functioning showed that just complexity of work with people acts as a significant predictive factor for the BTACT composite. Age, educational level, self-rated physical health and complexity of work with people accounted for 21% of the variance. This finding is supported by previous studies which have found that complexity with people is the type of occupational complexity that is most associated to general cognitive performance, even after correcting for education (Finkel et al., 2009; Smart et al., 2014).

Some authors discuss that complexity of work is associated with a better cognition because people who possess high cognitive skills, and so higher educational levels, might have better access to jobs rated as more complex by the DOT (Hyllegard & Lavin, 1992).

Table 7

Model 2 Latent Change Scores Estimates by Groups (Retirees and Workers)

		B	*SE B*	β	*z* value	*p*
Retirees (*n* = 149)						
	Estimates of change					
	μΔCOG	0.54	0.27	1.91	2.01	.045
	σ^2ΔCOG	0.05	0.10	.67	0.51	.609
	Prediction of ΔCOG					
	Cognition at Time 1	-0.25	0.17	-.51	-1.45	.143
	Age	-0.02	0.01	-.29	-1.80	.071
	Education	-0.01	0.02	-.06	-0.26	.793
	Health	0.02	0.05	.05	0.34	.733
	Complexity with people	0.04	0.03	.33	1.40	.162
	Complexity with data	-0.03	0.03	.17	1.13	.257
	Covariance with COG_T1					
	Age	-0.26	0.34	-.10	-0.76	.447
	Education	0.72	0.16	.50	4.59	<.001
	Health	0.11	0.06	.23	1.82	.069
	Complexity with people	0.73	0.16	.50	4.59	<.001
	Complexity with data	0.27	0.08	.31	3.19	.001
Workers (*n* = 322)						
	Estimates of change					
	μΔCOG	0.40	0.21	.89	1.94	.052
	σ^2ΔCOG	0.19	0.03	.93	5.56	<.001
	Prediction of ΔCOG					
	Cognition at Time 1	-0.17	0.05	-.19	-3.12	.002
	Age	-0.01	0.01	-.16	-2.23	.026
	Education	-0.02	0.01	-.09	-1.12	.261
	Health	0.05	0.04	.09	1.33	.184
	Complexity with people	0.01	0.01	.04	0.47	.640
	Complexity with data	-0.02	0.03	-.10	-0.85	.395
	Covariance with COG_T1					
	Age	-0.60	0.24	-.22	-2.48	.013
	Education	0.68	0.12	.52	5.73	<.001
	Health	0.11	0.04	.27	2.99	.003
	Complexity with people	0.41	0.11	.33	3.80	<.001
	Complexity with data	0.21	0.06	.35	3.43	.001

Note. ΔCOG = Rate of change; COG_T1 = Cognition at Time 1; *B* = Unstandardized coefficient; *SE* = Standard Error; β = Standardized coefficient. Fit indices: χ^2 = 24.2 (χ^2 Retirees = 9.6, χ^2 Workers = 14.7), *df* = 20, *p* = .232. CFI = .995, RMSEA = .030, SRMR = .048, GFI = 1.00, R^2 ΔCOG_R = .34, R^2 ΔCOG_W = .07.

In relation to this, few studies have controlled for previous cognitive ability variables. For instance, Smart et al. (2014), controlling for childhood intelligence, education and social deprivation, found that complexity of work with people and data

were associated with better cognitive ability in older age. In the present model, highest educational level had the greatest weight in the explained variance (Bachelors or higher degree (β = 0.68, $p < .001$)), while complexity with people showed a β = 0.15 ($p < .01$). However, recent evidence suggests that complexity of work mediates the protective effect of education by 11-22% (Fujishiro et al., 2019). Hence, as it has been suggested in previous research (Karp et al., 2009), it may be that the effect of work complexity is greater in low educational levels.

Our results show that no type of complexity of work explained variance of the Memory factor. Findings from another MIDUS study showed that occupational complexity was a significant predictor of the BTACT Memory factor (Grzywacz et al., 2016). However, that study is not directly comparable because it used a general complexity measure instead of the DOT categorization and did not differentiate between working with data, people and things. Additionally, the sample consisted of adults aged 32-84, so it might be that complexity of work accounts for episodic memory in the broad spectrum of adulthood, and not in older adults. Another possible reason why no indicator of complexity was shown to be significant in the prediction of the Memory factor may be that all levels of education are associated with memory, but only the highest level is associated to the executive functions, as shown in Table 5. This finding might suggest that memory is more required and influenced by educational level, while the unfolding of executive functioning is greater at highest educational levels (O'Shea et al., 2018; Ritchie et al., 2015).

In our study, the weight of education is less important for executive functioning, where the highest category is the only significant one (β = .47, $p < .01$). In addition, complexity with people and with data, age, and health were all significant (People β =

0.11, $p < .05$; Data β = .10, $p < .05$). As far as we know, just one study has previously found complexity with people to be associated with executive function (Sörman et al., 2019). Their sample had similar ages (50 – 75 y/o) and structural modeling analysis showed similar findings as complexity of work with people was related to main executive components (working memory and switching), as well as complexity with data (working memory). Other findings have also associated complexity of work with data with a better performance in executive functions and attention (Feldberg et al., 2016).

Some mechanisms could be considered about these associations. On one hand, it seems that social networks influence general cognition, memory performance and executive functioning (Ybarra et al., 2008). It would be expected that people in more social occupations have larger social networks and more complex interactions with people. Likewise, occupations with higher social participation are among the more complex occupations, since they entail constant interpretation of social cues, and selection and inhibition of appropriate responses (Cramm et al., 2013). These characteristics are inherently related to executive functioning. Processes as working memory, switching or reasoning are enhanced when interacting with other people (e. g. in negotiation or mentoring), as one needs to access, maintain and manipulate social information.

In that context, the concept of social working memory has recently emerged (Meyer et al., 2015). Research on this topic has found that social working memory tasks recruit two neurocognitive networks: the medial frontoparietal system or mentalizing system (associated with mental state reasoning) and the lateral frontoparietal system (associated to traditional working memory and general intelligence). At the same time, jobs with higher complexity with data, as researchers or accountants, imply a high level

of processing speed, working memory or task-switching, since they have to manipulate many sources of information simultaneously. Consequently, it would be expected that more complex occupations with people and data promote the activation of working memory systems, improving its performance. Thus, stimulation of working memory may transfer to an improvement in fluid intelligence (Zinke et al., 2014).

Effect of Complexity of Work on Intraindividual Cognitive Change after Retirement

The second objective was to determine the effect of complexity of work on long-term change in cognition by employment status. Results show that complexity of work with people was the only significant predictor of intraindividual cognitive change in retirees (β = .38, p = .044), compared to workers. Also, higher levels of pre-retirement complexity of work with people were associated with less decline in cognition compared to lower levels of complexity of work with people (Figure 3). That is, a less negative rate of change was found in those retiring from higher complex occupations (Figure 4).

This finding is in line with a previous study that found that higher levels of mental demands at work were associated with a slower rate of memory decline in older adults after retirement (Fisher et al., 2014). Moreover, it fits the differential preservation pattern (Salthouse, 2006), which was observed previously (Finkel et al, 2009). Thus, individuals in high-complexity occupations had the advantage of achieving higher cognitive performance up to retirement plus showed less cognitive change than those who retired from lower complexity jobs (see Figure 3), suggesting that the cognitive advantage presumably attributable to work complexity remains after retirement. Additional research is needed to understand the mechanism of the effect.

The effect of retirement on cognitive decline can be explained by the "unengaged lifestyle hypothesis" (Rohwedder & Willis, 2010) which states that people after

retirement lose their exposure to work environment and the engagement and routine that come with it, which may accelerate cognitive aging. These results provide support for Rohwedder and Willis' proposition that retirement represents a crucial life event that can lead to "mental retirement", or the tendency to significantly reduce intellectual activity. In that sense, Hamm et al. (2020) found in the same MIDUS sample that retirees who disengaged from challenging activities showed a steeper cognitive decline.

Furthermore, the fact that higher complexity of work has an effect on cognitive aging post-retirement is also supported by the cognitive reserve theory (Stern, 2009; Stern et al., 2018) which argues that complexity of work provides a range of cognitive benefits that protect against decline at older ages. Our findings support the notion that mental stimulation offered specifically by higher complexity of work with people relates to better cognitive function. In addition, this aspect of work also relates to less age-related cognitive decline, indicating that the reserve gained from complex work continues to provide cognitive advantage into older adulthood.

The finding that benefits of complex work appear to span throughout retirement deserves attention in the context of the possibility that mental stimulation through work may be the mechanism. Beyond the possibility that mental stimulation provided by high complex job helps build cognitive reserve, having a high complexity job may have other benefits. Although we could not test the possibility directly, it may be that those retiring from high complexity jobs have an easier time maintaining their pre-retirement levels of intellectual activity. Based on Atchley's continuity theory (Atchley, 1989), which posits individuals aspire to remain at the same level of engagement throughout the life course, we can speculate that those retiring from high complexity jobs transfer into intellectually engaging post-retirement activities. The identity continuity theory (Atchley, 1971), which

posits that retirement can lead to identity crisis which is best resolved by transition into activities that map well onto previous work activities, also supports this notion.

The fact that complexity of work with people specifically emerged as the stronger factor in reducing cognitive aging than complexity of work with data is of interest in terms of designing work-related interventions to promote cognitive health. Previous research also suggests complexity of work with people may be particularly useful in buffering against cognitive decline (Andel et al, 2016; Finkel et al., 2009) and risk of dementia (Andel et al., 2005). It may be that the specific work tasks reflected in complexity of work with people provides particularly distinct cognitive benefits. In addition, retirement also tends to bring about reduction in social networks (Kemperman et al., 2019), which has been found to accelerate cognitive decline in older adulthood. It may be that for people retiring from jobs with high complexity of work with people, staying socially engaged is somewhat easier. Regardless, complexity of work with people appears to hold promise in terms of cognitive health promotion.

Of note is that complexity of work with people did not influence the cognitive change in retirees ($\beta = 0.33$ $p = .162$) when complexity with data was added into the same model, although both were related to the level before retirement. This finding is likely to be explained by collinearity between complexity of work with people and data, whereby some aspects of intellectual stimulation are shared between the two constructs, as reflected in a relatively high correlation ($r = .45$, see Table 4). This may also be due to the influence of education on these associations. In a previous study, the association between complexity of work with data and cognition was substantially attenuated when education was included (Finkel et al., 2007).

Limitations and Strengths

This study has some limitations. First, we had available only one measurement of complexity of current work in a specific time. Ideally, a complexity of work index should be calculated for every job in which the individual has been employed, building a composite score. Secondly, this study only included two waves of data from the MIDUS study. Ideally, accounting for more longitudinal data would determine the rate of cognitive change in a longer period of time. Additionally, although the DOT has been widely used to determine level of complexity of work, it assigns levels according occupation, failing to characterize individual differences in complexity and perceptions of complexity. Although this may also be a strength as characterizing complexity as high subjectively may be a reflection of either actual work complexity or cognitive difficulties. Despite the fact that the BTACT cognitive battery has shown good reliability and concurrent validity (Lachman et al., 2014), telephone testing has relevant limitations. Namely, there are restrictions to auditory stimuli and tasks, and lack of control over distractors, and interferences due to the quality of connection or other technical problems. Hence, results would benefit from the use of a face-to-face administered battery.

This research has several strengths. First of all, the data from MIDUS is recent, so information about complexities is more likely to be representative of tasks in current jobs. Additionally, the entire sample resides in the same country, which suggests institutional retirement conditions are similar across the sample. Finally, we selected the exclusion criteria so that we could exclude non-cognitively healthy individuals, as well as those with previous history of stroke or clinical depression. As a result, we presented the association

between complexity of work and executive functioning in older workers, and its association with cognitive aging in health retired and working people.

In summary, the current study brings to light that complexity of work with people may play an important role in cognitive functioning, especially in executive function, a crucial domain in terms of everyday activities and overall cognitive function, both before and after retirement. The contrast to complexity of work with data, where the results were more obscure, along with the inclusion of multiple cognitive domains, provides a uniquely detailed look at a modifier of cognitive aging before and after retirement in MIDUS. This evidence implies that, when assessing the effect of occupational complexity, the types (i. e., people, data, things) should be specified, as they show different effects. Second, to our knowledge, this is the first longitudinal study to use a latent change score model to determine the influence of complexity of work with people on cognitive change, comparing individuals who retire in a 9-year-period with those who continue to work. This kind of analysis is a type of structural equation model that allows researchers to assess patterns, causes and consequences of intraindividual change (Ferrer & McArdle, 2010; Kievit et al., 2018). These outcomes continue to support the role of occupational complexity with people in cognitive functioning after the end of working life. Thus, only this type of complexity is shown to play a significant role in age-related cognitive decline after retirement, being slightest for those in more complex jobs.

Present findings have some theoretical implications for the cognitive reserve hypothesis. This study highlights the need for inclusion of specific measures of complexity of previous work in studies assessing the impact of cognitive reserve on normal and pathological aging trajectories. The lack of specification of the types of complexity, as well as the omission of occupational complexity measures could lead to inaccurate

conclusions. Furthermore, these findings have implications for the environmental complexity hypothesis and the disuse hypothesis, since not all types of complexity of work have the same effect on cognition in the short and long term.

Additionally, our findings provide a thorough look at a potential important factor contributing to slowing age-related cognitive decline in the early years following retirement; jobs with high complexity of work with people. Previous studies have shown that a higher complexity of work is also associated to a lower risk of developing Alzheimer's disease and other dementias (Karp et al., 2009). Thus, these findings showing that complexity of work with people is associated with cognitive abilities and that high levels might protect against cognitive decline, have substantial implications to health and design of preventive interventions, as recommended by the World Health Organization (World Health Institution, 2019). Interventions should therefore be focused on fostering cognitively engaging activities after retirement. Retirees from low complexity jobs may need to pay particular attention to the maintenance of their cognitive function post-retirement. Given that complexity of work with people stood out in the results as especially important, social engagement at work may operate as an overarching construct to slow cognitive aging, offering a clear target for intervention at the workplace (i.e., to increase social engagement in jobs low on complexity of work with people). Particularly, executive function stimulation is recommended since it is associated to less functional decline in instrumental activities of daily live in older people (Rebok et al., 2014).

Conclusion

Findings have shown an association between higher complexity of work with people and better general cognition, and complexity with data and people with executive

functioning. This association persisted after retirement, with those who retired from jobs with high complexity of work with people showing less cognitive decline. During working life, occupational complexity was associated with better general cognitive performance and, specifically, better executive functioning. Further research on associations between retirement, complexity of work with people and executive functioning is needed. In particular, the field would benefit from knowing what characteristics of managing people are associated to executive processes, and how they contribute to general cognitive functioning. Additionally, research assessing the implications of complexity of work on cognitive reserve is still required. In this sense, more neuroimaging studies would help to discern compensation in cognitive performance and real brain atrophy.

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Capítulo 6.
Unemployment and Cognition: a systematic review and meta-analysis

(Estudio 3)

Vélez-Coto, M., Rute-Pérez, S., Pérez-García, M., & Caracuel, A. (Under review). Unemployment and Cognition: a systematic review and meta-analysis. *Journal of Economic Psychology.*

Abstract

Unemployment and health have been associated and direction of their causal relation is frequently questioned. However, unemployment in relation to cognitive status has not been widely studied in spite of the findings that suggest that both directions could be applied. The aim of this systematic review was to review whether there is enough evidence to apply both the normal and reverse causation perspectives in the relationship between unemployment and cognition trough a qualitative review and a meta-analysis. Searches through PubMed, ProQuest and Scopus resulted in eighteen studies that were included in the qualitative review and nine in the meta-analysis. Studies must have at least one measure of cognitive abilities and unemployment. The qualitative analysis shows a reverse causation effect for people with low intelligence or cognitive abilities. The normal causation applied better for higher-skilled workers and show greater effect in the meta-analysis. Additionally, age of the sample moderated these effects in both cases. These outcomes help to establish some knowledge in order to enhance future research and improve interventions and life quality of unemployed people, reemployment strategies and welfare systems.

Keywords: unemployment, cognition, normal causation, reverse causation, systematic review, meta-analysis

6.1. Introduction

Unemployment is a concern for many people and for societies as a whole (Reed et al., 2011; Roberts & Bannigan, 2018), which is why the relationship between occupational status and mental health has been widely studied. Some researchers associate unemployment with lower levels of well-being (Creed & Klisch, 2005; McKee-Ryan et al., 2005), a higher risk of substance abuse (Compton et al., 2014), anxiety (Takahashi et al., 2015), depression (Riumallo-Herl et al., 2014), suicide (Madianos et al., 2014), and changes in personality (Anger et al., 2017). This would explain that unemployed people are more likely to seek psychiatric help (Buffel et al., 2015). Unemployment has also been related to organic diseases, like vascular and blood pressure alterations, insomnia and rheumatic pain (Buendía, 1990). Therefore, unemployment is considered a modulatory factor of physical and mental health (Benach et al., 2007). The high personal and economic costs of unemployment justify research on background factors and consequences, making it easier to develop interventions that could buffer or improve them (Eardley, 2002; Moore et al., 2017).

According to the WHO report about labor conditions and health inequalities, there are two different perspectives that could explain the relation between unemployment and health (Benach et al., 2007). On one hand, normal causation supports that unemployment is what can lead to health problems. On the other hand, the reverse causation defends that having a worse health causes an occupational selection, which leads the unhealthiest to be unemployed. There are many findings about physical and mental health that support both theories (Griep et al., 2015; Krug & Eberl, 2018; Salm, 2009). However, other dimensions might be taken into account in the individual health, such as cognitive status and its interactions with the environment. Some findings suggest

that both the normal and reverse causations perspectives might also be applying to the relationship between unemployment and cognition.

Findings from industrial and organizational psychology backs that the general cognitive ability index (g factor) is the best predictor of job performance (Bertua et al., 2005; Schmidt & Hunter, 1998). This is the basis why many general cognitive ability tests have been used in job selection processes for more than 80 years. This point of view supports the reverse causation as an explanation for the relation between unemployment and cognition due to the fact that the applicants' cognitive performance mediates their likelihood of being hired (Outtz, 2002).

Besides that, it has been known for a long time that a stimulating and demanding intellectual environment enhances cognition (Schooler, 1984). Work environments provide cognitive activity through some stimulating and challenging tasks that require and reward cognitive effort (Then et al., 2014). When those demands and incentives disappear, for instance during unemployment periods, the general cognitive performance declines (Fisher et al., 2014). These results suggest that the normal causation might also explain the relationship between unemployment and cognition.

In summary, there are some findings that suggest a link between unemployment and cognition. Given the socio-economic and psychological relevance of unemployment it is necessary to find data which allows understanding its association with the human cognition. To the authors' knowledge, this is the first systematic review analyzing this topic and the normal and reverse causation models in the relationship between unemployment and cognitive performance.

Therefore, the aims of this study were:

1) to review whether there is enough evidence to apply both the normal and reverse causation perspectives to support and explain a relationship between unemployment and cognition.
2) To determine what is the average strength of the association between unemployment and cognition.
3) To explore if the characteristics of the studies, such as the average age of the sample, are related to the association between unemployment and cognition.

6.2. Method

Systematic review

The systematic review process and report followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009) (Supplementary material 1). The searching of studies was conducted in the PubMed, ProQuest and Scopus databases. The last search was run on 30th September 2020. In addition, related documents suggested by databases were consulted, as well as reference lists of selected articles. Searching strategy included terms in relation with the two conceptual dimensions: occupational status ("unemployment" OR "unemployed" OR "nonworkers" OR "occupational status" OR "employment gaps" OR "employment status" OR "labor status" OR "jobless" OR "job loss") and cognitive performance ("cognition" OR "cognitive function" OR "cognitive abilit*" OR "cognitive performance" OR "cognitive assessment" OR "cognitive decline" OR "cognitive difficulties" OR "intelligence" OR "executive function" OR "attention" OR "memory" OR "reasoning" OR "neuropsycholog*").

The following eligibility criteria were applied for the inclusion of articles: (a) longitudinal, cross-sectional or case-control studies; (b) at least, one variable about

unemployment; (c) at least, one measure of cognitive status or specific cognitive functions; (d) statistical results showing relations between unemployment and cognitive measures; (e) no language or date restriction. The criteria for exclusion were studies that used samples of people with physical or mental illness or exclusively composed by retired people.

Selection process

Firstly, all identified papers were screened by applying the study criteria to the titles and abstracts. Subsequently, a full-text assessment was carried out based on the inclusion and exclusion criteria (Figure 1). This process resulted in the selection of 18 studies included in the qualitative analysis. The authors assessed the methodological quality and tabulated information about objectives, samples, study design, methodology, results, conclusions, and effect sizes of the studies included.

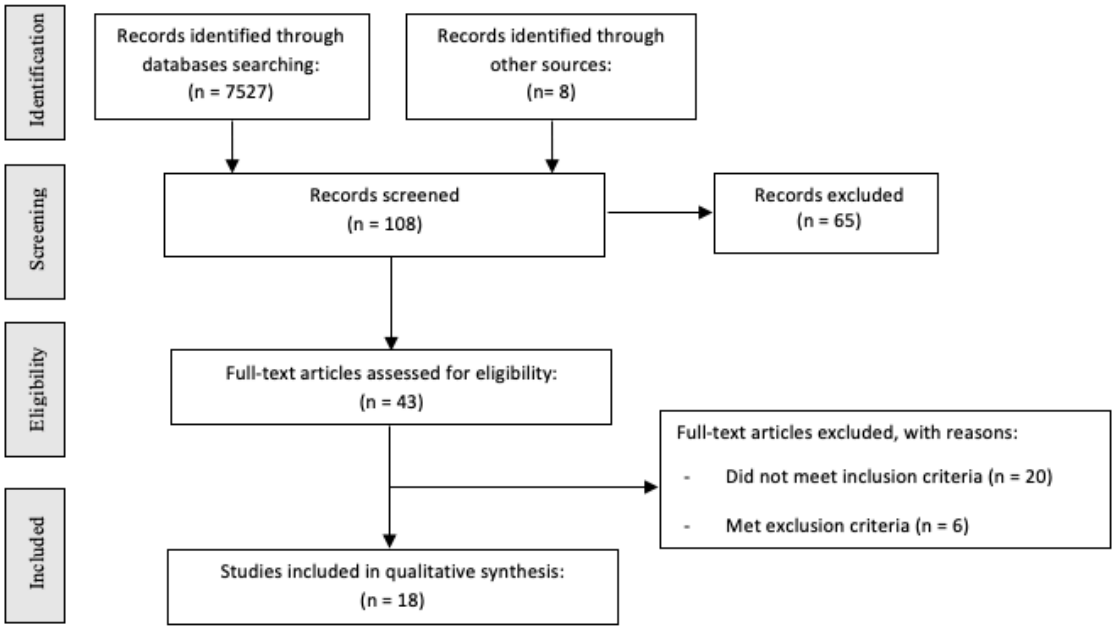
Quality assessment

The Newcastle-Ottawa Scale (NOS; Wells et al., 2000) was used to evaluate the methodological quality of cohort studies. This scale was developed using a Delphi process to define relevant variables, and it is one of the most recommended quality assessment tools (Ma et al., 2020). The NOS assesses studies through an 8-item checklist which rates the quality of sample selection, comparability and ascertainment of outcomes of interest. Selection evaluates the representativeness of the exposed and non-exposed groups. Comparability assess whether the groups have been matched or the analyses have been adjusted for cofounders. Outcomes evaluates the adequacy of the measure and the conditions of follow-up. Each item receives a star if it meets the requirement, and a maximum of nine stars is allowed. For cross-sectional studies an adapted version of the NOS was used (Hermont et al., 2014). This version has been used in previous studies and

allows a maximum of six stars, since longitudinal items are not included. In order to compare the risk of bias across the studies, a percentage of compliance was also calculated for both scales. Two authors (MVC, SRP) made autonomous quality ratings, and disagreements were solved through discussion and consultation with a third author (AC).

Figure 2

Flow-diagram of the selection process



Meta-analysis procedures

Studies were included in the meta-analysis if cognitive measures were available for both an unemployed and employed group, as well as whether they included an Odd Ratio measure indicating the probability of being unemployed or not, based on cognitive performance. Additionally, only studies with measures of general ability were included. Nine of the 18 studies of the systematic review were included in the meta-analysis.

Data extraction and management.

To perform the meta-analysis, means and standard deviations from the unemployed and employed groups were extracted in order to compute effect sizes and standard errors. When means and standard deviations were not available, data were requested from the authors. In two cases (Meyers & Houssemand, 2010; Moraes et al., 2010), Odd Ratios were transformed to effect sizes according to Cohen (1988), using the Psychometrica calculator (Lenhard & Lenhard, 2016). Means and standard deviations for women and men from Lynn et al.'s study (1984) were merged according to the Cochrane recommendations (Higgins et al., 2019). To allow a better interpretation of the meta-analysis, the values of inverse cognitive measures were reversed (e.g. tasks where the main score was time as in the Cognitive Estimation Test). Thus, a negative effect size indicated a worst performance in the unemployed groups.

Statistical analyses.

The meta-analysis was conducted using a random-effect-model based on Hunter and Schimdt's method (1990). Q, I^2 and τ statistics were used to test heterogeneity. The magnitude of the average effect size was judged using a recent proposed guideline (Gignac & Szodorai, 2016) where effect sizes of 0.15, 0.25 and 0.35 were considered small, typical and large, respectively. Further, two separate meta-regression were also conducted in order to test if the age of the sample at the time the cognitive measures were collected explained some variance in the groups of normal causation and reverse causation. Publication bias analyses were conducted using a rank correlation test to study asymmetry. Forest plots and funnel plots with standard errors were also generated. Analyses were performed using the JASP software (2020).

6.3. Results

6.3.1. Characteristics of the studies and qualitative results

The included studies were published between 1917 and 2020. Only cross-sectional (*n*=9) and cohort (*n*=9) designs were found. Age of the samples at the moment of cognitive assessment varied across studies. Seven studies included broad age ranges (from 15 to 89 years old), eight studies included middle and old-age individuals (30-79 years old) and three of them were comprised by young people (15-21). Additionally, one study used cognitive scores measured when the sample was from 7 to 9 years old (Caspi et al., 2006).

Studies' objectives were used to classify them into one of the two perspectives: normal or reverse causation. Seven papers were classified under normal causation (Table 1), which supports the idea that unemployment leads to worse cognitive functioning. Four of them used general ability measures (Freitas et al., 2012; Haworth et al., 1990; Mani et al., 2013; Moraes et al., 2010). Three of them used tests of performance in specific cognitive components (Haworth et al., 1990; Košćec-Bjelajac et al., 2019; Leist et al., 2013). One of the seven studies (Fryer & Warr, 1984) used a questionnaire of subjective cognitive ability instead of performance measures. Four of them used a cross-sectional design to observe the differences in cognitive performance between unemployed and employed individuals. Two studies used a pre-post design to determine if the cognitive difficulties changed in the transition to or from unemployment. By last, one cohort study was aimed to determine if unemployment spells (>6 months) across working life was associated with cognitive performance at older ages.

Eleven papers were conducted under the perspective that intelligence or general cognitive ability influences being unemployed (reverse causation) (Table 2). With regard

to the main variables, six of them used measures of general ability (Creed, 1999; Creed & Wiener, 1999; Hegelund et al., 2018; Heineck, 2011; Lynn et al., 1984; Meyers & Houssemand, 2010), and one used the crystallized factor measured with a vocabulary test (Layton, 1985). An IQ measure was applied in one study (Caspi et al., 2006). The oldest studies of Pintner & Toops (1917; 1918) and the newest from Sundstrup et al. (2020) were the only that chose measured specific components of cognition such as attention, working memory and verbal reasoning. In this group, there were some differences in the design of the studies. Three studies analyzed general cognitive ability in different employment trajectories after a short follow up (4-6 months). Three studies intended to predict the employment status after one year by fluid intelligence. One of them comprised a follow-up of 4-6 years. Two of them followed a 12-year follow-up cohort design that aimed to predict young adult unemployment through intelligence at earlier ages. Finally, two studies classified the types of unemployed according to their level of intelligence.

6.3.2. Findings from Studies Grouped Under the Normal Causation

Six studies found that unemployment was associated with worse cognition. Longer unemployment length was associated with self-reported worse cognitive performance (Fryer & Warr, 1083), and unemployed individuals showed poorer cognition than workers (Košćec-Bjelajac et al., 2019).

Mani et al.'s study (2013) showed that individuals had a worse cognitive performance during an unemployment period, even controlling for exercise, anxiety, stress and physical activity. Haworth et al (1990) found that unemployed people had lower cognitive scores than the employed. Moreover, Moraes et al. (2010) reported that those who were 75 years old or over and were employed performed better than their

matched unemployed in the MiniMental State Examination. Finally, Leist et al. (2013) found that longer unemployment during the life course was related to a higher risk of cognitive impairment in the older ages.

On the other hand, Freitas et al. (2012) found that the unemployed, retired and the people who do housework did not differ in cognitive performance from the employed group when age and education were controlled.

6.3.3. Findings from Studies Grouped Under the Reverse Causation

Eight studies found association between cognition and occupational status. Creed and Wiener (1999) found higher cognitive scores for unemployed that were compared with a non-unemployed clinical sample from a previous study conducted 10 years before by Felvus (1989). However, they showed lower scores in the Standard Progressive Matrix. A similar result was reached by Lynn et al. (1984), who found that unemployed had a lower fluid intelligence than employed individuals. However, intelligence did not predict unemployment one year later. By contrast, Meyers and Houssmand's (2010) research showed that intelligence predicted unemployment 12 months after. In addition, intelligence was the better psychological predictor of unemployment at 12 months for those participants that did not find a job in the six first months of the study.

Table 1
Selected documents for revision (normal causation).

Reference	Goal/s of interest for this review	Sample	Variables and Instruments	Main outcomes	Conclusions	Effect size *d* (Standard Error)

Freitas et al (2012) *	To analyze the influence of health and socio-demographic variables (e.g. employment status) in the MOCA performance.	*N* = 650 people from Portugal ($n_{inactive}$ = 320; $n_{employed}$ = 330). Age range = 25-91 years old (*M* = 55.84, *SD* = 15.12).	Dependent variable:
			- Cognitive performance: MoCa (Nasreddine et al., 2005): executive functions, visuospatial abilities, short-term memory, language, attention, concentration, working memory, and temporal and spatial orientation.
			
			Independent variable:
			- Employment status (as part of a Sociodemographic questionnaire):
			  - Employed: participants with an active work situation.
			  - Inactive: Unemployed, retired and domestic work.
				- Without controlling the effects of age and/or educational level:
				  - Significant differences in MoCA score between employment status (t = 11.78, p < .001) ($M_{inactive}$ = 23.13, *SD* = 3.65; $M_{employed}$ = 26.22, *SD* = 2.99).
				
				- Controlling for age and educational level:
				  - Not significant differences between employment status.
					Differences in cognitive performance lose its significance when controlling for age and educational level.	-0.93 (0.08)

Fryer & Warr (1984)	To observe the cognitive decline in non-worker men according to length of unemployment.	*N* = 954 unemployed from United Kingdom. Age range = 16 – 64. Length of unemployment: 1 – 12 months.	Dependent variable:
			- The 12 items from the self-reported 30 item General Health Questionnaire Scale (GHQ) (Goldberg & Williams, 1988) referred to cognitive functioning.
			
			Independent variable:
			- Length of unemployment and age.
				- Ten items were significant to length of unemployment:
				  - Taking longer to do things: F = 3.4, p < .01
				  - Ability to concentrate: F = 4.1, p < .001
				  - Feeling 'rusty' at things: F = 6.8, p < .001
				  - Feeling incapable to start things: F = 4.1, p < .001
				  - Mental alertness: F = 6.9, p < .001
				  - Difficulty to remember: F = 5.2, p < .001
				  - Feeling of capability to make decisions: F = 2.9, p < .05
				  - Slowness to 'catch on' what people say: F = 4.0, p < .001
				  - Mistakes while talking to people: F = 2.6, p < .05
				  - Mistakes adding up money while shopping: F = 3.8, p < .01
					There are significant associations between length of unemployment and subjective cognitive difficulties in speed and quality processing, accuracy, mental agility, closure, comprehension, memory and general alertness	

Haworth et al. (1990) *	To investigate cognitive difficulties in the unemployed.	*Second study:*
		N = 12 unemployed middle-age men. (Mean age: 40.75)
		N = 12 employed middle-age men. (Mean age: 40.25)
		Age range: 30-55
			Dependent variable:
			- Effortful processing tests:
			  - The Cognitive Estimation Test (Shallice & Evans, 1978).
			  - A Low Association Word Pairs task.
			  - Controlled Word Association task.
			- Automatic processing tests:
			  - The information test (WAIS, 1995).
			  - High Association Word task.
			  - Similarities test (WAIS, 1995).
			
			Independent variable:
			Occupational status (employed/unemployed)
				Significant differences between the employed and unemployed:
				- The Cognitive Estimation test: $M_{unemployed}$ = 4.3, *SD* = 2.96; $M_{employed}$ = 1.75, *SD* = 1.42, t = 2.722, p < .02.
				- Similarities: $M_{unemployed}$ = 13.9, *SD* = 4.39; $M_{employed}$ = 17.3, *SD* = 3.17, t = 2.182, p < .05.
					Unemployment may cause cognitive difficulties.
					
					Cognitive difficulties in the unemployed include problems of micro strategy generation.
						Deductive Reasoning:
						
						-1.10 (0.44)
						
						Similarities:
						
						-0.89 (0.43)

Košćec Bjelajac et al. (2019)	To explore the value of employment status as predictor of cognitive functions.	*N* = 650 ($n_{employed}$ = 460, $n_{unemployed}$ = 190)
		Age range: 54 – 60.
			Dependent variables:
			- SHARE cognitive tasks:
			  - Numeracy: percentages and subtraction.
			  - Verbal fluency: number of animals in one minute.
			  - Immediate and Delayed Verbal recall: number of words successfully reported.
			
			Independent variable:
			Current employment status: employed / unemployed.
				- Unemployment was a strong predictor of poorer results in the rural sample.
				- Poor calculation with percentages (urban sample): OR = 0.88 [0.58 – 1.34]
				- Poor calculation with percentages (rural sample): OR = 1.96 [0.97 – 3.96].
				- Poor subtraction (urban sample): OR = 1.07 [0.63 – 1.82].
				- Poor subtraction (rural sample): OR = 3.05, [1.36 – 6.82], p < .05.
				- Poor immediate verbal recall: OR = 0.91 [0.63 – 1.33]
				- Poor delayed verbal recall: OR = 0.92 [0.63 – 1.36]
				- Verbal fluency: β = 0.02 [-0.03 – 0.06].
					Unemployment in this population carries the risk of affecting specific cognitive functions.	

Leist et al. (2013)	To examine the association between different kinds of activities (e.g. unemployment) during employment gaps with cognitive function and change in late life.	Cross-sectional sample:
		N = 18,259; mean age = 59.44 (*SD* = 5.98).
		Longitudinal sample: *N* = 9,880 (Mean age = 59.45, *SD* = 5.64).
		From 13 European countries
			Dependent variables:
			- Cognitive function:
			  - Verbal fluency: naming as many animals as possible in a minute.
			  - Immediate recall: a ten items list.
			  - Delay recall: same list after a standardized interval of time.
			  - Orientation: answer the day, month, weekday and year.
			  - Arithmetic: five tasks of calculation.
			  - Summary cognitive function: Averaged z-scores of the 5 tests.
			
			Independent variable:
			- Unemployment for a period ≥ six months: data from the SHARELIFE survey (Börsch-Supan et al., 2005).
				Logistic regressions:
				- Model 1 (CV: Country, age, sex): Odd ratio (OR) unemployment = 1.17 (95% Confidence Interval, CI = 1.04 – 1.33).
				- Model 2 (Model 1 + early life factors): OR unemployment = 1.18 (95% CI = 1.04 – 1.35).
				- Model 3 (Model 2 + Later life factors): OR unemployment = 1.19 (95% CI = 1.04 – 1.36).
					- The effect on cognitive function of unemployment is stronger in high-skilled workers.
					- Unemployment is associated with a greater risk of cognitive impairment in older age.	

Mani et al. (2013) *	Second study of the paper, 'The field study': To observe whether poverty (period of unemployment) hinders cognitive function.	*N* = 464 sugarcane farmers from India.
		No age reported.
			Dependent variables:
			- Cognitive function:
			  - Fluid intelligence: Standard Progressive Matrices (SPM) (Raven, 2000).
			  - Cognitive control: a numeric version of the Stroop task, similar to the Five Digit Test: Errors and Response time.
			Independent variable:
			- Employment status:
			  - Unemployed/pre-harvest: before the harvest period
			  - Employed/post-harvest: at the end of the harvest period (four months later).
				Significant pre-post harvest differences:
				- SPM: M_{Pre} = 4.35, M_{Post} = 5.45 (p < .001).
				- Stroop response time: M_{Pre} = 146", M_{Post} = 131" (p < .001).
				- Stroop errors: M_{Pre} = 5.93, M_{Post} = 5.16 (p < .001).
					Farmers showed higher level of fluid intelligence and cognitive control in the period of work (post-harvest). Stress and food consumption could not fully explain the impairment in cognitive function.	-0.22 (0.07)

Moraes et al. (2010) *	To evaluate the impact of sociodemographic (e.g. occupational status) and health variables on cognitive performance.	*N* = 2,708 from Southern Brazil. 60 years old and over (*M* = 70.88, *SD* = 7.79).	Dependent variable: - Cognitive performance: Subjects were divided into those who scored under and above the 15th percentile on Brazilian version of MiniMental State Examination (MMSE) (Bottino et al., 1999). Independent variable: - Occupational Status: Being currently employed (yes/no).	Group F (five years of schooling, >75 years old): - Being currently employed was related to high scores on the MMSE in Group F (OR = .39, 95% CI = .19 – .82).	Being employed with 75 years old or more was associated with a higher performance on MMSE in those with five or more years of education.	-0.51 (0.16)

* studies included in the meta-analysis

Table 2

Selected documents for revision (reverse causation).

Reference	Goal/s of interest for this review	Sample	Variables and Instruments	Main outcomes	Conclusions	Effect size *d* (Standard Error)

Caspi et al. (1998)	To investigate what characteristics are able to predict youth unemployment.	*N* = 954
		Sample extracted from the Dunedin Multidisciplinary Health and Development Study (Silva, 1990).
			Dependent variable:
			Months of unemployment between age 15 to 21. Life history calendar (Caspi et al., 1996; Freedman et al.,1988) at age 21. It is a grid where every row refers to the employment trajectory and columns to the time. It allows to provide information about several years divided by months.
			Independent variables:
			At ages 7 to 9:
			- Human capital:
			  - Intelligence: Weschler Intelligence Scale for Children-Revised (WISC-R) (Weschler, 1974).
			
			At ages 3 to 5:
			- Human capital:
			  - Intelligence.
				Intelligence at ages 7 to 9:
				- Pearson correlation= -.22 (p < .001)
				- Bivariate regression:
				  - Tobit coefficient= -.003 (p < .001)
				  - Percent change in probability of unemployment: 20.6
				  - Increase in number of months of unemployment: 3.1
				- Multivariate regression:
				  - Tobit coefficient= -.001 (p < .001)
				  - Percent change in probability of unemployment: 11.6
				  - Increase in number of months of unemployment: 1.7
				
				Intelligence at ages 3 to 5:
				- r = -.21 (p < .001)
				- Bivariate regression:
				  - Tobit coefficient t= -.003 (p < .001)
				  - Percent change in probability of unemployment: 20.0
				  - Increase in number of months of unemployment: 3.0
				- Multivariate regression:
				  - Tobit coefficient = -.002 (p < .001)
				  - Percent change in probability of unemployment: 12.1
				  - Increase in number of months of unemployment: 1.8
					- Low intelligence at ages 7 to 9, and 3 to 5, predicts longer unemployment between 15 and 21 years old.
					- Low intelligence at ages 3 to 5 is significantly associated with unemployment at age 21.
					- The effects of the childhood variables on unemployment are mediated by later adolescent variables, since it initiates a process of cumulative disadvantage and risk.
					- Predictors attenuate considerably when try to predict 'state' of unemployment, instead cumulative duration of unemployment.	

Creed (1999) *	To determine predisposing factors for long-term unemployment in young people.	*N* = 89 unemployed from Brisbane, Australia.
		Average length of unemployment = 13.1 months (*SD* = 11.85, Range 0 - 98).
		Mean age = 19.07 (*SD* = .92, Range 16.8 - 20.9).
			Dependent variable:
			- Length of unemployment at T1.
			- Employment Status at T2 (four months later). Three groups were formed based on Employment Status at T2:
			  - EMP (n = 15): Employed at T2 and between T1 and T2.
			  - UE (n = 38): Unemployed at T2 and between T1 and T2.
			  - UE+WK (n = 36): Unemployed at T2 but working (WK) between T1 and T2 for at least one week.
			
			Independent variables:
			- General ability: 10-min timed version of the Standard Progressive Matrices (SPM-10) (de Lemos, 1989).
				- There were no significant correlations between length of unemployment at T1 and general ability.
				- EMP group had higher general ability levels measured at T1 than group UE+WK (F = 3.67, p < .05).
				- There were no significant differences in general ability between EMP and UE.
				- A multiple discriminant analysis at T2 (n = 77) found not significant prediction of employment status by demographic, individual differences and psychological well-being.
					- General ability is not related to length of unemployment.
					- There is no simple linear relationship between ability and gaining employment.
						-0.53 (0.31)

Creed & Wiener (1999) *	To determine normative data to unemployed for Shipley Institute of Living Scale (SILS) and Standard Progressive Matrices (SPM).	*N* = 366 unemployed from Australia.
		Mean age = 31;
		Range = 15 - 60 years.
			- Standard Progressive Matrices (Raven, 1938).
			  - Standard 20-minute timed administration (SPM-20).
			  - SPM 10-minute timed administration (SPM-10).
			- Shipley Institute of Living Scale (SILS) (vocabulary, abstraction and total scores) (Zachary, 1986).
			- Normative data of SPM-10 (Felvus, 1989).
			- Normative data of SILS (Zachary, 1986).
				- SPM-10: Unemployed had lower scores than normative data (t = 2.56, p < .05).
				- SILS-Vocabulary: Unemployed had lower scores than normative data (t = -4.90, p < .05).
				- SILS-Abstraction: Unemployed had higher scores than normative data (t = 4.86, p < .05).
					Unemployed people differ from normal population sample, showing a higher general ability.	0.39 (0.08)

Heineck (2011)	To provide evidence on a) the relationship between individuals' cognitive skills and unemployment propensity, and b) whether cognitive skills account for unemployment status (maintain UE or exit UE).	*N* = 1,948. Age: 20 – 55.	Dependent variable: a) Registered as unemployed between 2006 - 2008 b) Unemployment status in 2007 or 2008, conditional on either being employed or unemployed in 2006. Independent variable: Cognitive skills based on the Symbol-Digit Correspondence Test (SCT) (Weschler, 1997).	a) Cognitive skills – Unemployment propensity: - Females: -0.007 (p < .10) - Males: -0.017 (p < .05) b) Cognitive skills – Maintenance of employment: - UE 2007: ▪ Females: -0.011 (p < .05) ▪ Males: -0.006 (p < .05) - UE 2008: ▪ Females: -0.005 (not significant; ns) ▪ Males: -0.005 (p < .05) Cognitive skills – Exit of UE: - UE 2007: ▪ Females: -0.037 (ns) ▪ Males: -0.076 (ns) - UE 2008: ▪ Females: -0.078 (ns) ▪ Males: -0.048 (ns)	- Cognitive skills slightly decrease unemployment propensity. - Cognitive skills help male workers to stay employed. - Cognitive skills do not predict exit from unemployment.	
Hegelund et al. (2018) *	To investigate the role of IQ in predicting indicators of occupational achievement (unemployment) among young people.	*N* = 1,098,742 Danish men born since 1950 and appearing before a draft board during the periods from 1968 - 1984 and 1987 - 2015.	Dependent variable: Unsuccessful occupational achievement: unemployment at age 30. Independent variable: Intelligence at age 18. Børge Priens Prøve (BBP) (Teasdale, 2009): 78 items which include letter matrices, verbal analogies, number series and geometric figures. Group administered.	- Probabilities of unemployment at age 30 according to IQ at age 18: - IQ 70 = 8% - IQ 80 = 5% - IQ 100-130 = 3%	- IQ is a strong predictor of unsuccessful educational and occupational achievement. - The probability of being unemployed at age 30 decreases with increasing IQ. - IQ strongest relationship is with educational achievement. - Low IQ has a strong relationship with unsuccessful occupational achievement, but no or weak associations for superior IQ levels.	-0.89 (0.21)

Layton (1985)	To prove the belief that unemployed are less intelligent.	$N_{baseline}$ = 186 men ($n_{unemployed}$ = 29, $n_{employed}$ = 77, $n_{students}$ = 80).
		$N_{follow\text{-}up}$ (six months) = 101 ($n_{unemployed}$ = 39, $n_{employed}$ = 62).
			- Employment status: employed or unemployed.
			- Crystallized Intelligence: Mill Hill Vocabulary Scale (Raven, 1958), Form I Set B (Synonyms).
				Not significant differences in the Mill Hill Vocabulary Scale between unemployed and employed.
				Comparisons:
				- No significant differences between:
				  - Employed and students
				  - Students and unemployed
				  - Employed and unemployed
				  - Obtain a job after six months and still unemployed.
					There are not significant differences in crystallized intelligence between unemployed and employed people.	-0.09 (0.22)

Lynn et al. (1984) *	To determine how much of young unemployment can be predicted by a group of background variables (e.g. intelligence).	$N_{baseline}$ = 701 unemployed from North Ireland, between 15 and 16 years old.
		$N_{follow\text{-}up}$ (one year) = 294 ($n_{unemployed}$ = 79, $n_{employed}$ = 214)
			Dependent variable:
			Employment status: employed (students and workers) and unemployed (unemployed and Government Training Schemes' users †).
			
			Independent variable:
			Fluid intelligence: Abstract Reasoning Scale of the Differential Aptitude Test (Bennett, Seashore & Wesman, 1956).
				- Significant differences between groups in Fluid Intelligence:
				  - Men: $M_{unemployed}$ = 29.89 (SD = 9.77), $M_{employed}$ = 35.89 (SD = 8.16), $p < .01$.
				  - Women: $M_{unemployed}$ = 29.73 (SD = 8.27), $M_{employed}$ = 34.54 (SD = 8.77), $p < .01$.
				- Significant correlations:
				  - Fluid Intelligence – Employment status: r_{men} = .29 ($p < .01$), r_{women} = .20 ($p < .01$).
				
				- Regression:
				  - Intelligence did not predict employment status.
				
				- Path Analysis, Causal effect Intelligence – Employment status:
				  - Direct = .02
				  - Indirect = .21
				  - Total = .23
					- Employed group show higher levels of fluid intelligence than unemployed.
					- Educational attainment, home background, school type and intelligence have the greatest casual effects determining employment status.
						-0.61 (0.10)

Meyers & Houssemand (2010) *	To assess what psychological variables (e.g. intelligence) increase prediction of unemployment, beside socio-professional data.	Group of newly unemployed (no past of unemployment) from Luxembourg. Mean age = 28 (range = 15 - 64). N at six months = 314 ($n_{unemployed}$ = 105; $n_{employed}$ = 197). N at 12 months = 309 ($n_{unemployed}$ = 89; $n_{employed}$ = 207; lost at follow up n = 13) N at 12 months, in those who were registered at six months = 99 ($n_{unemployed}$ = 59; $n_{employed}$ = 40).	Dependent variable: Employment status: employed and unemployed. Independent variable: - Fluid intelligence: Shortened computer version of the B54 (Bonnardel, 1977). It consists of 32 items, where logical series are shown and must be completed.	Prediction of unemployment at six months for all subjects: - Intelligence was not significant. Prediction of unemployment at 12 months for all subjects: - Intelligence was significant (OR = 1.05; CI 95% = 1.01 -1.10; $p < .05$). - Including intelligence in the model (allowances for 12 months, core self-evaluations and change coping) increase prediction in 1.3 points, but it was not significant ($p > .05$). Prediction of unemployment at 12 months for those who were still unemployed at 6 months: - Intelligence was the highest significant predictor (OR = 1.12; CI 95% = 1.04 - 1.21; $p < .01$). - Adding psychological variables (openness, self-efficacy, social anxiety, symptom reduction coping and intelligence) to age and gender, increased the estimation 12.1 points ($p < .05$).	Psychological dimensions (e.g. intelligence) play an additional role in predicting job finding for people who have more difficulties in finding one.	-0.28 (0.02)

Sundstrup et al. (2020)	To determine the association of individual cognitive ability in late midlife with labor market participation among older workers	Workers from the Copenhagen Aging and Midlife Biobank.
		N = 5076
		Mean age = 54.3 (SD = 3.8). Age range at baseline = 49-63
			Dependent variable:
			Unemployment at follow-up (4-6 years later than cognitive assessment at baseline).
			Independent variable:
			Subtest from the I-S-T 2000 R (Amthauer et al., 2001):
			- Sentence Completion test.
			- Verbal Analogies subtest.
			- Number Series subtest.
				- Model 1 (minimally adjusted): low cognitive ability (at least 1 SD below the mean for each gender) was associated with unemployment [HR ¼ 1.72 (95% CI ¼ 1.48- 2.00)].
				- Model 4 (fully adjusted):
				  - Low ability in verbal analogies was associated with unemployment [HR ¼ 1.24 (95% CI ¼ 1.04-1.47)].
				  - Low ability in number series was associated with unemployment [HR ¼ 1.26 (95% CI ¼ 1.07-1.48)].
				  - High cognitive ability in the three subtests was not associated with any of the labor market outcomes.
					Individual cognitive ability in late midlife was not associated with unemployment in the fully adjusted model. Thus, no direct effect of individual cognitive ability in late midlife was observed on the risk of permanently or temporarily leaving the labor market

Pintner & Toops (1917)	- To determine the *mentality* of the applicants as a group. ‡
	- To determine the relation of mentality to industrial, social, or educational factors.
		N = 94 unemployed men from Columbus, Ohio.
		Age range = "under 20" – 89.
			Dependent variable:
			- Occupational status: obtained in an Employment Office. Classified as:
			  - *Unemployed:* habitually working on steady jobs, but for the time are unemployed.
			  - *Casuals:* habitually work on temporary jobs which allows them to earn enough money to tide them over until it again becomes necessary to work.
			  - *Odd Jobs:* Mainly day jobs.
			  - *Unemployables:* never get a job unless there is a great demand.
			Independent variable:
			- Cognitive performance converted to mental age:
			  - The A cancellation test (Whipple, 1910)
			  - The Easy Direction Test (B) (Woodworth & Wells, 1911)
			  - Hard Directions Test (Woodworth & Wells, 1911)
			  - Digit-Symbol Test (Pyle, 1913).
			  - Easy Opposites Test (Whipple, 1910).
			  - Cube Test (Pintner, 1915).
				- Dividing the data categorically a 28.7% corresponded to "Feebleminded", 29.8% to "Borderline", 28.7% to Backward, 8.5% to Normal and a 4.3% to Bright.
				- Depending on industrial class (length of time an individual is habitually employed) the average mental age is as follows: Unemployed = 10.9, Casual = 10, Odd Jobs = 9, Unemployable = 8.7.
					- Just a 12,8% of the total sample have a normal or higher mental age.
					- The unemployed group show a higher mental age than the casuals, odd jobs and unemployable groups.

Pintner & Toops (1918)	Same as Pintner and Toops (1917).	*N* = 40 unemployed men from Dayton	Same as Pintner and Toops (1917).	- A 7'5% were Feebleminded, 25% Borderline, 32.5% Backward, 20% Normal and 15% Bright. - They did not find Unemployable subjects in this sample. The rest of industrial classes had the following mental ages: Unemployed = 12, Casuals = 10.6, Odd Jobs = 10.2.	- A 35% of the total sample shows a normal or higher mental age. - The unemployed group shows a higher mental age than the casuals, odd jobs and unemployable groups.

* studies included in the meta-analysis
† Programs to provide work experience or training for unemployed adolescents. Authors grouped those in the training schemes with unemployed due to the lack of success finding a job.
‡ Mentality refers to the mental age calculated from the scores of the cognitive performance tests.

One possible explanation is that there was an accumulation of the effect of low intelligence along with other disadvantages. Heineck's (2011) results showed that cognitive skills predicted the unemployment propensity and the maintenance of a job but did not predict the exit of the unemployment situation. Additionally, Caspi et al. (1998) and Hegelund et al. (2018) found that intelligence at young ages (7-9 years old and 18 years old, respectively) was a strong predictor of unemployment twelve years later, specifically for people with low intelligence. Finally, Pintner and Toops found that just a 12.8% (1917) and 35% (1918) of their unemployed sample had a normal or higher mental age.

Alternatively, two studies did not find a significant association between intelligence and occupational status. Creed (1999) showed no correlation between fluid intelligence and length of unemployment in a group of people between 16 and 20 years old. Moreover, after a follow-up of four months, results did not show significant differences between people that were continuously employed versus unemployed during these four months. In the second place, there were no differences in crystalized intelligence between samples of employed and unemployed people (Layton, 1985). A conflicting result was found by Sundstrup et al. (2020) since low cognitive performance was associated with unemployment 4-6 years later, but higher levels were not.

6.3.4. Results from the methodological quality assessment of the studies

Regarding the methodological quality score in the Newcastle-Ottawa Scale (NOS) and the Adapted Newcastle-Ottawa Scale (aNOS), six of the eighteen studies had a good methodological quality (Caspi et al., 2006; Freitas et al., 2012; Košćec-Bjelajac et al., 2019; Leist et al., 2013; Moraes et al., 2012; Sundstrup et al., 2020). Nine of them had a fair quality, and three showed a poor quality (Table 3). Checklist and detailed score for each

study can be consulted on Supplementary material 2. In particular, studies lacked comparability quality (Figure 2).

Table 3

Methodological quality scores of the reviewed studies ordered by their compliance score.

Normal causation studies	Compliance score	Quality range	Reverse causation studies	Compliance score	Quality range
Košćec-Bjelajac et al., 2019	100	Good	Sundstrup et al., 2020	100	Good
Leist et al., 2013	100	Good	Caspi, et al., 1998	88.9	Good
Freitas et al., 2012	83.3	Good	Heineck, 2011	77.8	Fair
Moraes et al., 2012	83.3	Good	Creed, 1999	66.7	Fair
Mani et al., 2013	66.7	Fair	Hegelund et al., 2018	66.7	Fair
Haworth et al., 1990	50.0	Fair	Meyers & Houssemand, 2010	66.7	Fair
Fryer & Warr, 1984	33.3	Poor	Lynn et al., 1984	55.6	Fair
			Pintner & Toops, 1917	50	Fair
			Pintner & Toops, 1918	50	Fair
			Creed & Wiener, 1999	50.0	Poor
			Layton, 1985	33.3	Poor

6.3.5. Meta-analysis results

A total of nine studies, including four from the normal causation and five from the reversed one, were included in the meta-analysis. The results showed a large and significant effect size (*ES* = -0.43, 95%CI = [-0.61; -0.25], p<.001). The rank correlation test suggested the presence of moderate publication bias (p=.477). The results showed a large heterogeneity, with $Q(8) = 157.093$, p<.001, I^2 = 88.9%. Therefore, a meta-regression was performed to examine the potential moderator effect of the age of the sample at the

time of the cognitive assessment. The results did not display significant association, plus the heterogeneity indexes were still high. Then, two separate meta-regressions were performed to assess the mean effect size of the studies grouped under the normal and the reverse causation, controlling for age of the sample.

Figure 2

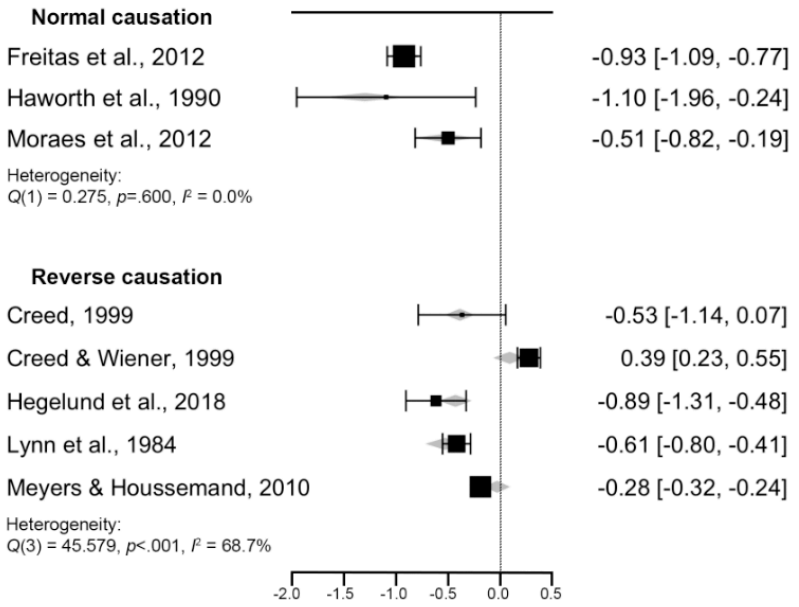
Summary of results of the quality assessment of the 18 studies included in the systematic review.

The meta-regression of the studies under normal causation included three studies, since one of them lacked data on the age of the sample. The results also displayed a significant and larger association (*ES* = -2.33, 95%CI = [-3.57; -1.09], *p*<.001; Age: β = 0.03, 95%CI = [0.00; 0.05], *p*=.019). Results also showed the lack of heterogeneity and publication bias (Figure 3 and Figure 4, respectively). However, these results should be taken with caution due to the small amount of studies included. The mean effect size of the reverse causation studies (*n*=5) was large and significant (*ES* = -1.67, 95%CI = [-2.28;

-1.05], *p*<.001). The covariate age also showed a significant association (β = 0.06, 95%CI = [0.08; 0.03], *p*<.001). Heterogeneity test suggested a moderate variability (Figure 3), and the rank correlation test indicated the absence of publication bias (*p*=1.00) (Figure 4).

Figure 3

Forest plot of the meta-regressions of studies associating cognition with unemployment, using age as covariate, and by direction of the hypothesis (reverse causation and normal causation).



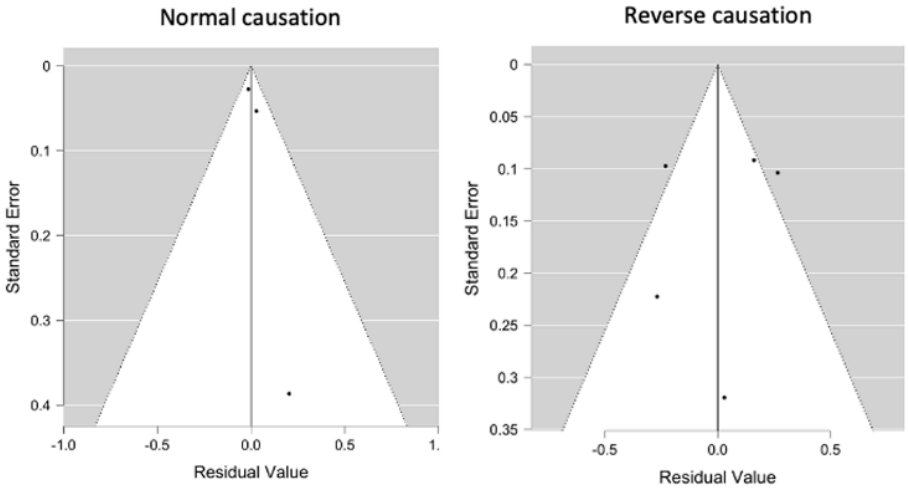
6.4. Discussion

The objectives of the study were to review whether there is enough evidence to apply both the normal and reverse causation, to determine the average size of the association between unemployment and cognition, and to explore if the age of the sample moderates the association. Findings of the qualitative review indicate there is more support for normal causation, which indicate that unemployment is associated with a worse cognitive performance. Six studies reported a significant association. Among them, covariates as unemployment length, age, and especially education, seemed to be relevant. Moreover, although the meta-regression was limited to a small amount of

studies, average effect size was greater in this group of studies, and showed no heterogeneity, compared to the reverse causation one. This relationship might be mediated by two different and synergic mechanisms.

Figure 4

Funnel plots of the meta-regressions controlling for age.



First, the Environmental Complexity Theory (Schooler et al., 1999) proposes that the cognitive function is more likely to decline when some environmental factors change, and the intellectual effort is not needed anymore. Supporting this theory, high intellectual demands at work have been proven to increase cognitive functioning of workers (Schooler et al., 1999; Then et al., 2014) and low intellectual demands have shown a quicker decline in processing speed, memory and general cognitive performance (Bosma et al., 2003). This hypothesis is supported by the study of Leist et al. (2013), where the effect was more accentuated for highly-skilled workers.

Secondly, unemployment is a complex stressor (Kapuvári, 2011; Sumner & Gallagher, 2017) and some studies have shown a negative relationship between chronic stress and cognitive functions. Stress has been linked to worse attention performance (Liston et al., 2009), learning (Niessen, 2006) and information recall (de Quervain et al.,

2009). Thus, referring to the stress-disease model (Kagan & Levi, 1971), stress could be a mediator between unemployment and impaired cognitive performance.

However, some limitations among the normal causation studies must be considered, as the validity of self-reported measures (Fryer & Warr, 1984) or representativeness of the of the unemployed samples (Moraes et al., 2010). On the other hand, one study did not show a significant association between unemployment and cognition, after controlling for age and education (Freitas et al., 2012). However, sensibility of the cognitive measure is compromised because data were extracted with the MoCA that shows ceiling effect for people aged under 60 (O'Driscoll & Shaikh, 2017).

Regarding the reverse causation studies, the average effect size was also large and significant, but the heterogeneity was high. Thus, the meta-regression results should be taken with caution. In the qualitative analysis, findings under the reverse causation perspective highly suggest an association between unemployment and general cognition only for people with a low or very low intelligence and cognitive abilities levels, and it cannot be extended to higher cognitive ability levels. For instance, low intelligence at age 18 predicted unemployment at the age of 30. However, this prediction was weak for medium IQ levels and null for higher intelligence scores (Hegelund et al., 2018). Also, Sundstrup et al. (2020) found this association in those with low cognitive scores. This makes sense regarding the predictability of job performance by general cognitive ability (Bertua et al., 2005), since a low level of fluid intelligence could not be enough for the requirements of a job.

This group of findings is also characterized by a high heterogeneity among them. It might be that some features of their designs prevent generalization of results. In first place, most of the samples are comprised by teenagers and very young adults, and it has

been found that unemployment youth have a higher propensity of being unemployed in the future because of the lack of work experience (Raaum & Reed, 2006; Reneflot & Evensen, 2014). Also, in terms of age, reasons of entry and exit of unemployment, and enrollment in education should have been better controlled. There are some evidences that support that those who quit work (compared to involuntary loss) and young people with more years of education or some work experience during school, are more likely to find a job faster (Ahn et al., 2004; Manacorda et al., 2017). Further, the availability of options to exit from unemployment are greater for young adults, as they could seek for education or training programs (Reneflot & Evensen, 2014). Additionally, studies where intelligence was measured at earlier ages accounted for other social and health variables suggesting the influence of a process of cumulative disadvantages (Caspi et al., 2006, Lynn et al., 1984). Regarding the present study, mean age was significant for both the normal and reverse causation, meaning that the older the sample, the stronger the association between unemployment and cognition.

Another possible limitation for generalization is the short length of unemployment and follow-ups that were analyzed in some studies. Brief periods of time are not representative of unemployment and the course of professional trajectories. Manacorda et al. (2017) found that the mean duration to find the first job in Asia, Latin America, Africa, and Europe is of 23 months, and 41.3 months to find a stable job. Thus, periods of follow up of four months (Creed, 1999) or one year (Lynn et al., 1984) could be too short to find generalizable conclusions based on regression models. Other limitations refer to the number of participants and non-equivalent group sizes. A validity concern is more evident in the study of Creed & Wiener (1999) because comparison groups were from a ten-year previous research in a clinic setting (Felvus, 1989) and

normative data. The last limitation of most studies is the lack of control of some variables that affect the fluid intelligence such as the age, the education level or the socioeconomic status (Peng et al., 2017; Yu et al., 2009).

In summary, the current review about cognitive performance and unemployment arose from the scientific literature that supports that both normal and reverse causation can explain the relationship between unemployment and health. Findings from the included studies, either about normal or reverse causation, support that there is a relationship between unemployment and cognitive performance, which it is supported by the meta-analyses. Specifically, for those studies about the normal causation. In spite of the scarce evidence in both perspectives and the need for further research, this review sheds light on the association between unemployment and cognition, and its possible mediator mechanisms. Additionally, this review and meta-analysis warn of several limitations that have to be taken into account for future studies. According to our findings, it would be recommendable to include a greater list of modulatory variables in order to have a comprehensive vision of the topic. All socio-demographic, educational, and personality factors should be controlled as confounding or modulator variables. Moreover, due to the special plasticity of cognitive functions, socio-professional variables might be included into analysis. Thus, related fields of research include the level of job complexity or mental workload as a key factor. Studies like the ones carried out by Potter et al. (2008), Then et al. (2014) or Fisher et al. (2014), observed that the level of mental demands at work is an influential factor in cognitive status in adulthood and elderly. Thus, including characteristics about the complexity of works could help to conceptualize and find more moderating mechanisms of the relationship. It also would be valuable to specify the unemployment rates and characteristics of the labor market in the countries

where studies are implemented. There is evidence about the influence of unemployment rates on the relation between health effects and unemployment (Thern et al., 2017). In particular, periods of high unemployment may buffer negative consequences, and can be attributed to external factors. In addition, it may be interesting to include factors as indicators of stress at work, training during unemployment, underemployment or voluntary work. Lastly, the methodological quality of studies should be improved to obtain stronger generalizations.

Conclusions

The topic about the unemployment-cognition relationship has been scarcely studied. However, the current findings support an association between them. The strength of the association in the studies under the normal causation hypothesis is greater than those under the reverse causation. Specifically, studies from reverse causation showed that low levels of intelligence or general cognitive ability were associated with being unemployed, whereas studies from normal causation displayed a worse cognitive performance in high-skilled unemployed. In both cases, age of the sample was positively associated with the strength of the association.

However, more research in the topic and the mediator mechanisms of length of unemployment, age and educational level is needed. As such, future findings may help improve interventions and life quality of unemployed people, reemployment strategies and welfare systems.

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Capítulo 7.
Modulatory variables of cognition during unemployment

(Estudio 4)

Vélez-Coto, M., & Caracuel A. (Submitted). Modulatory variables of cognition during unemployment. *Journal of Vocational Behavior*.

Abstract

Occupational attainment and work characteristics, as complexity of work, have been shown to influence cognitive performance of workers, having a long-lasting effect which is manifest also in older ages. Unemployment is also known to influence psychological and physical health, in a negative way. Despite these evidences, consequences of unemployment of cognition have been scarcely studied. This study tests a structural equation model of the relationship between age, educational level, complexity of previous work with data and people, mental and general health, and cognitive performance in an unemployed sample. Additionally, the mediation effect of health symptoms on cognitive performance is studied. Cross-sectional data from 131 unemployed from Granada, Spain, were analyzed. The proposed model showed good fit. Executive functioning and memory were shown to be directly influenced by length of unemployment and education, and health variables did not mediate this association. Complexity of pre-unemployment work predicted memory and executive functioning. This study shows that unemployment has an influence on cognitive status, which is protected by previous occupational complexity and educational level. These findings might have some implications for the environmental complexity and cognitive reserve theories. Nevertheless, more studies analyzing moderating mechanisms and factors are needed in order to improve unemployment interventions. Cognitive interventions would help unemployed individuals to improve their job seeking, as well as to perform better in daily activities and future work.

Keywords: unemployment, cognitive performance, health, cognitive reserve, complexity of work.

7.1. Introduction

Occupational attainment and education have long been considered two of the greatest enhancers of cognitive functioning (Ikanga et al., 2016; Stern, 2006). Some authors have suggested that education is highly related to occupational complexity as it helps individuals to have better access to more complex jobs, and therefore to more cognitively stimulating environments (Hyllegard & Lavin, 1992; Oltmanns et al., 2017). However, independent effects of each of these factors on cognition have been found (Chapko et al., 2016; Kremen et al., 2019). Work leads individuals to confront new situations and difficulties, which would require them to develop and apply their skills to respond these demands adequately (Russo, 2016). The analysis of work demands is mainly based on two indexes, the subjective intellectual or cognitive demands and the complexity of work (Hussenoeder et al., 2019). Both indexes have been studied in relation to cognitive performance. Marquie et al. (2010) found that higher levels of cognitive demands at work were associated with higher levels of cognitive performance and a more favorable cognitive change in the following ten years, after controlling for age, education and physical and psychological health of workers. Additionally, workers who had a job where the ability to identify, evaluate and implement solutions for complex problems was required, showed better memory and executive functioning (Grzywacz et al., 2016).

Complexity of work index refers to the extent the work provides of cognitively challenging tasks and rewards to develop and improve workers' cognitive abilities, as well as it enhances opportunities of social interaction (Denier et al., 2017). Typically, the types of complexity of working with data, people, or things are specified through consensual guidelines. However, qualified job analysts denoted that only the first two types of complexity show good reliability (data = 0.85, people = 0.87, things = 0.47) (Cain &

Treiman, 1981; Kröger et al., 2008). In terms of their relationship with cognition, complexity of work with people and data show clearer associations than complexity with things (Boots et al., 2015; Dekhtyar et al., 2016; Karp et al., 2009; Smart et al., 2014). Complexity of work and job demands have also been associated with specific executive components, as working memory (Sörman et al., 2019) or the cognitive flexibility components (Gajewski et al., 2010; Vélez-Coto et al., In press).

This relationship between work and cognitive performance has been found to be maintained even after retirement. Rohwedder and Willis (2010) found a decrease in the memory performance of workers after retirement, which have been replicated in several studies (Celidoni et al., 2017; Hamm et al., 2020). Moreover, it has been shown that a higher pre-retirement complexity of work was associated with a better executive functioning, and with a slower rate of decline afterwards (Fisher et al., 2014; Vélez-Coto et al., In press) despite the effect of age on the decline in different cognitive abilities (Whitley et al., 2016).

In view of these findings, two theories have been used to explain the effect of the occupational complexity on the cognitive performance of workers and their cognitive trajectory. In first place, the cognitive reserve theory suggests that inter-individual differences in both cognitive performance and cognitive trajectories are determined by the influence of stimulating activities through the life-course (Stern et al., 2018). These proxies include years of education, leisure activities, socioeconomic status, social participation and occupational features as complexity of work. Thus, work itself might have a positive effect on cognitive abilities enhanced by brain plasticity, increasing the cognitive reserve. According to the analyses of previous studies made by Vance et al. (2016), the five benefits of work that are likely to directly and indirectly foster brain health

and cognition in a positive way are: social engagement (de Frias & Dixon, 2014; Jedrziewski et al., 2014), routine (Erickson et al., 2019), the stress-protective effect of the sense of purpose and meaning (Hakanen & Wilman, 2012), incomes (Mani et al., 2013; Sturgeon et al., 2016) and learning new skills (Chein & Schneider, 2005; Zatorre et al., 2012). Among these, social engagement and learning new abilities have been found to be direct consequences occupational complexity (Denier et al., 2017).

Secondly, the environmental complexity theory (Schooler, 1984) states that a complex and stimulating environment, such as work, provides the suitable conditions to improve cognitive performance. In these contexts, motivation for cognitive improvement is rewarded, increasing the likelihood of its occurrence. However, the rewards and resources needed to develop and maintain the level of cognitive functioning would disappear when the environment changed and some of its complexity was lost. This decline would trigger the adaptation of cognitive abilities to the new environment, which would be revealed by a decrease in cognitive performance. Therefore, as long as work is considered a complex and stimulating environment, unemployment could be associated with cognitive decline, as it occurs with other effects on general health.

This relationship between unemployment and cognition has been studied, yet scarcely. Fryer and Warr (1984) studied whether a group of unemployed individuals reported a worsening of their cognitive abilities after losing their job. They found that those in the longer-term unemployment groups reported more cognitive difficulties. Haworth et al. (1990) corroborated the subjective changes of Fryer and Warr's study (1984) but also compared differences between unemployed and workers in a battery of cognitive tasks, founding poorer performance in general cognitive ability and verbal reasoning in the group of unemployed. Poverty and lack of work have also been

associated with a worse cognitive control and abstract reasoning, after controlling for anxiety, stress, nutrition and physical exercise (Mani et al., 2013). Conversely, Freitas et al. (2012) found that the differences in cognitive performance between unemployed and workers disappeared when age and educational level were controlled. These controversial findings highlight the relevance of controlling all related factors.

On the other hand, unemployment has been mostly studied in relation to its effect on general health. Exposure to unemployment has been associated with increasing distress symptoms (Frasquilho et al., 2016). Paul and Moser (2009) found that unemployed individuals showed a 34% of mental health problems compared to the 16% of the employed. In other study (Linden & Rotter, 2018) a 40.2% of the unemployed sample had severe levels of distress. This effect has been also reflected in the perceived health status, which the unemployed scored 19% worse (Tøge, 2016), and it seemed to be modulated by the duration of unemployment (Urbanos-Garrido et al., 2015). Further, unemployment has been associated with less healthy behaviors (Tavares, 2014), less physical activity (Salmon et al., 2003), and sleep problems and insomnia (Maeda et al., 2019; Wolińska, 2020). These health effects have been linked to the fact that unemployment is considered a psychosocial chronic stressor (Miller et al., 2007). The link between stress and cognition could be due to its association with an increase in cortisol (Sumner & Gallagher, 2017) and C-reactive protein and fibrinogen (Hughes et al., 2015). These findings suggest a possible effect on cognitive performance mediated by this set of psychological and physiological stress reactions, which are associated to structural and functional brain changes (Liston et al., 2009; McEwen, 2017). Specifically, stress has been related to a decrease in executive functioning, memory, attention and learning (Butler et al., 2017; Lupien et al., 2009; Shields, Sazma et al., 2017).

This association between unemployment and health may be affected by reverse causality, which posits that health status influence the unemployment propensity. Although this question has been widely discussed (Novo et al., 2000; Wanberg, 2012), several findings support that the normal causation shows a stronger effect (Krug & Eberl, 2018). Specifically, a relevant meta-analysis showed that the effect size of the normal causation (d=0.51) was greater than that shown by reverse causality (d=0.23) (Paul & Moser, 2009).

To sum up, the evidence indicates that education, work, and its complexity have an effect on the cognitive functioning of individuals, which may also be mediated by the effect of unemployment on health. Findings about this topic are still sparse and heterogenous, and theoretical and empirical support is limited. In view of this, it is therefore necessary to study in greater depth the association between unemployment and cognition accounting for characteristics of previous work and the possible mediator effect of health symptoms. To our knowledge, this is the first study using structural equation modelling for the purpose of integrating into a model the interaction of sociodemographic, occupational and health factors in relation to the cognitive status of the unemployed. Thus, the aims of this study were:

- To test a path model of the relationships between age, educational level, complexity of previous work with data and people, mental and general health, and cognitive performance in an unemployed sample.
- To determine whether mental and general health symptoms mediate the association between unemployment and cognitive status.

7.2. Methods

Participants and Procedure

The sample was recruited in the city of Granada (Spain) through on-line advertisements, press and among the attendees of workshops for unemployed people organized by the regional employment service. The inclusion criteria were being unemployed (i.e. available to work but unable to find a job) and being 18-65 years old. The exclusion criteria were being enrolled in official studies; and having a diagnosis of disabling physical illness or mental or intellectual disorder.

A total of 131 unemployed volunteers from the metropolitan area of Granada met the criteria. The sample mean age was 36.26 (*SD* = 10.68, age range = 20 – 64) and 54.9% of the sample were female (Table 1). Regarding education, most of the sample (63.4%) had superior education, and the 8.4% eight had years of education or less. The mean length of unemployment was 19.42 months (*SD* = 17.88).

Table 1

Descriptive statistics of the sample

		M (*SD*) [Range] *or n* (%)
Age		36.26 (10.68) [20 - 64]
Length of unemployment (months)		19.42 (17.88) [0.5 - 84]
Duration of unemployment by groups	0 – 6 months	32 (24.4%)
	7 – 12 months	33 (25.2%)
	13 – 24 months	26 (19.8%)
	> 24 months	40 (30.5%)
Gender	Male	61 (43.6%)
	Female	70 (53.4%)
Educational Level	Primary school	11 (8.4%)
	Secondary school	37 (28.2%)
	Superior	83 (63.4%)

The assessments were conducted at two stages. First, participants responded an online form, which included socio-demographic data, length of unemployment, and health questionnaires. Secondly, they were cited individually for the on-site evaluation. In this session, information about the complexity of the previous job was collected through an interview, and a battery of neuropsychological tests was administered. The assessments were held between October 2015 and June 2017 at the Mind, Brain and Behavior Research Centre (University of Granada).

This study was approved by the Ethics Committee of the University of Granada (reference number 119/CEIH/2015) and conducted after obtaining written informed consent of the participants. All participants were rewarded with 10€ for their participation.

Variables and instruments

Age, educational level (i.e. primary studies, secondary and superior) and length of unemployment (i. e. months) were recorded from the first questionnaire.

Complexity of previous work

Complexity of previous work was measured using the Dictionary of Occupational Titles (DOT) classification scheme. This classification is composed of a list of particular skills that are required in every occupation and reflects the level of complexity in three categories: management of data, people, and things (Table 2). Participants were asked whether they had to perform every level of tasks in their previous job. Thus, the most complex level for every category (i.e. complexity of work with data and complexity of work with people) was selected. Complexity of work with things was not included in the analysis due to its low levels of reliability (Cain & Treiman, 1981; Gow et al., 2014; Kröger et al., 2008). This system allows to score their complexity of work with data from 0 to 6,

and complexity of people from 0 to 8. For this study, scores were reversed so a higher score reflects a higher level of complexity of work.

Table 2

Categories, levels and tasks of complexity of work with data and people

Complexity of work with data		
Management of information, knowledge, and conceptions, obtained by observation, investigation, interpretation, visualization, and mental creation. Data are intangible and include numbers, words, symbols, ideas, concepts, and oral verbalization.		
0	Synthesizing	Integrating analyses of data to discover facts and/or develop knowledge concepts or interpretations.
1	Coordinating	Determining time, place, and sequence of operations or action to be taken on the basis of analysis of data; executing determinations and/or reporting on events.
2	Analyzing	Examining and evaluating data. Presenting alternative actions in relation to the evaluation is frequently involved.
3	Compiling	Gathering, collecting, or classifying information. Reporting and/or carrying out a prescribed action in relation to the information is frequently involved.
4	Computing	Performing arithmetic operations and reporting on and/or carrying out a prescribed action in relation to them. Does not include counting.
5	Copying	Transcribing, entering, or posting data.
6	Comparing	Judging the readily observable functional, structural, or compositional characteristics (whether similar to or divergent from obvious standards) of data, people, or things.
Complexity of work with people		
Management of human beings; also, animals dealt with on an individual basis as if they were human.		
0	Mentoring	Dealing with individuals in terms of their total personality in order to advise, counsel, and/or guide them with regard to problems that may be resolved by legal, scientific, clinical, spiritual, and/or other professional principles.
1	Negotiating	Exchanging ideas, information, and opinions with others to formulate policies and programs and/or arrive jointly at decisions, conclusions, or solutions.
2	Instructing	Teaching subject matter to others, or training others (including animals) through explanation, demonstration, and supervised practice; or making recommendations on the basis of technical disciplines.
3	Supervising	Determining or interpreting work procedures for a group of workers, assigning specific duties to them, maintaining harmonious relations among them, and promoting efficiency.
4	Diverting	Amusing others, usually through the medium of stage, screen, television, or radio.
5	Persuading	Influencing others in favor of a product, service, or point of view.
6	Speaking-Signaling	Talking with and/or signaling people to convey or exchange information. Includes giving assignments and/or directions to helpers or assistants.
7	Serving	Attending to the needs or requests of people or animals or the expressed or implicit wishes of people. Immediate response is involved.
8	Taking instructions-Helping	Attending to the work assignment instructions or orders of supervisor. (No immediate response required unless clarification of instructions or orders is needed.). Helping applies to ``non-learning'' helpers.

Note. Information extracted and adapted from the Dictionary of Occupational Titles (DOT) (see https://occupationalinfo.org/appendxb_1.html)

Mental and general health symptoms

Perceived stress was measured with the Perceived Stress Scale (Cohen et al., 1983), which Spanish version has shown good validity and sensitivity (Remor, 2006). This is a 14-item self-report measure that assess the frequency to which situations are considered as stressful. Each item is rated on a Likert scale ranging from 0 (never) to 4 (very often).

Perceived distress was assessed using the Symptom Checklist 90 – Revised (Derogatis, 1970) - Spanish version (González de Rivera et al., 1989). It is a 90-item inventory to evaluate the presence of distress in nine dimensions (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism). Among these indexes, the Positive Symptom Distress Index (PSDI) was used because is the average score of items scored above zero and then, considered a pure intensity measure.

Sleep problems were evaluated with the Medical Outcomes Study Scale (MOS-Sleep) (Spritzer & Hays, 2003). It consists of a 12-item list which is divided into 6 dimensions: sleep disturbance, snoring, sleep awakening short of breath or with headache, sleep adequacy, somnolence and quantity of optimal sleep. A sleep problem index can be also summarized using 9 items. However, the global index of sleep problems was used in this study. The Spanish version of this scale has been validated in several populations (Viala-Danten et al., 2008; Zagalaz-Anula et al., 2017).

Perceived health status was assessed asking the participants their health status (i. e. How is your health in general? 0 – Really bad to 5 – Very good). Scores of self-perceived health have been considered a good indicator of general objective health (Wu et al., 2013). Also, hours of physical activity per week were asked with the following question:

"How many hours a week do you spend doing physical activities?". Scores were reversed so a higher score means a worse perceived health status and less physical activity.

Cognitive measures

To evaluate learning and verbal memory performance, the Hopkins Verbal Learning Test – Revised, form A (Brandt & Benedict, 2001) - Spanish version (Bilbao et al., 2017), was used. It consists of a list of 12 words from three different categories (i. e. birds, home tools and drinks). This list has to be learned over three trials and be recalled after 20 minutes. Afterwards, it is administered a recognition trial, comprised of 24 words including 6 semantically related and 6 semantically unrelated distractors. Three scores were used in this study: the immediate total score (i. e. sum of the three trials), the delayed and recognition scores (i. e. sum of correct answers on each trial).

To measure the inhibition and the flexibility, the Color-Word Interference Test from the Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001) was applied. It includes four different trials: 1) reading (time of word reading of colors reading), 2) naming (time of naming the colors of different colored squares), 3) inhibition (time of naming the color of the ink, which is incongruent with the word, -e.g. the word blue is written with green ink-, and 4) switching between color naming and word color-incongruent reading. Two contrast scores were calculated to determine the inhibition or resistance to interference (time in trial 3 minus time in trial 1) and the switching or cognitive flexibility (time in trial 4 minus time in trial 1+2). In order to facilitate the interpretation of the analysis, timed indices scores reversed so a higher score reflects higher ability. Both resistance to interference and switching contrast scores were used in the study.

Three facets of the reasoning ability were assessed. The abstract and semantic reasoning were measured with the Matrix and Similarities subtests of the WAIS-III – Spanish version (Wechsler, 1999) respectively. The Matrix subtest shows 26 incomplete logical series and five answer choices, each choice shows an element that could complete the series. Participants have to choose the option they think fits best. The Similarities subtest comprises 19 pairs of words in which the participant must explain how the two elements are similar. The verbal-analytic reasoning was measured with the Verbal Analogies subtest of the RIAS – Spanish version (Reynolds & Kamphaus, 2009). It includes 51 incomplete sentences where three elements are related, and the participant must complete them. Two of them are somehow related to each other, and the participant must find a word that relates to the third one. The scores used in this study were the number of correct answers.

The working memory was measured with the Letter-Number Sequency subtest of the WAIS-III. This task consists of arranging a sequence of numbers and letters so that the participant first says the numbers in increasing order, and then the letters in alphabetical order. The variable used in this study was the number of correct answers.

The planning ability was assessed with the digital version of the Tower of London (TOL; Shallice, 1982) in the PEBL Test Battery (Mueller & Piper, 2014). The Phillips' (1999) configuration was set. In eight trials with progressive difficulty, the participants are given three stacks with five disks in sum and a picture showing the goal configuration. They have to move the disks among the stacks to get the final disposition. Participants are taught that there are limitations in this task: they can only move one disk at a time and the moved disk must be placed at the top of the stack. Every goal configuration can be achieved by a minimum amount of movements. The variable included in the analyses was

the main accuracy score of this task: the number of extra movements the participant needed to complete the task. Scores were inverted in order to facilitate interpretation, so a higher score means a better performance.

Statistical Analyses

Two Exploratory Factor Analyses (EFA) were conducted to identify the possible factors formed by the outcome measures of mental and general health and cognition in order to create the latent variables for the Structural Equation Model. The maximum likelihood estimation method was applied. The EFA were performed using the JASP software (2020).

To examine the association between sociodemographic and occupational information, mental and general health, and cognitive variables, Structural Equation Model (SEM) was used. The test of goodness of the model's fit was performed at two stages (Koizumi, 2013): the measurement model analysis, and the structural model analysis. For this type of analysis, a sample between 100-150 has been set as a minimum size for SEM, and between 100-200 for factor analysis (Ding et al., 1995; MacCallum et al., 1999; cited in Kyriazos, 2018), chiefly if factors are defined by multiple variables.

Analyses were performed in R Software (v. 4.0.0.) (R Core Team, 2020), using the lavaan package (Rosseel, 2012). The maximum likelihood estimation was applied. This method comprised the general missing type procedure (i.e., the model is estimated using all the data available without imputing). Model fit standards of comparative fit index (CFI) (> .95), root mean square error of approximation (RMSEA) (<.06), its 90% Confidence Interval and *p* value, and standardized root mean square residual (SRMR) (<.08) (Hu & Bentler, 1999) were used. The CFI measures the improvement of the hypothesized model fit over the baseline model which assumes independence among factors. The RMSEA

quantifies the badness of fit. The SRMR measures the difference between observed and predicted correlations.

7.3. Results

The first exploratory factor analysis displayed one factor including four of the five mental and general health measures (Table 3) (χ^2 = 7.7, *gl* = 5, *p* = .17).

Table 3

Factor Loadings of the mental and general health symptoms

	Factor 1	Uniqueness
Perceived Stress Scale	0.822	0.325
MOS Sleep Problems	0.657	0.568
Physical Activity		0.993
Perceived Health Status	0.467	0.781
SCLR - PSDI	0.754	0.431

Note. Estimation method: Maximum likelihood. MOS: Medical Outcomes Study Sleep Scale; SCLR-PSDI: Symptoms Checklist Revised – Positive Symptoms Distress Index.

The second Exploratory Factor Analysis (EFA) yielded two cognitive factors (Table 4) (χ^2 = 44.69, *gl* = 26, *p* = .01). Factor 1 was comprised of six tasks and the dimension was named executive functions. The second factor included the three measures of the memory task.

According to the results of the EFAs, three latent variables were included in the structural equation model. The matrix of correlations between all the variables included are shown in Table 5. Both the measurement and the fit model analyses used 122 observations from the sample. First, the measurement model was tested. The results showed the goodness of the fit (χ^2 = 59.96, *gl* = 62, *p* = .55; CFI = 1.00; SRMR = .05; RMSEA = .00, 90% CI = .00 - .05, *p* = .94).

Then, the test of the proposed relationships between the latent factors and the sociodemographic and occupational variables (age, level of education, complexity of work with people and data, and length of unemployment) was conducted (Figure 1). Descriptive data for the dependent variables is shown in Table 6.

Table 4

Factor Loadings of the cognitive performance tasks

	Factor 1	Factor 2	Uniqueness
Verbal Analogies	0.690		0.484
Similarities	0.475		0.748
Letters and Numbers	0.438		0.742
TOL – Extra movements	0.488		0.738
Matrix Reasoning	0.588		0.622
D-KEFS – Interference contrast			0.880
D-KEFS – Switching contrast	0.482		0.797
HVLT Immediate		0.808	0.300
HVLT Delayed		0.820	0.328
HVLT Recognition		0.524	0.738

Note. Estimation method: Maximum likelihood. TOL: Tower of London; D-KEFS: Delis-Kaplan Executive Function System; HVLT: Hopkins Verbal Learning Test

The fit measures showed a good fit of the model (χ^2 = 113.37, *gl* = 112, *p* = .45; CFI = .996; SRMR = .05; RMSEA = .010, 90% CI = .00 - .05, *p* = .97). Further, the explanation rates for negative health status, memory and executive functioning were 8.7%, 16.1%, and 24.6%, respectively. A significant direct effect on the executive functioning factor was shown by length of unemployment (β = -0.08, *p* = .012), education (β = 2.29, *p* = .01), and a marginally significant effect of complexity of work with data (β = 0.55, *p* = .052). The indirect effect of length of unemployment on executive functioning through mental and general health symptoms was equal to zero (-0.00 × -0.95 = 0), as it occurred with memory (-0.00 × -0.39 = 0). The memory factor was significant and directly predicted by

Table 5

Correlation matrix for all the dependent and independent variables included in the structural equation model

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	-																
2. Educational level	-.086	-															
3. Length unemployment	.192*	-.050	-														
4. CW with data	.379**	.192*	.061	-													
5. CW with people	.274**	.082	.062	.479**	-												
6. Perceived health status	-.026	-.018	.017	.129	.095	-											
7. MOS Sleep	-.080	.100	-.090	.056	-.084	.352**	-										
8. Perceived Stress Scale	-.097	.221*	-.099	.004	-.068	.375**	.528**	-									
9. SCLR - PSDI	-.118	.208*	-.042	.086	-.005	.311**	.491**	.641**	-								
10. Verbal Analogies	.030	.199*	-.278**	.254**	.210*	.063	.092	.052	.029	-							
11. Similarities	-.033	.256**	-.130	.105	.169	.078	.041	.103	.024	.461**	-						
12. Letter-Number Sequency	-.053	.153	-.075	.105	.077	-.092	-.065	-.009	.013	.416**	.212*	-					
13. Matrix	-.157	.199*	-.171	.093	-.011	-.024	.035	-.067	-.072	.412**	.320**	.296**	-				
14. TOL Extra movements	-.028	.069	.018	.121	.050	.179*	.045	.017	-.015	.354**	.263**	.228*	.377**	-			
15. Color-Interference - Switching	-.044	.013	-.060	.209*	.212*	.043	-.013	-.068	.044	.260**	.212*	.111	.183*	.159	-		
16. HVLT - Immediate	-.034	.158	-.205*	.016	.194*	-.088	-.096	-.014	.007	.279**	.213*	.370**	.253**	.197*	-.009	-	
17. HVLT - Delayed	.150	.126	-.135	.090	.213*	.101	-.089	.061	.066	.274**	.145	.201*	.225*	.244**	-.030	.677**	-
18. HVLT - Recognition	.035	.175*	-.043	.012	.101	-.071	-.060	-.102	-.103	.129	.193*	.056	.134	.054	-.001	.421**	.443**

Note. CW = Complexity of work; MOS Sleep: Medical Outcomes Study Scale – Sleep; SCLR - PSDI = Positive Symptom Distress Index (SCL-R); TOL = Tower of London; HVLT: Hopkins Verbal Learning Test. Spearman rho correlations are shown for gender and educational level. Spearman rho correlation are shown for educational level.

** p <.001 * p.05

complexity of work with people (β = 0.34, *p* = .008), length of unemployment (β = -0.04, *p* = .018), and marginally by educational level (β = 0.5, *p* = .054). Mental and general health was directly predicted by level of education (β = 0.13, *p* = .04).

Table 6

Descriptive data of the dependent variables

		M (*SD*)
Health symptoms	Perceived health status	-3.45 (0.96)
	MOS-Sleep	40.41 (19.64)
	Perceived Stress Scale	29.96 (7.77)
	SCLR-R PSDI	1.97 (0.52)
Executive functioning	Verbal Analogies	34.86 (7.62)
	Similarities	22.15 (3.56)
	Letter-Number Sequency	10.69 (2.36)
	Matrix	18.05 (4.25)
	TOL Extra movements	-18.08 (10.88)
	Color-Interference - Switching	-9.86 (10.93)
Memory	HVLT - Immediate	25.98 (4.02)
	HVLT - Delayed	9.38 (1.99)
	HVLT - Recognition	11.68 (0.60)

Note. PSDI: Positive Symptom Distress Index; MOS-Sleep: Medical Outcomes Study Sleep Scale; TOL: Tower of London; HVLT: Hopkins Verbal Learning Test.

7.4. Discussion

The first aim of this study was to test a path model of the relationships between age, educational level, complexity of previous work with data and people, mental and general health, and cognitive performance in an unemployed sample. The structural model analysis showed good fit of the model, which indicates that the proposed model is appropriate.

Mental and general health symptoms showed a direct influence from educational level, meaning that individuals with higher educational levels showed a more negative

perceived health. Generally, this association displays the opposite direction in general population (Hämmig & Bauer, 2013; Niemeyer et al., 2019), and in mixed groups of unemployed and part-time workers (van Zon et al., 2017), showing worse health those better educated. However, some findings support our result in unemployed.

For instance, Dooley et al. (2000) found that the increase in depression caused by unemployment was exacerbated in highly educated people. Additionally, Košćec-Bjelajac et al. (2019) analyzed differences by area of residence and found that having a higher level of education was associated with more severe symptoms of depression in people who lives in urban areas, as the sample of the current study.

This finding might be explained by the fact that the more educated unemployed would have to make a larger psychological adjustment to adapt to their new situation. In contrast, people with lower levels of education, since they are at greater risk of becoming unemployed (Schuring et al., 2013), might deal with frequent experience of negative feelings associated to job insecurity (László et al., 2010; Silla et al., 2009) and might develop coping skills. Further, people with higher levels of education tend to obtain jobs of higher social status (Connor et al., 2001) and the impact of job loss could be greater due to the experience of lowering social status, which brings with it a sense of loss of control associated with greater psychological difficulties (Farhood & Dimassi, 2012). In addition, decreasing of social status is accompanied by loss of income, which is also associated to a decrement in leisure activities, which have been considered a risk factor for depression, anxiety and stress (Cuypers et al., 2012).

Executive functioning was directly predicted by education and complexity of work with data (marginally significant). Effect of education on executive function is widely

supported by studies where years of education predicted abstract reasoning, processing speed, visuospatial abilities, and logical and episodic memory (e. g. Ritchie et al., 2015).

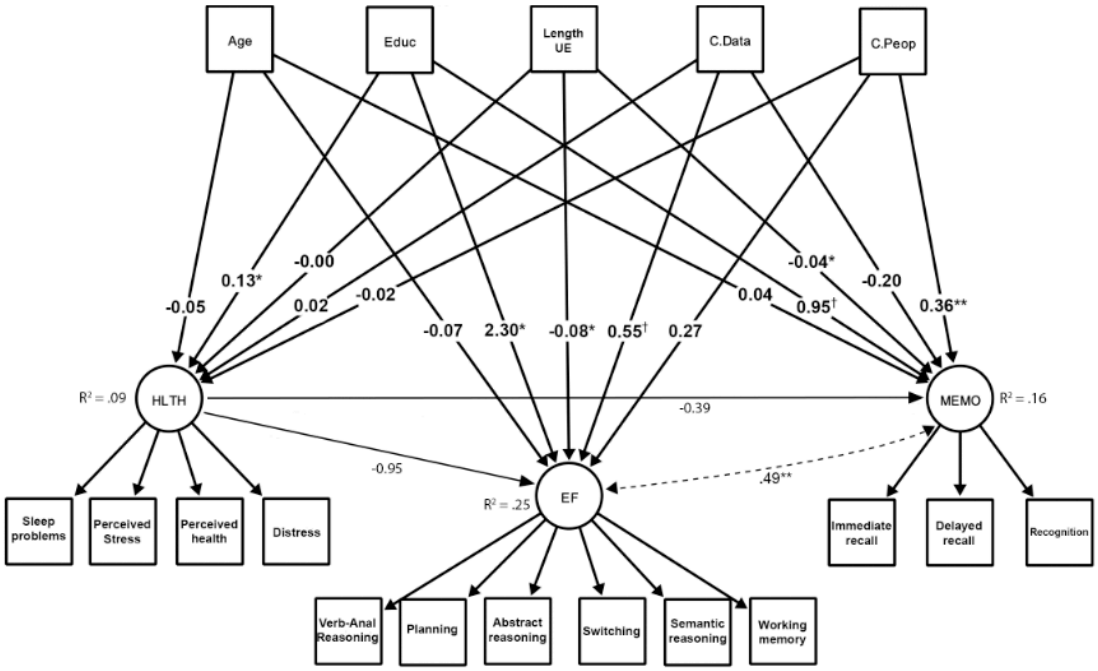
However, as far as we know, effects of complexity of previous work have not been studied during unemployment. In consideration of the findings from active workers, occupational complexity has shown influence in their cognitive performance, even after retirement. It has been found that more complex jobs were associated with better overall executive functioning in workers (Grzywacz et al., 2016; Kraup et al., 2018; Vélez-Coto et al., 2020), and specifically with their cognitive flexibility (Gajewski et al., 2010). Taking into account the types of complexity, higher levels of complexity with data were associated with the cognitive control of 50-75-aged individuals, while complexity of work with people was with their switching ability (Sörman et al., 2019). This effect of occupational complexity with data on executive functioning seems reasonable since most complex jobs on data management involve tasks inherently related to executive functioning: integrating, developing, coordinating and analyzing different sources of information.

Regarding memory performance, it was affected by educational level (marginally significant) and occupational complexity with people (significant). Previous studies aimed to determine the influence of occupational complexity on long-term cognition have found that complexity with people is associated with a less pronounce memory aging (Andel et al., 2016), and even with a lower risk of developing dementia Kröger et al., 2008). The mechanisms by which the complexity of working with people can influence memory are not clear. Despite this, there might be an explanation in the research about the influence of social environments on cognition. Seeman et al. (2011) found that histories of greater social contacts and support enhanced the executive and memory

performance along the ages 35-85. A systematic review focused on specific aspects of social interactions that may influence cognition (Kelly et al., 2017) and concluded that social support and composite measures -combinations of social support, relationships, activity or networks-, were associated with episodic memory, but not social networks and activity alone.

Figure 1

Simplified graph of the structural equation model that shows the relationships between age, educational level, complexity of previous work, cognitive performance and mental and general health.



Note. Dashed arrows represent correlations. Dark arrows indicate regressions with its beta coefficients. Educ: Educational level; Length UE: Length of unemployment; C.Data: Complexity of work with data; C.Peop: Complexity of work with people; HLTH: Health symptoms; EF: Executive functioning; MEMO: Memory. **p <.01, *p < .05, †Marginally significant.

In light of this, we could then hypothesize that people who have more complex jobs with people are exposed to more socially stimulating interactions. These kinds of

jobs imply mentoring, negotiating and instructing. For these actions, provide support, advising, consider other's thoughts or interests, and build genuine bonds might be required. Thus, workers may be exposed to situations that lead them to benefit more from those social aspects involved in cognitive performance.

Both education and complexity of work are sociobehavioral proxies for cognitive reserve (Stern et al., 2018), although the mechanisms are not clear yet. In regards to the specific complexity of work with people, it has been hypothesized that social activities also contribute to build the cognitive reserve up (Opdebeeck et al., 2018; Scarmeas & Stern, 2003), and that social support promote resilience against the harmful effect of stress (Ozbay et al., 2007), benefiting memory and executive performance (Luethi et al., 2008; Lupien et al., 2009). Thus, people who have reached a higher level of education, and have had more complex jobs, have been exposed to more stimulating experiences that have led them to develop a greater cognitive reserve. This reserve refers to the adaptability, capacity and flexibility of brain and its cognitive processes to cope with aging, pathology or insult. Therefore, it could be that in our sample of unemployed, higher education and more complex previous jobs act as protectors of the negative effects found of duration of unemployment on executive functioning and memory.

This effect displayed a negative association between months of unemployment and cognitive status, meaning that the longer the unemployment, the poorer the cognitive performance. Studies of the effect of employment status on cognition and comparing unemployed to worker groups have finding a worse cognitive performance of the former (Haworth et al., 1990; Freitas et al., 2012; Košćec-Bjelajac et al., 2019), and a significant effect of length of unemployment (Fryer and Warr, 1984). The effect seems to have long-term implications, as found in Leist's et al. (2013) study, where having periods

of unemployment longer than six months during midlife were associated with a higher risk of cognitive impairment at older ages. The effect of job loss and length of unemployment might be explained by the environmental complexity theory (Schooler, 1984).

This theory states that work provides a cognitively stimulating environment, as well as rewards for the cognitive effort, which make employees being more motivated to develop their abilities. When this environment changes to a less stimulating one, cognitive abilities may decrease in order to adapt to the new environment and due to the lack of stimulation (Schooler, 1984). Accordingly, it might be that the longer the non-exposure to work environments, the greater the deterioration of executive functions.

Another possible explanation is that longer periods of unemployment may be related to greater stress, and thus to worse cognitive performance. Hence, this was the second objective of the current study. As long as the proposed model was valid, the health variables were related to cognitive functioning, taking into account the effect of the other independent variables. However, health variables did not show a direct significant prediction of memory and executive functioning, while length of unemployment did it on both. And the effect of length of unemployment on health symptoms was zero. This specific finding might be explained by a non-linear association between those variables. Some authors have found that unemployed people show adaptation of habituation to their new situation (Clark et al., 2001; De Witte et al., 2010). Particularly, a normalization after one year of unemployment may occur (Till et al., 2019).

Nevertheless, unemployment is considered a psychosocial stressor (Sumner & Gallagher, 2017), and longer unemployment has been associated to higher levels of stress and lower well-being (Creed & Klisch, 2005; Dettenborn et al., 2010; Pavlova &

Silbereisen, 2012). Otherwise, cognitive functioning has been shown to be affected by stress processes. In a recent meta-analysis results displayed a detrimental effect of stress on working memory and cognitive flexibility, due to cortisol production and increasing proinflammatory cytokines (Shields, Sazma et al., 2017). However, some moderators seem to be involved in this relationship, such as stress reactivity and coping resources (Plieger & Reuter, 2020), which we did not include in our study. Previous studies comparing cognitive performance in unemployed and workers did not control for health or stress levels, with one exception. Mani et al. (2013), controlled for stress, physical exercise and anxiety levels and found that workers in an unemployment spell had worse cognitive control and abstract reasoning.

On the whole, our finding suggests that the length of unemployment has an effect on memory and executive functioning that is not moderated by mental and general health status. According to this, the variations on cognitive status may be better explained by the loss of exposition to stimulating contexts as the environmental complexity theory posits (Schooler, 1984), instead of the stress effect. Additionally, greater cognitive reserve enhanced by higher education and complexity of previous work may protect from the detrimental effect of unemployment.

Limitations and strengths

Several limitations of this study must be noted. First, a larger sample and comparing the results with a control group (e.g. workers) would have allowed to establish some differences in relation to the exposure of the variable of interest (i. e. unemployment). Secondly, this study was conducted cross-sectionally. Ideally, having longitudinal data would allow us to better determine the influence of length of unemployment on the trajectory of cognitive performance through the period of

unemployment, as well as the influence of all the set of variables on the propensity of being employed or unemployed (i. e. reverse causation). Moreover, despite we used the Dictionary of Occupational Titles (DOT), which it has been widely used to determine level of complexity of work, complexity scores in this study were based on participants' reports about what activities did they have to perform at previous work. Thus, it might be that the levels of complexity of jobs were under or overestimated.

This study has a number of strengths as well. First of all, the entire sample has the same nationality and was assessed under the same period of time, which facilitates that social and institutional unemployment conditions were similar among them. Finally, with the selected exclusion criteria we were able to include physically, psychologically and cognitively healthy individuals and unemployed people who did not returned to official studies. Thus, these results show the relationship between sociodemographic and occupational, health and cognitive variables of a sample of healthy people who are actually unemployed and looking for a new job.

In summary, the present study reveals that cognitive functioning is also affected by unemployment, and that it depends on sociodemographic, occupational and health factors. Length of unemployment showed a direct effect on cognition, and the indirect effect through health symptoms was unidentified. Moreover, the effect of education and complexity of work on executive functioning were higher than length of unemployment, suggesting that the effect of cognitive reserve could be observed in periods of unemployment. To our knowledge, this is the first study that use a structural equation model to explore the associations of health and cognitive performance in a sample of healthy unemployed, accounting for pre-unemployment work characteristics. Additionally, this type of analysis allows to assess patterns, and direct and indirect effect

between variables (Gunzler et al., 2013), so it allowed us to make some conclusions on direct effects.

Current findings have some theorical implications for cognitive reserve and environmental complexity theories. Education and length of unemployment emerged as the two factors that directly and significantly predicted executive performance. With this, education had a greater and positive relationship and length of unemployment showed a negative association. In addition, complexity of working with the data and people showed a significant positive association with executive function and memory, respectively. Thus, this study sheds light on how cognitive reserve might protect cognition from declines shaped by alterations in the course of life as unemployment, not just from injuries or cognitive aging. Likewise, these findings highlight the need for include measures of complexity of work when assessing the influence of occupational characteristics on cognitive reserve and cognitive performance. Further, this study notes that in complex environments (i.e., work), besides intervening on cognitive performance, it is also necessary to take into account the temporal variations that have place in exposure (for example, the duration of unemployment).

Some practical implications should also be highlighted since executive performance is involved in different areas of an individual's life. First, it has been found to be involved in the stress regulation and perception, as well as health complaints (Shields, Moons et al., 2017), which have been observed to increase during unemployment. Secondly, executive functions are necessary to deal with any alteration in the demands or context of daily life (Connor & Maier, 2011). And, in third place, it supports occupational performance, especially in novel and complex tasks (Gillen, 2009; Katz, 2005), as well as general cognitive ability has been considered one of the best

predictors of job performance (Bertua et al., 2005; Ohme y Zacher, 2015). Therefore, interventions in the unemployed should be aimed at maintaining executive functioning, as well as increasing job-seeking skills and promoting emotional and behavioral skills to better cope with the new situation.

Conclusions

Findings have displayed an association between sociodemographic and occupational characteristics, health symptoms and cognitive performance during unemployment. Specifically, a direct effect on memory and executive functioning was shown by length of unemployment and education. Conversely, an indirect effect through health variables was not found. Memory ability was directly predicted by pre-unemployment complexity of work with people, and executive functioning was it by complexity of work with data. However, little is still known and further research on this relationship is needed. Particularly, the field would benefit from knowing what psychological and cognitive variables are involved in the individual experience of unemployment, as coping strategies. Moreover, more studies assessing the implications of cognitive reserve and environmental complexity in unemployment are still required. In this sense, longitudinal studies accounting for previous stimulating experiences and observing the cognitive trajectory during unemployment would help to identify other mediator variables, stages or a possible floor effect.

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V. DISCUSIÓN GENERAL, CONCLUSIONES Y PERSPECTIVAS FUTURAS

CAPÍTULO 8.
Discusión general, conclusiones y perspectivas futuras

8.1. Discusión general

Este proyecto pretende cubrir un vacío en el estudio de las consecuencias del desempleo, un problema que perjudica a miles de personas en el mundo y por el que España se ha visto considerablemente afectada. Concretamente, la laguna detectada consistió en que, a pesar de conocerse un amplio espectro de consecuencias sobre la salud física y psicológica a causa de la ausencia de empleo, así como sus repercusiones sociales, la investigación había dedicado muy poca atención a explorar el impacto en el rendimiento cognitivo.

Por ello, de forma específica, esta Tesis se desarrolló con la motivación de investigar cómo afectaría el desempleo a nivel individual en determinadas habilidades cognitivas que podrían dificultar que la persona lograse un empleo y saliese de esa situación. Para estudiar estos efectos y comprender de una manera más amplia las relaciones entre la ausencia de empleo y la cognición, también se exploraron las asociaciones entre la jubilación y la cognición. Para ello, el presente trabajo está compuesto por varios estudios que analizan cómo el rendimiento cognitivo se ve afectado por dos tipos de ausencia de empleo y por el grado de estimulación proporcionado por el trabajo realizado antes de dicha ausencia. También se analizó la influencia de una serie de variables sociodemográficas. En definitiva, el objetivo general de la presente Tesis Doctoral fue analizar la relación entre la ausencia de empleo, por desempleo y jubilación, y el rendimiento cognitivo, así como estudiar las variables moduladoras de dicha asociación.

8.1.1. *Influencia de la ausencia de empleo en el estado cognitivo*

De modo general, los resultados de esta Tesis Doctoral han mostrado que tanto el empleo, como los periodos de ausencia de empleo tienen relación con el rendimiento

cognitivo de las personas. Por un lado, se ha observado que un mayor grado de tareas estimulantes derivadas específicamente de las actividades realizadas con otras personas o manejando datos en el puesto de trabajo está asociado a un mejor rendimiento cognitivo de los trabajadores (primer estudio de la Tesis). Estos hallazgos avalan los encontrados por otras investigaciones recientes (Sörman et al., 2019). Por otro lado, se ha encontrado que los trabajadores mayores que se jubilaron mostraron posteriormente un empeoramiento de su rendimiento cognitivo, en comparación con aquellos que continuaron trabajando (segundo estudio de la Tesis). Igualmente, la duración del tiempo que no se ha estado trabajando, pero por causa del desempleo, se ha visto asociado a un decremento en la capacidad de memoria y el funcionamiento ejecutivo de los desempleados (cuarto estudio de la Tesis). Estos hallazgos también respaldan recientes investigaciones que han mostrado que la transición a la jubilación afecta negativamente al estado y envejecimiento cognitivos (Celidoni et al., 2017; Hamm et al., 2020; Xue et al., 2018), así como el desempleo empeora el rendimiento cognitivo de las personas en edad laboral (Haworth et al., 1990; Košćec-Bjelajac et al., 2019; Mani et al., 2013).

Entre los mecanismos que explican la asociación entre la ausencia de empleo y el detrimento de las funciones cognitivas, se han propuesto el estrés y el empeoramiento de la salud (Sandín, 1995; Vance et al., 2016), así como la falta o cambio de la estimulación recibida a través de desempeñar un empleo (Rohwedder & Willis, 2010; Schooler, 1984; Young & Stanton, 2002).

Según Vance et al., (2016) el trabajo proveería un entorno en el cual tienen lugar una serie de procesos que se han asociado con mejoras en la salud cerebral. Concretamente, estos procesos son la participación social, el seguimiento de rutinas, el establecimiento de objetivos, la obtención de ingresos económicos y el aprendizaje de

nuevas habilidades. Así, una reducción o el cese del empleo elevaría los niveles de estrés y reduciría el bienestar general y los beneficios neuroplásticos que el empleo aporta, interferiendo con el rendimiento cognitivo. Según el modelo procesual del estrés de Sandín (1995), situaciones como el desempleo o la transición a la jubilación provocan un empeoramiento del estado de salud y una respuesta de estrés que han sido asociadas a alteraciones del rendimiento cognitivo (Butler et al., 2017; Dominique et al., 2009; Lupien et al., 2009). No obstante, los resultados encontrados en los estudios de esta Tesis no apoyan completamente este mecanismo, al menos en todas las muestras estudiadas. En el caso de los trabajadores antes de la jubilación (segundo estudio de la Tesis), sí se detectó una relación entre el estado de salud percibido y el estado cognitivo, pero fue marginalmente significativa. Sin embargo, una vez que esos trabajadores se jubilaron, el estado de salud no se relacionó con su tasa de declive cognitivo. Este último hallazgo ha sido encontrado previamente también en mayores, en los que un mayor nivel de estrés percibido se asoció con su rendimiento cognitivo, pero no con un declive cognitivo más rápido (Chen et al., 2019). En cuanto a la muestra de desempleados (cuarto estudio de la Tesis), el modelo validado no mostró que hubiese un efecto indirecto del desempleo en la cognición a través de los factores emocionales. En cambio, el efecto directo de la duración del desempleo sí fue significativo, sugiriendo que las variaciones en el rendimiento cognitivo se pueden deber a otros factores, como el propio estado laboral y su relación con la estimulación cognitiva.

La relación entre la ausencia de empleo y la salud ha sido, y continúa siendo, centro de un debate sobre la causalidad entre ambos factores. En este sentido, y estudiando la cognición como una faceta más del estado de salud, se han encontrado evidencias para una causalidad tanto directa como inversa entre el desempleo y el

rendimiento cognitivo (tercer estudio de la Tesis). Al analizar todos los estudios revisados en conjunto, se encontró un tamaño del efecto medio de la asociación (*d* = 0.43) (Cohen, 1988). Sin embargo, al estratificar el análisis por la direccionalidad de los estudios e incluir la edad de la muestra estudiada, se encontró un efecto mayor esta asociación, siendo más grande para la causalidad directa (*d* = 2.33) que para la causalidad inversa (*d* = 1.67). El resultado general es similar al reportado por estudios previos que relacionaron el desempleo con un empeoramiento de la salud (*d* = 0.51) y observaron un efecto débil de la causalidad inversa (Paul & Moser, 2009). Este hallazgo también se ha mostrado en un estudio sobre la relación entre la jubilación, y el declive cognitivo, donde los efectos fueron más consistentes para una causalidad directa (Bonsang et al., 2012). Por lo tanto, teniendo en cuenta los resultados obtenidos de esta Tesis, es plausible concluir que la ausencia de empleo provoca un empeoramiento del rendimiento cognitivo de las personas y que es la pérdida de exposición a los factores estimulantes del trabajo lo que explica el cambio en el estado cognitivo. La potencia mayor de la causalidad directa no resta importancia ni complementariedad a los efectos de la causalidad inversa, ya que, de acuerdo con los resultados obtenidos, se puede inferir que el empeoramiento del rendimiento cognitivo puede a su vez condicionar la obtención o mantenimiento de un trabajo, en el caso del desempleo, así como un peor estado cognitivo puede propiciar la salida del mundo laboral, en el caso de la jubilación. Es decir, la ausencia de empleo provocaría un empeoramiento cognitivo que, a su vez, dificulte la participación en el mercado laboral.

El efecto directo que hemos encontrado que tiene la ausencia de empleo sobre la cognición podría explicarse mediante varias hipótesis o teorías. En primer lugar, atendiendo a la teoría de la complejidad ambiental (Schooler, 1984), el empleo

constituye un ambiente complejo que proporciona estímulos y demandas para el desarrollo de las propias habilidades, reflejándose en el mejor rendimiento cognitivo que ha sido contrastado en muestras de trabajadores en esta Tesis. En cambio, cuando se produce un descenso en la complejidad del entorno y el ambiente se vuelve más sencillo, los individuos responden adaptando sus recursos a las nuevas demandas. Por lo tanto, en ausencia de las demandas que supone el trabajo se produciría una disminución del desempeño cognitivo, como se ha visto en el estudio con desempleados. Este fenómeno de menor rendimiento como adaptación al ambiente es explicado por la teoría de los recursos atencionales maleables (MART), la cual postula que los recursos cognitivos se adaptan a las demandas, de forma que una disminución de éstas iría asociada a un declive del rendimiento cognitivo (Young & Stanton, 2002). Otra línea explicativa distinta pero complementaria para comprender el fenómeno en población jubilada, es la hipótesis del estilo de vida desconectado (Rohwedder & Willis, 2010) que propone que los jubilados disponen de menos oportunidades para llevar a cabo actividades cognitivamente estimulantes que los trabajadores. Esta disminución de la actividad podría llevar a las personas a desconectar mentalmente y ver reducido su rendimiento cognitivo. A pesar de que esta teoría se formuló de forma específica para la jubilación, lo mismo podría ocurrir con los desempleados cuando la situación se alarga en el tiempo y el nivel de actividad desciende, adquiriendo un carácter muy similar a cuando se produce de forma definitiva en la jubilación.

8.1.2. *Variables que modulan la relación entre la ausencia de empleo y el rendimiento cognitivo*

Los resultados obtenidos en los cuatro estudios de esta Tesis permiten, en su conjunto, concluir que hay factores sociodemográficos y ocupacionales que intervienen

en la relación que mantienen la ausencia de empleo y el rendimiento cognitivo. Estos son, concretamente, la edad, el nivel educativo y el grado y tipo de complejidad del empleo actual o realizado con anterioridad.

La evolución de la cognición a lo largo de la vida adulta continúa siendo un tema de gran interés y se estima que en un punto entre los 35-45 años se inicia un declive progresivo, aunque muy leve (Strittmatter et al., 2020), que se acentúa en la vejez (Murman, 2015). Este hecho se ha manifestado consistentemente en los estudios realizados en esta Tesis, mostrándose una relación negativa entre la edad y el rendimiento cognitivo. Cabe destacar el rol modulador que también tiene la edad en los efectos del desempleo. Al introducir la variable edad de la muestra en los análisis del tercer estudio, el tamaño del efecto medio de la asociación aumentó considerablemente. Así, se pudo concluir que la fuerza de la asociación entre el desempleo y el rendimiento cognitivo era mayor cuanto más alta era la edad media de la muestra, especialmente en el subanálisis de los estudios sobre la causalidad inversa. Hasta donde nuestro conocimiento alcanza, entre los estudios que han analizado esta asociación, sólo el realizado por Fryer y Warr (1984) estratificó los resultados por grupos de edad, mientras que en el resto de los estudios fue incluida como covariable. Estos autores encontraron una mayor presencia de dificultades cognitivas en los desempleados de mediana edad. Este hallazgo podría deberse a una relación no lineal en lo que a la edad respecta. En este sentido, en el estudio de Strittmatter et al. (2020) se encontró que el rendimiento cognitivo a lo largo del curso vital sigue un patrón de U invertida, alcanzando el pico máximo en torno a los 40 años. Además, este patrón se mantuvo incluso tras controlar el nivel de complejidad de las tareas. Por tanto, se puede plantear la existencia de un patrón no lineal en la relación entre la edad y el rendimiento cognitivo durante el desempleo.

Por otro lado, en estudios sobre la influencia del desempleo en aspectos emocionales, los síntomas depresivos muestran un patrón de U invertida, con su máxima afectación en torno a los 35 años (Pavlova & Silberiesen, 2012). Ante la posibilidad de que también actúen mecanismos emocionales con patrones no lineales, en el campo específico de la ausencia de empleo se requieren más investigaciones que estudien las diferencias por edad en el rendimiento cognitivo y los posibles mecanismos que lo determinen.

Al igual que la edad, reiteradamente se ha relacionado la educación con la cognición, pero de forma positiva (Ritchie et al., 2015), lo cual se ha visto también reflejado en los resultados de esta Tesis. Los niveles educativos superiores estuvieron asociados a un mejor rendimiento cognitivo general de los trabajadores (primer estudio de la Tesis) y de los desempleados (cuarto estudio de la Tesis). Esta relación se encontró también con el rendimiento en memoria. Sin embargo, respecto a las funciones ejecutivas, sólo el nivel educativo universitario resultó ser un predictor significativo. En cuanto a los jubilados, el nivel educativo sí se relaciona con su estado cognitivo, pero no con la cantidad de declive producido en el periodo posterior a la jubilación (segundo estudio de la Tesis). Estos hallazgos coinciden con estudios previos en los que la educación se ha asociado al nivel de rendimiento cognitivo, pero no a los cambios o tasa de declive cognitivo (Berggren et al., 2018; Clouston et al., 2020; Seblova et al., 2020).

Por su parte, el concepto de complejidad ocupacional ha resaltado por su relevancia a lo largo de las distintas etapas de la vida laboral. En primer lugar, se ha encontrado que la complejidad derivada del trabajo con personas está asociada a un mejor rendimiento cognitivo general, y específicamente ejecutivo (primer estudio de la Tesis). En segundo lugar, la complejidad del trabajo con personas se ha mostrado como el único predictor del cambio cognitivo producido tras la jubilación (segundo estudio de

la Tesis). Estos hallazgos están respaldados por otras investigaciones realizadas al respecto en población trabajadora y jubilada (Andel et al., 2017; Finkel et al., 2009; Fisher et al., 2014; Kraup et al., 2018; Lane et al., 2017). No obstante, los estudios previos sobre población desempleada no han tenido en cuenta el efecto de la complejidad del trabajo anterior (tercer estudio de la Tesis). Al incluir esta variable en un modelo sobre el rendimiento cognitivo de los desempleados, el tipo de complejidad del empleo previo asociada al trabajo con datos es capaz de predecir el funcionamiento ejecutivo; y la complejidad por el trabajo con personas predice el rendimiento en memoria (cuarto estudio de la Tesis).

El hecho de que la educación y la complejidad ocupacional resalten como los dos principales indicadores de un mejor estado cognitivo durante la jubilación y el desempleo encuentra apoyo en la teoría de la reserva cognitiva (Stern et al., 2018). La reserva cognitiva es la capacidad cerebral que permite resistir al perjuicio de las funciones cognitivas y se ve determinada por las experiencias estimulantes a las que se expone una persona a lo largo de su vida. Entre ellas, el nivel educativo y determinadas características ocupacionales han sido propuestas frecuentemente como facilitadores de la reserva cognitiva, además de las actividades sociales, el ejercicio físico o el estatus socioeconómico (Barulli & Stern, 2013; Puente et al., 2015). En este sentido, el nivel educativo y la complejidad de los trabajos previos habrían aportado una serie de beneficios cognitivos que permite a los individuos rendir mejor ante el deterioro producido por la ausencia de empleo. De forma complementaria, estos resultados podrían explicarse por la teoría de la continuidad (Diggs, 2008), la cual indica que ante una crisis, como la jubilación o el desempleo, las personas necesitan involucrarse en el mismo tipo de actividades que venían realizado. De esta forma, personas con mayor nivel

educativo o trabajos más complejos, estarían más motivadas para mantener el nivel de estimulación previo a la falta de empleo. Esto llevaría a una mayor disposición para realizar actividades y tareas de mayor estimulación, lo que se reflejaría en un mejor rendimiento cognitivo. De no ser así, la teoría del desuso (Salthouse, 2006, 2009) sugiere que no seguir realizando de forma continua actividades cognitivamente estimulantes disminuye el rendimiento cognitivo.

Por último, se ha mostrado que la duración del desempleo tiene un efecto directo sobre el funcionamiento cognitivo y la memoria (cuarto estudio de la Tesis). Cuanto mayor es la duración del desempleo, peor es el rendimiento cognitivo. Sólo un estudio previo ha analizado de forma específica los efectos del desempleo segmentando en distintos tramos de duración, encontrando que quienes más dificultades cognitivas presentaban eran los desempleados de larga duración (más de 12 meses) (Fryer & Warr, 1984). En cambio, en cuanto a la jubilación, un estudio encontró que, al menos en los 10 años siguientes, el declive se produce de forma gradual (Fisher et al., 2014).

En investigaciones sobre los efectos del desempleo en la salud psicológica, también se han encontrado efectos relacionados con la duración. Sin embargo, estos encuentran que la máxima afectación se produce en torno a los 12 meses desde el inicio del desempleo (De Witte et al., 2010; Thill et al., 2019). Después de esta etapa de empeoramiento, sigue una de fluctuaciones que termina por estabilizarse en un nivel cognitivo inferior respecto al inicial cuando se alcanza el segundo o tercer año (Paul & Moser, 2009). Por tanto, aún son necesarias más investigaciones que analicen el rendimiento cognitivo y su evolución en distintos momentos de duración del desempleo y de la jubilación.

8.1.3. *Implicaciones prácticas*

Los hallazgos de esta Tesis muestran que la perspectiva neuropsicológica es necesaria en el estudio sobre las consecuencias de la ausencia de empleo. Se ha observado que tanto la jubilación como el desempleo están asociadas a un peor funcionamiento ejecutivo y a la memoria de las personas. Este empeoramiento es relevante ya que está asociado a un declive en el funcionamiento de la vida diaria (Puente et al., 2015) y a una peor toma de decisiones, autocontrol y toma de iniciativa (Baumeister, 2002). Estas habilidades, a su vez, son necesarias y están relacionadas con una búsqueda de empleo más eficaz (Gnambs, 2017; Koen et al., 2010; Liu et al., 2014), lo que podría explicar los hallazgos encontrados en el tercer estudio sobre la influencia del rendimiento cognitivo en las probabilidades de encontrar un nuevo empleo y mantenerlo.

Las medidas de atención a desempleados y jubilados que se ofrecen actualmente, como los programas de activación o garantía laboral y rentas universales básicas, o pensiones, están destinadas a cubrir las necesidades sociales, instrumentales y formativas (O'Halloran et al., 2018). Sin embargo, son escasas las oportunidades que ofrecen para mejorar los aspectos de salud que se ven afectados por la ausencia de empleo. Según los hallazgos de esta Tesis y por generalización del corpus de evidencia sobre la eficacia de la estimulación y rehabilitación neuropsicológicas, las personas desempleadas de larga duración y jubiladas podrían beneficiarse de las técnicas de intervención neurocognitiva. Mediante ellas se podría optimizar el rendimiento cognitivo de los afectados, mejorando, por tanto, su funcionamiento diario y/o sus opciones de re-empleo. Hasta donde sabemos, no existen estudios previos sobre intervenciones cognitivas en poblaciones desempleadas y no clínicas. No obstante, la ONG *Crittenton*

Women's Union, ahora llamada *Economic Mobility Pathways*, en Boston (Massachusetts), diseño y comenzó a implementar un programa llamado *Mobility Mentoring* (tutoría de la movilidad) que incluye el desarrollo de las funciones ejecutivas como uno de sus pilares. Basándose en conocimientos científicos sobre el efecto que tiene la pobreza, el estrés y el sesgo social sobre el funcionamiento cognitivo, diseñaron este modelo que aplican en familias de bajos ingresos, con el objetivo de restaurar su capacidad para manejar problemas y generar estrategias que le ayuden a salir de su situación desfavorecida (Babcock, 2012a, 2012b). Entre sus actividades han incluido el uso de aplicaciones de juegos cognitivos. Aunque no se han encontrado análisis publicados sobre su eficacia, los informes publicados por el equipo indican un alto índice de éxito (Babcock & Lowe, 2018).

Según los resultados de esta Tesis, el perfil más vulnerable, y que más se podría beneficiar de una intervención cognitiva, sería el de desempleados y jubilados de larga duración, mediana edad, bajo nivel educativo y que anteriormente han tenido empleos de un bajo nivel de complejidad en lo relativo al manejo de datos o personas. En cuanto a las características de un posible programa de intervención, investigaciones previas han concluido que éstos deben tener una duración de al menos 12 semanas y de 1 a 3 sesiones de una hora para observar mejoras en personas mayores sanas, de forma presencial o computerizada (Gates et al., 2020; Sanjuán et al., 2020). En el caso de los adultos, también se han encontrado evidencias de mejora mediante el entrenamiento cognitivo (Kane et al., 2017). En análisis preliminares realizados con la muestra del cuarto estudio, se encontraron diferencias en el rendimiento de las funciones ejecutivas (memoria de trabajo, inhibición y resistencia a la interferencia) en función de las distintas duraciones de desempleo (Vélez-Coto et al., 2017a; 2017b). Concretamente, se observó un peor rendimiento en la franja de los meses iniciales y cuando se alcanzaron períodos

de larga duración. En los meses intermedios (6-12 meses), se observó un pico de recuperación, seguido de nuevo por una tendencia descendiente, aunque decreciente. En este sentido, sería recomendable realizar las intervenciones cognitivas a partir de los 6 meses de duración de desempleo, o iniciarlas inmediatamente en el caso de los jubilados.

Por otro lado, teniendo en cuenta las variables que se han mostrado asociadas al impacto del cese laboral en la cognición, se propone tener en cuenta el grado de complejidad del trabajo con datos y personas a la hora de evaluar a estas poblaciones. Esta información puede resultar útil para estimar de forma más precisa el impacto que tendrá la jubilación en el rendimiento cognitivo, así como la resistencia individual a presentar declive durante el desempleo. Igualmente, se recomienda la inclusión de los índices específicos de complejidad del trabajo con el manejo de personas, datos y cosas en los instrumentos de evaluación de la reserva cognitiva.

Por último, los hallazgos de este trabajo ponen de manifiesto la influencia de factores sociales del empleo en el rendimiento cognitivo. En base a ello, se recomienda promover la realización de actividades sociales en trabajos en los que las interacciones con otras personas sean menos complejas y demandadas. Igualmente, realizar actividades socialmente estimulantes, como un voluntariado, durante los períodos de cese de actividad podría compensar la ausencia de estimulación social laboral y el aislamiento que pueden llegar a sufrir las personas desempleadas y jubiladas (Lengfeld & Ordemann, 2016; Yang, 2020).

8.2. Conclusiones

De los resultados obtenidos en los cuatro estudios que componen la presente Tesis Doctoral se derivan las siguientes conclusiones:

1. La ausencia de empleo, tanto por jubilación como por desempleo, está asociada a un peor rendimiento cognitivo.
2. El efecto del desempleo en el rendimiento cognitivo no está mediado por la salud emocional.
3. La ausencia de empleo afecta principalmente a las funciones ejecutivas.
4. Una mayor complejidad ocupacional relacionada con las interacciones sociales protege del declive cognitivo asociado a la edad tras la jubilación.
5. Una mayor duración de desempleo está relacionada con un peor rendimiento en el funcionamiento ejecutivo y memoria.
6. Un peor rendimiento cognitivo se asocia con más dificultades para encontrar y mantener un empleo.
7. Las personas con mayor nivel educativo y que han realizado trabajos más complejos están más protegidas de los efectos nocivos del desempleo y la jubilación.

8.3. Perspectivas futuras

Los resultados y conclusiones de los estudios realizados en la presente Tesis permiten plantearse nuevas perspectivas para futuras investigaciones en la línea de la neuropsicología y la ausencia de empleo. Así pues, se plantean los siguientes estudios:

1. Diseñar y validar un instrumento para evaluar diferentes índices de complejidad del trabajo, basados en las tareas realizadas en el empleo.
2. Estudiar qué aspectos concretos de la complejidad de un trabajo determinan su influencia en el rendimiento cognitivo.
3. Investigar si el efecto de la complejidad laboral sobre el rendimiento cognitivo está modulado por variables sociodemográficas, psicológicas o sociales.

4. Estudiar de forma longitudinal la trayectoria cognitiva a lo largo del período de desempleo, controlando la influencia de variables sociodemográficas, ocupacionales y de salud.
5. Estudiar si durante el desempleo se produce un patrón de diferenciación preservada o preservación diferenciada en función del nivel de complejidad del empleo previo.
6. Investigar si se produce un efecto acumulativo de los períodos de desempleo y su duración durante la vida laboral que afecte al envejecimiento cognitivo.
7. Estudiar cómo afectan al rendimiento cognitivo los periodos intermitentes de trabajo y desempleo durante un largo período de tiempo.
8. Estudiar la influencia de factores psicológicos, económicos y sociales en el rendimiento cognitivo durante el desempleo.
9. Estudiar si se produce un efecto de normalización cognitiva tras el cese de actividad laboral por desempleo o jubilación.
10. Estudiar la eficacia de un programa de intervención neuropsicológica en desempleados para mejorar el rendimiento cognitivo y, consecuentemente, las probabilidades de reempleo.

En último lugar, los resultados de esta Tesis Doctoral suponen la apertura de un campo de investigación novedoso que relaciona la Neuropsicología con el desempleo, por lo que de este trabajo se pueden derivar otros proyectos que sirvan para mejorar la calidad de vida de las personas desempleadas y jubiladas, así como para desarrollar intervenciones de empleabilidad más holísticas y eficaces.

IV. GENERAL DISCUSSION, CONCLUSIONS AND FUTURE PERSPECTIVES

CAPÍTULO 9.
General discussion, conclusions and future perspectives

9.1. General discussion

This project aims to fill a gap in the study of the consequences of unemployment, a problem that harms thousands of people around the world and for which Spain has been considerably affected. Specifically, the gap detected was that, despite knowledge of a wide range of consequences on physical and psychological health due to the absence of employment, as well as its social repercussions, the research had devoted very little attention to exploring the impact on cognitive performance.

Therefore, this Thesis was developed with the motivation of investigating how unemployment would affect at an individual level certain cognitive skills that could make it difficult for a person to obtain a job and exit of that situation. In order to study these effects and understand in a broader way the relationships between unemployment and cognition, the associations between retirement and cognition were also explored. To this end, the present work is composed of several studies that analyze how cognitive performance is affected by two types of absence of work and by the degree of stimulation provided by the work performed before such absence. The influence of a series of sociodemographic variables was also analyzed. In short, the general objective of the present Doctoral Thesis was to analyze the relationship between the absence of work, due to unemployment and retirement, and cognitive performance, as well as to study the modulating variables of this association.

9.1.1. *Influence of the absence of work on cognitive status*

In general, the results of this Doctoral Thesis have shown that both employment and periods of lack of work are related to the cognitive performance of people. On the one hand, it has been observed that a greater degree of stimulating tasks derived specifically from activities carried out with other people or handling data in the workplace

is associated with better cognitive performance of workers (first study of the Thesis). These findings support those found by other recent research (Sörman et al., 2019). On the other hand, it has been found that older workers who retired showed a worsening of their cognitive performance, compared to those who continued working (second study of the Thesis). Likewise, the length of lacking work due to unemployment has been associated with a decrease in the memory capacity and executive functioning of the unemployed (fourth study of the Thesis). These findings also support recent research that has shown that the transition to retirement negatively affects cognitive status and aging (Celidoni et al., 2017; Hamm et al., 2020; Xue et al., 2018), just as unemployment worsens the cognitive performance of people of working age (Haworth et al., 1990; Košćec-Bjelajac et al., 2019; Mani et al., 2013).

Among the mechanisms that explain the association between lack of work and impairment of cognitive functions, stress and worsening health have been proposed (Sandin, 1995; Vance et al., 2016), as well as the lack or change of stimulation received through employment (Rohwedder & Willis, 2010; Schooler, 1984; Young & Stanton, 2002).

According to Vance et al., (2016) work might provide an environment in which a number of processes that have been associated with improvements in brain health take place. Specifically, these processes are social participation, following routines, setting goals, earning income, and learning new skills. Thus, a reduction or cessation of employment would raise stress levels and reduce general well-being and the neuroplastic benefits that employment brings, interfering with cognitive performance. According to Sandín's (1995) processual model of stress, situations such as unemployment or the transition to retirement cause a worsening of health status and a stress response that

has been associated with alterations in cognitive performance (Butler et al., 2017; Dominique et al., 2009; Lupien et al., 2009). However, the results found in the studies of this Thesis do not fully support this mechanism, at least in all the studied samples. In the case of workers before retirement (second study of the Thesis), a relationship was detected between perceived health status and cognitive status, but it was marginally significant. However, once these workers retired, health status was not related to their rate of cognitive decline. This latter finding has previously been found also in older people, where a higher level of perceived stress was associated with their cognitive performance, but not with faster cognitive decline (Chen et al., 2019). As for the sample of unemployed people (fourth study of the Thesis), the validated model did not show that there was an indirect effect of unemployment on cognition through emotional factors. On the contrary, the direct effect of the duration of unemployment was significant, suggesting that the variations in cognitive performance may be due to other factors, such as the work status itself and its relationship with cognitive stimulation.

The relationship between lack of employment and health has been, and continues to be, the focus of a debate on the causality between the two factors. In this sense, studying cognition as one more facet of health status, evidences have been found for both direct and inverse causality between unemployment and cognitive performance (third study of the Thesis). By analyzing all the studies reviewed together, a mean effect size of the association was found (d = 0.43) (Cohen, 1988). However, by stratifying the analysis by the directionality of the studies and including the age of the sample studied, a greater effect was found for this association, being larger for direct causality (d = 2.33) than for inverse causality (d = 1.67). The overall result is similar to that reported by previous studies that related unemployment to a worsening of health (d = 0.51) and

observed a weak effect of reverse causality (Paul & Moser, 2009). This finding has also been shown in a study on the relationship between retirement and cognitive decline, where the effects were more consistent for direct causation (Bonsang et al., 2012). Therefore, taking into account the results obtained from this Thesis, it is plausible to conclude that the absence of employment causes a worsening of people's cognitive performance and that it is the loss of exposure to the stimulating factors of work what explains the change in cognitive status. The greater power of direct causality does not diminish the relevance or complementarity of the effects of reverse causality, since, according to the results obtained, it can be inferred that the worsening of cognitive performance can in turn condition the obtaining or maintaining of a job, in the case of unemployment, as well as a worse cognitive state can favor the exit from the labor market, in the case of retirement. In other words, the absence of employment would cause a cognitive worsening which, in turn, would make participation in the labor market more difficult.

The direct effect that the absence of employment has on cognition could be explained by several hypotheses or theories. Firstly, according to the theory of environmental complexity (Schooler, 1984), employment constitutes a complex environment that provides stimuli and demands for the development of one's own abilities, reflected in the better cognitive performance that has been displayed in samples of workers in this Thesis. On the other hand, when there is a decrease in the complexity of the environment and the environment becomes simpler, individuals respond by adapting their resources to the new demands. Therefore, in the absence of the demands of work, a decrease in cognitive performance would occur, as has been seen in the study with unemployed people. This phenomenon of lower performance as adaptation to the

environment is explained by the theory of malleable attentional resources (MART), which postulates that cognitive resources adapt to the demands, so that a decrease in these would be associated with a decline in cognitive performance (Young & Stanton, 2002). Another different but complementary explanatory perspective to understand the phenomenon in the retired population is the disconnected lifestyle hypothesis (Rohwedder & Willis, 2010), which proposes that retirees have fewer opportunities to involve in cognitively stimulating activities than workers. This decline in activity could lead people to become mentally disconnected and get their cognitive performance reduced. Although this theory was formulated specifically for retirement, the same could happen to the unemployed when the situation is prolonged over time and the level of activity decreases, acquiring a very similar character to that which occurs definitively in retirement.

9.1.2. *Modulating variables of the relationship between the absence of employment and cognitive performance*

The results obtained in the four studies of this Thesis allow, as a whole, to conclude that there are sociodemographic and occupational factors that intervene in the relationship that maintain the absence of employment and cognitive performance. These are, specifically, age, educational level and the degree and type of complexity of current or previous employment.

The evolution of cognition throughout adult life continues to be a topic of great interest and it is estimated that at one point between 35-45 years of age a progressive, albeit very slight, decline begins (Strittmatter et al., 2020), which is accentuated in old age (Murman, 2015). This fact has been consistently manifested in the studies carried out in this Thesis, showing a negative relationship between age and cognitive performance.

It is worth noting the modulating role that age also has in the effects of unemployment. When introducing the variable age of the sample in the analyses of the third study, the size of the average effect of the association increased considerably. Thus, it could be concluded that the strength of the association between unemployment and cognitive performance was greater the higher the average age of the sample, especially in the subanalysis of the studies on inverse causality. To the extent that our knowledge reaches, among the studies that have analyzed this association, only the one carried out by Fryer and Warr (1984) stratified the results by age groups, while in the rest of the studies it was included as a covariate. These authors found a greater presence of cognitive difficulties in the unemployed in middle age. This finding could be due to a non-linear relationship in terms of age. In this sense, in the study by Strittmatter et al. (2020) it was found that cognitive performance throughout the life course follows an inverted U pattern, reaching a peak around age 40. Moreover, this pattern was maintained even after controlling for the level of task complexity. Therefore, a non-linear pattern can be suggested in the relationship between age and cognitive performance during unemployment. On the other hand, in studies about the influence of unemployment on emotional facets, depressive symptoms show an inverted U pattern, with its maximum affectation around the age of 35 (Pavlova & Silberiesen, 2012). Given the possibility that emotional mechanisms with non-linear patterns also act, in the specific field of unemployment, more research is required to study age differences in cognitive performance and the possible mechanisms that determine it.

As age, education has been recurrently related to cognition, but in a positive way (Ritchie et al., 2015), which has also been reflected in the results of this Thesis. Higher educational levels were associated with better general cognitive performance of workers

(first study of the Thesis) and of the unemployed (fourth study of the Thesis). This relationship was also found with memory performance. However, with respect to executive functions, only the university educational level proved to be a significant predictor. As for retirees, educational level is indeed related to their cognitive status, but not to the amount of decline produced in the post-retirement period (second study of the Thesis). These findings are consistent with previous studies in which education has been associated with the level of cognitive performance, but not with the changes or rate of cognitive decline (Berggren et al., 2018; Clouston et al., 2020; Seblova et al., 2020).

For its part, the concept of occupational complexity has stood out for its relevance throughout the different stages of working life. In first place, it has been found that complexity derived from work with people is associated with better general cognitive performance, and specifically executive performance (first study of the Thesis). Secondly, the complexity of work with people has been shown to be the only predictor of cognitive change produced after retirement (second study of the Thesis). These findings are supported by other research on this subject in the working and retired population (Andel et al., 2017; Finkel et al., 2009; Fisher et al., 2014; Kraup et al., 2018; Lane et al., 2017). However, previous studies on the unemployed population have not taken into account the effect of the complexity of previous work (third study of the Thesis). By including this variable in a model on the cognitive performance of the unemployed, the type of complexity of previous work associated with data work is able to predict executive functioning, and complexity by work with people predicts memory performance (fourth study of the Thesis).

The fact that education and occupational complexity stand out as the two main indicators of improved cognitive status during retirement and unemployment finds

support in the theory of cognitive reserve (Stern et al., 2018). The cognitive reserve is a brain capacity that allows resisting the damage of cognitive functions, and it is determined by the stimulating experiences to which a person is exposed throughout his life. Among them, educational level and certain occupational characteristics have been frequently proposed as facilitators of the cognitive reserve, in addition to social activities, physical exercise or socioeconomic status (Barulli & Stern, 2013; Puente et al., 2015). In this sense, the educational level and the complexity of the previous jobs would have provided a series of cognitive benefits that allow individuals to perform better in the face of the deterioration produced by the absence of employment. Complementarily, these results could be explained by the theory of continuity (Diggs, 2008), which indicates that in the face of a crisis, such as retirement or unemployment, people need to engage in the same type of activities they had been previously doing. In this sense, people with a higher level of education or more complex jobs would be more prone to maintain the level of stimulation they had before the lack of employment. This would lead to a greater inclination to perform more stimulating activities and tasks, which would be reflected in better cognitive performance. Otherwise, the theory of disuse (Salthouse, 2006, 2009) suggests that not continuing to continuously perform cognitively stimulating activities decreases cognitive performance.

Finally, it has been shown that the duration of unemployment has a direct effect on cognitive functioning and memory (fourth study of the Thesis). The longer the duration of unemployment, the worse the cognitive performance. Only a previous study has specifically analyzed the effects of unemployment by segmenting it into different periods of duration, finding that those who presented the greatest cognitive difficulties were the long-term unemployed (more than 12 months) (Fryer & Warr, 1984). In

contrast, with regard to retirement, one study found that, at least in the following 10 years, the decline occurs gradually (Fisher et al., 2014).

In research on the effects of unemployment on psychological health, effects related to duration have also been found. However, they find that the maximum effect occurs around 12 months from the onset of unemployment (De Witte et al., 2010; Thill et al., 2019). After this stage of worsening, it follows a preiod of fluctuations that ends up stabilizing at a lower cognitive level than the initial one when the second or third year is reached (Paul & Moser, 2009). Therefore, more research is still needed to analyze cognitive performance and its evolution at different times during unemployment and retirement.

9.1.3. *Practical implications*

The findings of this Thesis show that the neuropsychological perspective is necessary in the study of the consequences of the absence of employment. It has been observed that both retirement and unemployment are associated to a worse executive functioning and to people's memory. This deterioration is relevant since it is associated with a decline in the functioning of daily life (Puente et al., 2015) and with worse decision making, self-control and initiative (Baumeister, 2002). These skills, in turn, are necessary and related to more effective job search (Gnambs, 2017; Koen et al., 2010; Liu et al., 2014), which might explain the findings found in the third study about the influence of cognitive performance on the probabilities of finding and maintaining a new job.

The measures currently offered to the unemployed and retirees, such as activation or labor guarantee programs and basic universal income, or retirement allowances, are intended to cover social, instrumental and training needs (O'Halloran et al., 2018). However, the opportunities they offer to improve the health aspects affected by the

absence of employment are scarce. According to the findings of this Thesis and by generalization of the body of evidence on the effectiveness of neuropsychological stimulation and rehabilitation, long-term unemployed and retired people could benefit from neurocognitive intervention techniques. Through them, the cognitive performance of those affected could be optimized, therefore improving their daily functioning and/or their re-employment options. As far as we know, there are no previous studies on cognitive interventions in unemployed and non-clinical populations. However, the NGO Crittenton Women's Union, now called Economic Mobility Pathways, in Boston, Massachusetts, designed and began to implement a program called Mobility Mentoring that includes the development of executive functions as one of its pillars. Based on scientific knowledge about the effect that poverty, stress and social bias have on cognitive functioning, they designed this model that they apply in low-income families, with the aim of restoring their ability to manage problems and generate strategies that help them to get out of their disadvantaged situation (Babcock, 2012a, 2012b). Their activities include the use of cognitive game applications. Although no published analysis of their effectiveness has been found, reports published by the team indicate a high success rate (Babcock & Lowe, 2018).

According to the results of this Thesis, the most vulnerable profile, and the one that could benefit most from a cognitive intervention, would be the unemployed and long-term retirees, middle-aged, with a low educational level and who have previously held jobs with a low level of complexity in terms of data management or people. As for the characteristics of a possible intervention program, previous research has concluded that these should last at least 12 weeks and 1 to 3 one-hour sessions to observe improvements in healthy older people, in a face-to-face or computerized way (Gates et

al., 2020; Sanjuán et al., 2020). For adults, evidence of improvement through cognitive training has also been found (Kane et al., 2017). In preliminary analyses carried out with the sample of the fourth study, differences were found in the performance of executive functions (working memory, inhibition, and resistance to interference) according to different lengths of unemployment (Vélez-Coto et al., 2017a; 2017b). Specifically, worse performance was observed in the initial months and when long periods were reached. In the intermediate months (6-12 months), a peak recovery was observed, followed again by a downward, albeit decreasing, trend. In this sense, it would be advisable to carry out the cognitive interventions from the 6 months of unemployment, or to initiate them immediately in the case of retirees.

On the other hand, taking into account the variables that have been shown to be associated with the impact of cessation of work on cognition, it is proposed to take into account the degree of complexity of the work with data and people when evaluating these populations. This information may be useful to estimate more precisely the impact that retirement will have on cognitive performance, as well as the individual resistance to present decline during unemployment. Likewise, it is recommended that specific indices of complexity of work with people, data, and things be included in the instruments of evaluation of the cognitive reserve.

Finally, the findings of this work highlight the influence of the social aspects of employment on cognitive performance. Based on this, it is recommended to promote social activities in jobs where the interactions with other people are less complex and demanded. Likewise, performing socially stimulating activities, such as volunteering, during periods of termination of activity could compensate for the absence of stimulation

through work as well as the social isolation suffered by unemployed and retired persons (Lengfeld & Ordemann, 2016; Yang, 2020).

9.2 Conclusions

From the results obtained in the four studies conducted in this Doctoral Thesis, the following conclusions are derived:

1. The absence of work, both due to retirement and unemployment, is associated with a worse cognitive performance.
2. The effect of unemployment on cognitive performance is not mediated by emotional health.
3. The absence of work mainly affects executive functioning.
4. Greater occupational complexity related to social interactions protects against age-related cognitive decline after retirement.
5. A longer length of unemployment is associated with a worse performance in executive functioning and memory.
6. A worse cognitive performance is associated with more difficulties in finding and maintaining a job.
7. People with a higher level of education and who have performed more complex jobs are more protected from the harmful effects of unemployment and retirement.

9.3 Future perspectives

The results and conclusions of the studies carried out in this Thesis allow us to consider new perspectives for future research in the field of Neuropsychology and the absence of work. Therefore, the following studies are proposed:

1. To design and validate an instrument to assess the different indexes of work complexity, based on the tasks performed in the job.
2. To study which specific features of complexity of work determine its influence on cognitive performance.
3. To investigate if the effect of labor complexity on cognitive performance is modulated by sociodemographic, psychological or social variables.
4. To longitudinally study the cognitive trajectory across the period of unemployment, controlling the influence of sociodemographic, occupational and health variables.
5. To study whether the level of complexity of previous work displays a pattern of preserved differentiation or differentiated preservation during unemployment.
6. To investigate whether there is a cumulative effect of periods of unemployment, and their duration, during working life which affects cognitive aging.
7. To study how intermittent periods of work and unemployment over a long period of time affect cognitive performance.
8. To study the influence of psychological, economic and social variables on cognitive performance during unemployment.
9. To study whether there is a cognitive normalization along unemployment or retirement.
10. To study the effectiveness of a neuropsychological intervention program for the unemployed in improving cognitive performance and, consequently, the probability of re-employment.

Finally, the results of this present Doctoral Thesis give away the opening of a burgeoning research area that applies Neuropsychology to unemployment. Therefore, from this work other projects can be derived that serve to improve the quality of life of unemployed and retired people, as well as to develop more holistic and effective employability interventions.

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