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DETECTION AND EVALUATION SYSTEM FOR UPPER LIMB APRAXIA IN POST-STROKE PATIENTS

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**DETECTION AND EVALUATION SYSTEM FOR
UPPER LIMB APRAXIA IN POST-STROKE PATIENTS**

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*“Y al alba por el balcón,
desembocó todo el cielo”*

FEDERICO GARCÍA LORCA

*A mi hermano Migui, mi persona favorita.
El mejor regalo de la vida es que tú estés en ella.*

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ABBREVIATIONS

ULA: Upper Limb Apraxia

TULIA: Test for Upper Limb Apraxia

ADL: Activities of Daily Living

MOHO: Model of Human Occupation

CFA: Confirmatory Factor Analysis

COSMIN: COnsensus-based Standards for the selection of health Measurement
INstruments

NIHSS: National Institutes of Health Stroke Scale

CFI: Comparative Fit Index

AMOS: Analysis of MOment Structures

KMO: Kaiser-Meyer-Olkin

RMSEA: Root Mean Squared Error of Approximation

TLI: Tucker-Lewis Index

SRMR: STANDARDISED ROOT MEAN SQUARED RESIDUAL

STARD: Standards for Reporting of Diagnostic Accuracy

CI: Confidence Interval

ROC: Receiver Operating Characteristic

AUC: Area Under the Curve

AST: Apraxia Screen of TULIA

ICC: Intraclass Correlation Coefficient

Abstract

Resumen



ABSTRACT

Introduction and rationale

Upper limb apraxia (ULA) is a neurological deficit that affects the ability to plan and perform intended movements with the upper limbs. ULA is caused by acquired brain damage, with stroke the most prevalent aetiology. The assessment of ULA involves the evaluation of a person's ability to plan and perform purposeful movements. This includes their capacity to imitate gestures, simulate actions under pantomime requests, use real objects, and recognise gestures and actions. The Test for Upper Limb Apraxia (TULIA) Apraxia test and the Activities of Daily Living (ADL) Observations scale are two comprehensive instruments that extensively evaluate ULA. The TULIA Apraxia test evaluates ULA by forty-eight items. These items involve imitation and pantomime tasks and cover symbolic, non-symbolic, transitive, and intransitive gestures. The ADL Observations scale measures the effect of ULA on daily life activities. Neither of these tests has been validated in the Spanish-speaking post-stroke population.

Human occupation is defined as the set of activities that individuals perform, along with the subjective value and meaning that these activities provide. Roles are a fundamental part of human occupation, as they define how people are involved and participate in society. Role participation usually decreases after a stroke, partly due to cognitive factors, although the relationship with specific deficits, such as apraxia, has not yet been sufficiently explored. Health factors are a variety of biological, psychological, social, and environmental elements that influence a person's overall well-being and functionality. Perceived self-efficacy is a health factor defined as the belief in one's ability to achieve personal goals and cope with the challenges of daily life. Given that

ULA affects activities, non-verbal communication, and interaction with the environment, this syndrome could be related to self-efficacy levels in post-stroke patients.

Objectives

The two overall objectives of this doctoral thesis are: i) to analyse the psychometric properties of two instruments for detecting and evaluating upper limb apraxia in Spanish-speaking post-stroke patients; and ii) to explore whether upper limb apraxia is related to human occupation and health factors in post-stroke patients.

Methods

Seven observational cross-sectional studies were conducted to achieve these two objectives. In terms of the first objective, the first study consisted of the translation, cross-cultural adaptation, and construct validity of the TULIA Apraxia test for Spanish-speaking post-stroke patients. The second study analysed the reliability, cut-off points, and diagnostic accuracy of the TULIA Apraxia test in post-stroke patients. The third study, cross-cultural adapted the ADL Observations scale and analysed its psychometric properties for Spanish-speaking post-stroke patients.

Regarding the second objective, the fourth and fifth studies included the cross-cultural adaptation, content validity, and analysis of the psychometric properties of the Role Checklist in post-stroke patients, the most common instrument used to evaluate role participation. The sixth study evaluated the relationship between ULA and role participation in post-stroke patients. Finally, the seventh study analysed whether ULA was related to general self-efficacy and self-efficacy to manage symptoms in post-stroke patients.

Results

In the first study, the Spanish version of the TULIA Apraxia test was obtained. The confirmatory factor analysis, with a sample of 201 post-stroke patients, confirmed the six-factor structure of the test (RMSEA = 0.046; CFI = 0.891; TLI = 0.882), and convergent validity showed that these six factors correlated adequately with different ULA tests. In the second study, which also had a sample of 201 post-stroke patients, internal consistency was assessed for the six factors of the TULIA Apraxia test showing values greater than 0.716 (95% CI 0.653 – 0.772). The cut-off points of the six factors ranged from ≤ 25 to ≤ 35 , and all presented a correct balance between sensitivity and specificity. In the third study, the Spanish version of the ADL Observations scale was obtained. Construct validity was analysed in a sample of 180 post-stroke participants, confirming a four-factor structure (RMSEA = 0.078; CFI = 0.952; TLI = 0.934). Internal consistency, which was assessed for each of these four factors, showed a minimum value of 0.641 (95% CI 0.495 – 0.753). The cut-off points identified values between ≥ 1 and ≥ 4 with an adequate balance between sensitivity and specificity.

The Spanish version of the Role Checklist was obtained from the fourth study, and its content validity was analysed by a panel of 14 independent experts. The values of Aiken's V coefficient showed a strong level of agreement among the experts. The fifth study had a sample of 179 post-stroke patients. Regarding internal consistency, Cronbach's alpha for role participation was 0.73 (95% CI 0.57 – 0.74) and for assigned value to roles was 0.45 (95% CI 0.53 – 0.57); almost all item-total correlations were significant. The test-retest reliability analysis showed an ICC greater than 0.84, and the inter-rater reliability analysis showed an ICC of 0.99 for role participation and assigned value to roles. In the sixth study, with a sample of 153 post-stroke participants, the results show that ULA was related to role participation. Specifically, transitive pantomime was

linked to current role participation levels ($R^2 = 0.205$). Non-symbolic imitation and transitive imitation were associated with changes in role participation after stroke ($R^2 = 0.158$). Intransitive pantomime showed a relationship with expectations of future role participation ($R^2 = 0.178$). Non-symbolic imitation and intransitive pantomime were related to the assigned value to roles ($R^2 = 0.162$). The seventh study has a sample of 82 post-stroke participants. The findings revealed that intransitive imitation accounted for 14% of the variance in general self-efficacy and 10% of self-efficacy for managing emotional symptoms. Transitive imitation explained 12% of the variance in self-efficacy for managing global symptoms and 5% for social-home integration symptoms. The combination of intransitive imitation, non-symbolic pantomime, and alterations in activities of daily living performance associated with ULA explained 24% of the variance in cognitive self-efficacy.

Conclusions

The results of this doctoral thesis show that the two instruments for detecting and assessing upper limb apraxia, the TULIA Apraxia test and the ADL Observations scale, are valid and reliable tools with high diagnostic accuracy in Spanish-speaking post-stroke patients. Furthermore, the results suggest that upper limb apraxia is related to human occupation and health factors in these patients. In particular, levels of role participation, general self-efficacy, and self-efficacy for managing symptoms after stroke.

RESUMEN EXTENSO

Introducción y justificación de la tesis

La apraxia de los miembros superiores (AMS) es un déficit neurológico que afecta a la capacidad de planificar y realizar movimientos intencionados con la extremidad superior. Se origina después un daño cerebral adquirido, siendo el ictus la causa más frecuente. Aproximadamente entre el 28 y el 54% de los pacientes post-ictus presentan apraxia de los miembros superiores. En estas personas, la AMS se manifiesta a través de diferentes síntomas clínicos, siendo los principales la dificultad o inhabilidad para realizar: i) movimientos simples, repetitivos o secuenciales; ii) gestos que implican posiciones específicas de brazos, manos o dedos; iii) movimientos hacia el propio cuerpo o hacia fuera; iv) acciones con una o ambas manos; v) movimientos que implican el uso de objetos de la vida diaria; vi) pantomimas y vii) imitación de gestos. Estas manifestaciones clínicas impactan en la vida diaria de las personas interfiriendo en su autonomía, afectando su capacidad para interactuar con el entorno y su reintegración en la comunidad. Habitualmente, también la AMS se describe por exclusión, puesto que todos estos déficits no pueden ser explicados por problemas motores o sensoriales, falta de comprensión, alteraciones musculares, dificultad en la coordinación, deterioro cognitivo o discapacidad intelectual.

La detección y evaluación de la AMS se basa en valorar la capacidad de una persona para planificar y realizar diferentes movimientos intencionados con las manos. Para que esta detección sea eficaz debe tener en cuenta numerosos componentes que permiten evaluar de manera precisa el contínuum de manifestaciones práxicas. Estos componentes incluyen una combinación de las principales vías sensoriales de entrada de la información, tipos de comandos, tipos de gestos, presencia o ausencia de objetos reales

y características de los movimientos. Cuando una evaluación de AMS recoge esta amplia variedad de componentes, es posible objetivar todos los errores apráxicos que se pueden cometer durante los movimientos. Existen diferentes instrumentos de detección y evaluación de la AMS, pero dos de los más exhaustivos y utilizados son el TULIA Apraxia test y la ADL Observations scale.

El TULIA Apraxia test es una herramienta que evalúa la AMS a través de 48 tareas de imitación y pantomima. Abarca gestos simbólicos, no simbólicos, transitivos e intransitivos. Originalmente, fue diseñado para su uso en personas post-ictus, aunque a día de hoy se utiliza también en diferentes condiciones médicas, como demencia, trastorno depresivo o esquizofrenia. Sin embargo, aún no ha sido validado para personas hispanohablantes que han sufrido un ictus. La ADL Observations scale es un instrumento de evaluación conceptualizado para valorar el impacto que tiene la AMS sobre las actividades de la vida diaria. Evalúa el rendimiento práxico en función de cuatro parámetros del desempeño, independencia, iniciación, ejecución y control, durante la realización de cuatro actividades. Esta escala también fue diseñada originalmente para su uso en personas post-ictus. En esta línea se ha utilizado sobre todo para evaluar el efecto de diferentes intervenciones y para registrar la progresión de la AMS. Sin embargo, la ADL Observations scale tampoco ha sido validada para utilizarse con pacientes post-ictus de habla hispana.

La ocupación humana es el conjunto de actividades que se realizan, junto con el significado y el valor que se les asigna. Estas actividades requieren un compromiso motivado y guiado por un patrón basado en tres factores: capacidad de desempeño, volición y habituación. Dentro de la habituación, los roles son una pieza fundamental puesto que definen el conjunto de comportamientos, responsabilidades y principios que

guían el modo en que los individuos se implican y participan en la sociedad. La participación en roles suele disminuir tras un ictus, en parte debido a factores cognitivos, aunque aún no se ha explorado suficientemente si déficits específicos, como la apraxia, están relacionados con esta reducción en la participación.

Los factores de salud se refieren a diversos elementos biológicos, psicológicos, sociales y ambientales que influyen sobre el bienestar general de las personas, afectando tanto al riesgo de desarrollar afecciones como a la capacidad de controlarlas o recuperarse de ellas. Algunos de estos factores están relacionados con la funcionalidad y la volición, como es el caso de la autoeficacia. La percepción de autoeficacia se define como la creencia en la propia capacidad para gestionar objetivos personales y enfrentar los retos de la vida cotidiana. En pacientes que han sufrido un ictus, la autoeficacia puede influir sobre el proceso de recuperación, además de influir en la capacidad para gestionar los síntomas y secuelas propias del daño cerebral. Dado que la AMS afecta a la vida diaria, a la comunicación no verbal y a la interacción con el entorno, es plausible suponer que la presencia de apraxia podría influir en los niveles de autoeficacia en pacientes post-ictus.

La AMS afecta a un alto porcentaje de supervivientes de ictus y actualmente es un déficit infradiagnosticado en esta población, principalmente debido a tres razones: i) la falta de un cuerpo de conocimiento sólido, ii) la baja conciencia del déficit por parte de los pacientes y iii) la falta de instrumentos con rigor metodológico para detectar y evaluar la AMS en diferentes contextos culturales e idiomáticos. Por ello, la validación y el análisis de las propiedades psicométricas del TULIA Apraxia test y de la ADL Observations scale, para su uso en personas hispanohablantes que han sufrido un ictus es

tan necesario. Además, esta validación permitirá explorar si la AMS se relaciona con la ocupación humana y los factores de salud en esta población.

Objetivos

Los objetivos de esta tesis doctoral son: i) analizar las propiedades psicométricas de dos instrumentos de detección y evaluación de la apraxia de miembros superiores en pacientes post-ictus de habla hispana; y ii) explorar si la apraxia de los miembros superiores se relaciona con la ocupación humana y ciertos factores de salud en personas que han sufrido un ictus.

Metodología

Se han llevado a cabo siete estudios observacionales transversales en línea con los dos objetivos propuestos. Cinco de esos estudios fueron sobre la validación y análisis de las propiedades psicométricas de los instrumentos, todos ellos adheridos a la metodología COSMIN y dos de ellos también a la metodología STARD. El primer estudio consistió en la traducción, adaptación transcultural y análisis de la validez de constructo del TULIA Apraxia test. El proceso de traducción y adaptación utilizó el método de retro-traducción y la validez de constructo se evaluó en pacientes post-ictus utilizando un análisis factorial confirmatorio y un análisis de validez convergente. El segundo estudio analizó la fiabilidad, los puntos de corte y la precisión diagnóstica del TULIA Apraxia test en pacientes post-ictus. La fiabilidad se evaluó con alfa de Cronbach y los puntos de corte se calcularon utilizando la curva ROC, el área bajo la curva y el índice de Youden. La precisión diagnóstica del test se analizó mediante análisis de sensibilidad, especificidad y valores predictivos. En el tercer estudio se adaptó transculturalmente la ADL Observations scale y se analizaron sus propiedades psicométricas. La adaptación transcultural siguió también el método de retro-traducción.

Las propiedades psicométricas analizadas fueron la validez de constructo, la consistencia interna, la identificación de puntos de corte y la precisión diagnóstica en pacientes post-ictus. La validez de constructo se examinó mediante un análisis factorial confirmatorio, la consistencia interna mediante alfa de Cronbach, los puntos de corte se calcularon según la curva ROC, el área bajo la curva y el índice de Youden. Finalmente, la precisión diagnóstica se midió con análisis de sensibilidad, especificidad y valores predictivos.

El cuarto y quinto estudio versaron sobre la adaptación transcultural, análisis de la validez de contenido y análisis de las propiedades psicométricas del Role Checklist en pacientes post-ictus hispanohablantes. El Role Checklist es el instrumento por excelencia para evaluar la participación en roles y tampoco estaba validado para su uso en esta población. La adaptación transcultural siguió el método de retro-traducción y la validez de contenido se analizó mediante un panel de expertos y se cuantificó utilizando el coeficiente V de Aiken. Las propiedades psicométricas incluyeron la consistencia interna, que se calculó con alfa de Cronbach y una correlación ítem-total. También se llevó a cabo un análisis test-retest e inter-observador que fueron interpretados mediante el coeficiente de correlación intraclase. El sexto estudio exploró si había alguna relación entre la AMS y la participación en roles en pacientes post-ictus, mediante un análisis de regresión por pasos. Por último, el séptimo estudio investigó si la AMS estaba relacionada con la autoeficacia general y la autoeficacia para el control de síntomas en pacientes post-ictus, también mediante un análisis de regresión por pasos.

Resultados

En el primer estudio se obtuvo la versión en español del TULIA Apraxia test. El análisis factorial confirmatorio, realizado en una muestra de 201 pacientes post-ictus, confirmó la estructura de seis factores del test (RMSEA = 0,046; CFI = 0,891; TLI =

0,882) y la validez convergente mostró que esos seis factores se correlacionaban adecuadamente con diferentes instrumentos de evaluación de la AMS. En el segundo estudio, que también contó con una muestra de 201 pacientes post-ictus, se evaluó la consistencia interna para los seis factores del TULIA Apraxia test, mostrando valores que oscilaron entre 0,716 (95% IC 0,653 - 0,772) y 0,824 (95% IC 0,784 - 0,858). Los puntos de corte para los seis factores variaron entre ≤ 25 y ≤ 35 y todos presentaron un correcto equilibrio entre sensibilidad y especificidad. El valor predictivo positivo mínimo fue 0,667 (95% IC 0,542 - 0,777) y el valor predictivo negativo mínimo fue 0,763 (95% IC 0,644 - 0,859). Estos datos muestran que el TULIA Apraxia test clasificó correctamente, como mínimo, el 67% de pacientes con apraxia y el 76% de pacientes sin apraxia. En el tercer estudio se obtuvo la versión en español de la ADL Observations scale. La validez de constructo se analizó en una muestra de 180 participantes post-ictus, confirmando una estructura de cuatro factores (RMSEA = 0,078; CFI = 0,952; TLI = 0,934). La consistencia interna de esos cuatro factores mostró valores que oscilaron entre 0,641 (95% IC 0,495 - 0,753) y 0,886 (95% IC 0,839 - 0,921). Los puntos de corte se situaron entre ≥ 1 y ≥ 4 , todos con un adecuado equilibrio entre sensibilidad y especificidad. Los valores predictivos positivos de la escala oscilaron entre 0,721 (95% IC 0,675 - 0,937) y 0,833 (95% IC 0,623 - 0,956), lo que indica que se identificaron eficazmente a más del 72% de los pacientes que tenían afectación en las actividades de la vida diaria causada por la AMS. Por el contrario, los valores predictivos negativos oscilaron entre 0,738 (95% IC 0,635 - 0,825) y 0,909 (95% IC 0,815 - 0,966), lo que indica que la ADL Observations scale puede identificar correctamente a más del 74% de los individuos que no presentaban dificultades en las actividades cotidianas.

Del cuarto estudio se obtuvo la versión en español del Role Checklist. Un panel de 14 expertos independientes evaluó la validez de contenido, que después fue cuantificada mediante el coeficiente V de Aiken, mostrando un fuerte nivel de acuerdo entre los expertos. Esto garantiza una adecuada validez de contenido de la versión en español del Role Checklist. El quinto estudio, que tuvo una muestra de 179 pacientes post-ictus, obtuvo un alfa de Cronbach de 0,73 (95% IC 0,57 - 0,74) para la participación en roles y un alfa de Cronbach de 0,45 (95% IC 0,53 - 0,57) para el valor asignado a los roles. Todas las correlaciones ítem-total fueron significativas, con valores que oscilaron entre 0,16 y 0,57 excepto para tres ítems sobre la participación en el pasado. El análisis de fiabilidad test-retest mostró valores superiores a 0,84, y el análisis de fiabilidad entre evaluadores obtuvo valores que se mantuvieron en 0,99. En el sexto estudio, con una muestra de 153 pacientes post-ictus, se encontró que la AMS estaba relacionada con la participación en roles. Específicamente, la pantomima transitiva se asoció a los niveles de participación en la actualidad ($R^2 = 0,205$). La imitación no simbólica y la imitación transitiva se asociaron a los cambios en la participación en roles tras el ictus ($R^2 = 0,158$). La pantomima intransitiva mostró una relación con las expectativas de participación futura en roles ($R^2 = 0,178$). La imitación no simbólica y la pantomima intransitiva se relacionaron con el valor asignado a los roles ($R^2 = 0,162$). El séptimo y último estudio involucró 82 pacientes post-ictus y los resultados muestran que la AMS se relacionó con la autoeficacia general y la autoeficacia para el control de síntomas. La imitación intransitiva explicaba el 14% de la varianza en la autoeficacia general y el 10% de la autoeficacia para gestionar los síntomas emocionales. La imitación transitiva explicó el 12% de la varianza en la autoeficacia para el manejo de los síntomas globales y el 5% para los síntomas de integración social. La combinación de la imitación intransitiva, la

pantomima no simbólica y las alteraciones en el desempeño de las actividades de la vida diaria asociadas a la ULA explicaron el 24% de la varianza en la autoeficacia cognitiva.

Conclusiones

Los resultados de esta tesis doctoral muestran que el TULIA Apraxia test y la ADL Observations scale son dos herramientas válidas, fiables y con una alta precisión diagnóstica para detectar y evaluar la apraxia de los miembros superiores en pacientes post-ictus de habla hispana. Por otro lado, ha encontrado que la apraxia de los miembros superiores se relaciona con la ocupación humana y los factores de salud en estos pacientes, específicamente con la participación en roles, la autoeficacia general percibida y la autoeficacia para manejar los síntomas tras un ictus.

I

Introduction

Rationale for this thesis

Objectives



1. INTRODUCTION

1.1. Stroke

1.1.1. Concept and stroke types

A stroke is defined as a sudden interruption of blood flow in the brain, caused by an obstruction or a rupture of a vessel. This obstruction or rupture leads to acute or chronic damage to different brain structures, depending on where it occurs and the gravity of the lesion¹. There are generally three primary types of strokes classified by their aetiology: ischaemic, haemorrhagic, or lacunar². An ischaemic stroke occurs when an obstruction, usually a clot, restricts cerebral blood flow. This type of stroke is the most common, affecting approximately 85% of patients³. On the other hand, a haemorrhagic stroke is a cerebral blood vessel rupture, causing bleeding into the brain and surrounding tissues. This is the most severe type of stroke and has the worst prognosis⁴. The third type of stroke is called lacunar stroke, and it is a small vessel disease⁵.

Strokes are largely a preventable medical condition influenced by both unmodifiable and modifiable risk factors. Unmodifiable factors certainly indicate a higher risk of stroke, but modifiable factors are the primary focus of preventive interventions⁶. Indeed, 90% of strokes are attributable to ten modifiable risk factors: hypertension, diabetes, cardiac problems, smoking, abdominal obesity, hyperlipidaemia, sedentary lifestyle, alcohol consumption, poor diet, and stress⁷. Although many of these risk factors are health conditions, they can be managed or reduced through lifestyle changes. As one of the leading causes of disability and mortality worldwide, stroke presents a major public health challenge. Its global burden continues to rise due to an ageing population and an increasing prevalence of risk factors.

1.1.2. Stroke epidemiology

Stroke is one of the principal causes of mortality worldwide and a primary contributor to adult disability. The global incidence of stroke was estimated at approximately 12.2 million new cases in 2019, which has contributed to the increase of 143 million disability-adjusted life-years and 6.6 million deaths⁸. Furthermore, over the past three decades, stroke incidence has been increasing by around 70%, the prevalence by approximately 85%, and the disability-adjusted life years by 37%⁹. These rates are particularly problematic since this trend is expected to continue in the coming years due to longer life expectancy and the growing presence of risk factors among younger populations¹⁰. In 2019, the principal risk factors associated with stroke were high systolic blood pressure, high body-mass index, high fasting plasma glucose levels, air pollution, and smoking¹¹. As these risk factors are modifiable, the actual public health challenge is controlling them to reduce stroke cases and improve chronic conditions associated with them. The sequelae associated with stroke are rising as well, and they are increasingly affecting younger people in a chronic manner¹². One of these is cognitive impairment, which is a very frequent and limiting consequence of stroke¹³.

1.1.3. Cognitive sequelae of stroke

Cognitive impairment is one of the most common post-stroke sequelae that persists over time. The prevalence of this impairment varies widely but usually ranges from 20% to 80%, depending on factors such as medical conditions, diagnostic criteria, and country¹⁴. Various cognitive domains can be affected, including attention, memory, executive function, and praxis. Impairments in these domains often serve as strong predictors of long-term cognitive function^{15,16}. Specifically, deficits in the praxis domain are valuable indicators of broader cognitive decline, underscoring the necessity of

evaluating apraxia in post-stroke patients¹⁵. In this line, it is essential to comprehend these cognitive sequelae along the post-stroke interventions. The early assessment and management of specific cognitive deficits allow for the identification of issues as soon as possible, and this will help to prevent complications and improve quality of life.

1.2. Upper limb apraxia

1.2.1. Definition and overview of upper limb apraxia

Praxis refers to the process of executing deliberate movements aimed at achieving a specific goal. This process requires a complex cognitive mechanism that involves planning, programming, sequencing, and execution¹⁷. For that reason, praxis can be understood as the integration of perception, motor processing, and action performance¹⁸. The deliberated movements may include the use of tools or objects, communication with others, or interaction with the environment¹⁹. The motor response must adapt to the contextual demands, accommodating unexpected changes, and the spatial-temporal plane in which the movement occurs. This adaptability ensures that movements are executed precisely and appropriately across variable contexts²⁰.

A disorder in the praxis process is known as apraxia. There are various types of apraxia, with upper limb apraxia (ULA) being one of the most common forms. ULA is defined as a cognitive deficit that impairs the ability to plan or perform intended, purposeful movements with the hands or arms²¹. Typically, ULA is described by exclusion, as the deficits in performing movements cannot be explained by: i) comprehension lack, ii) object recognition difficulties, iii) uncooperativeness, iv) intellectual decline, v) lack of motivation, vi) other cognitive impairments, vii) motor and sensory deficits, viii) weakness, ix) movement alterations (such as tremors, chorea, myoclonus, or dystonia), and x) disorders in muscle tone²²⁻²⁴. ULA exhibits a wide

spectrum of manifestations, with principal symptoms including difficulty or inability to perform: i) simple, repetitive, or multistep movements; ii) gestures involving specific hand or finger positions; iii) movements towards or away from the body; iv) actions involving one or both hands; v) movements with everyday objects; vi) pantomime; and vii) gesture imitation^{25,26}.

Detection and evaluation of ULA across its broad manifestations are essential for guiding evaluation and rehabilitation strategies and for optimal research. The use of validated assessment instruments not only aids in diagnosing ULA but also it is necessary to explore the relationship between ULA and other occupational and health factors.

1.2.2. Key concepts for understanding upper limb apraxia

ULA is a multidimensional deficit, formed by various concepts that can become abstract and complex without clear definitions. For that reason, standardising the definition of key terms is essential for accurate assessment, effective rehabilitation, and objective research. These concepts include:

- Gestures are deliberated movements performed, in the case of ULA, with hands or arms to convey a non-verbal message or achieve an action goal²⁷.
- Imitation is the replication of a movement or gesture with the same precision as a previously demonstrated example²⁸.
- Pantomime is performing a movement or gesture following a verbal request, usually in a simulated context²⁹.
- Symbolic gestures mean that the gesture conveys a meaning, often linked to social or cultural context³⁰.

- Non-symbolic gestures, conversely, mean that the gesture does not have a specific meaning or cultural significance³⁰.
- Transitive gestures imply the use of objects, either in a real or simulated manner³¹.
- Intransitive gestures do not involve objects³¹.

1.2.3. Historical approach of upper limb apraxia

The term “apraxia” was first introduced by Steinthal in 1871. He described an aphasic patient who could not play the violin, held the pen reversed, or grasped the spoon as if it were a novel object. Although Steinthal identified these issues, he did not provide a detailed definition of apraxia; he just mentioned it³². Two years later, Gogol used the term “apraxia” to explain difficulties in using objects, attributing these challenges to perceptual deficits³³. In 1888, Starr defined “apraxia” as the inability to recognise the use of objects. This author proposed an assessment method involving the presentation of objects to patients, asking them to identify each one³⁴. In 1900, Liepmann advanced the understanding of apraxia by exploring errors in the execution of intentional movements and the use of objects. He was the first to propose an extensive conceptual framework for apraxia. His approach was informed by a case involving an imperial councillor who had difficulty performing learnt movements and using objects, both upon imitation and verbal command. Notably, the patient’s perception, language comprehension, and global cognitive functions were preserved, leading Liepmann to propose the term “motor apraxia” to describe this condition and distinguish it from perceptual disorders or ignorance of object use³⁵. In 1908, Liepmann expanded his research by assessing 42 patients with right-brain damage and 47 with left-brain damage. He identified apraxia in 20 of the left-brain-damaged patients, 14 of whom were aphasic and six were not. This led Liepmann to conclude that aphasic and apraxic deficits are independent, although he

noted that the left cerebral hemisphere plays a dominant role in language and motor control³⁶. Based on his discoveries about the left hemisphere's role, Liepmann introduced the concept of a “motor programme”. This concept supports the organisation and execution of actions, initially guided by a visual representation of the sequence. Based on this conception, Liepmann classified apraxia into three distinct types: ideational, ideomotor, and limb-kinetic apraxia. Ideational apraxia refers to difficulties in formulating a motor plan for actions, particularly in tasks requiring a sequence of movements. Ideomotor apraxia is characterised by disruptions in the execution of movements, despite having a clear concept of the intended action³⁷. Limb-kinetic apraxia involves disturbances in limb movements, resulting in slow, awkward motions, and a loss of precision³⁸.

Decades later, Norman Geschwind revisited and expanded upon these ideas, bringing apraxia research into modern neuroscience. Geschwind, a pioneer in the study of disconnection syndromes, built on Liepmann’s framework by emphasising the role of neural pathways connecting different brain regions involved in motor control³⁹. He proposed a model based on the disconnection of Wernicke’s area and the left premotor cortex. For an individual to perform a pantomime correctly in response to a verbal command, information must flow from the language-processing areas to the motor regions responsible for movements. In right-handed individuals, this occurs within the left hemisphere, but in left-handed individuals, the signal must also cross to the opposite side via the corpus callosum. Damage to the connections between these areas, such as the supramarginal gyrus or arcuate fasciculus, could result in apraxia. This would manifest as an ability to understand commands but an inability to perform them, as the language processing areas become disconnected from the motor execution regions^{40,41}.

Following Geschwind's theories, new cognitive models for explaining upper limb apraxia have emerged. These new models explored the processing levels that involve gesture production, moving away from a purely neuroanatomical approach. Multiple possible pathways for producing gestures were proposed, even for the same gesture, diverging from Liepmann's single-mechanism model¹⁸. Contemporary cognitive models also challenge the notion that apraxic manifestations solely result from disconnections between sensory, language or motor, centres. Instead, they propose that multiple stages of processing are involved in converting sensory information into motor commands⁴².

Roy and Square in 1985 proposed a model that delineates two main systems involved in upper limb praxis: the conceptual and the production systems. The conceptual system includes knowledge about the meaning of gestures and how to use objects. Damage to this system can cause errors in pantomiming symbolic and transitive gestures, such as confusing tools. The production system, on the other hand, manages the actual execution of movements. Impairments in this system result in clumsy actions and mistakes in movement sequences⁴³.

Rothi, Ochipa, and Heilman, in the 1990s, introduced a model of apraxia that features the concept of an "action-lexicon", which divides gesture production and recognition into distinct systems: the input action-lexicon for recognising gestures and the output action-lexicon for producing them. Their model also proposes multiple input routes for processing gestures, including visual for gestural information, visual for object use, and auditory for verbal information. Also, they suggested a non-lexical system for directly imitating gestures without requiring conceptual understanding. This model underscores the complexity and multidimensionality of apraxia, illustrating how impairments in different types of processing can conduct to various forms of upper limb apraxia⁴⁴.

In 2002, Buxbaum expanded on the Rothi, Ochipa, and Heilman model by proposing a three-system framework for apraxia. The first system, the dorsal action system, is involved in dynamic body representations and affects gesture imitation and pantomime when impaired but allows correct tool use when the tool is provided. This system is associated with the dorsal frontoparietal cortex. The second system, the ventral system, is linked to conceptual knowledge of tool function; damage here leads to errors in tool use and tool substitution, typically due to temporal lobe lesions, while gesture recognition and imitation generally remain unaffected. The third system, the central praxis system, integrates both dorsal and ventral features and is responsible for pantomime production and recognition. Damage to the left inferior parietal lobe affects this system⁴⁵.

Currently, research on ULA is progressing in several directions. One of the main points is to enhance early detection and evaluation methods for ULA, as accurate diagnosis is important for advancing both research and clinical practice. Improving detection not only enriches the comprehension of this complex deficit but also lays the foundation for more effective interventions in upper limb apraxia.

1.2.4. Stroke and upper limb apraxia

Stroke is the leading cause of ULA, with an estimated prevalence of approximately 28% to 54% among stroke survivors⁴⁶. Even after recovery of other cognitive and physical functions, around 50% of individuals may continue to exhibit apraxic errors⁴⁷. The clinical symptoms of the ULA can have an impact on the daily lives of post-stroke patients, interfering with essential activities such as toileting, dressing, and bathing⁴⁸, and serving as a negative predictor of returning to work⁴⁹. Furthermore, impairments in imitation and pantomime skills, essential for communication and social

interaction, complicate community reintegration and social life⁵⁰. Consequently, addressing ULA is a critical component of post-stroke evaluation protocols, as managing apraxia helps enhance cognitive functions, motor abilities, and autonomy in daily activities⁵¹⁻⁵³.

1.2.5. Upper limb apraxia assessment

The assessment of upper limb apraxia involves a register of a person's ability to plan and perform purposeful movements, including their capacity to imitate gestures, simulate actions under pantomime requests, use real objects, and recognise gestures and actions. ULA evaluation has advanced considerably over recent decades, driven by a growing understanding of apraxia and its diverse manifestations. Early assessments primarily focused on basic imitation tasks and had a somewhat limited scope⁵⁴. Initially, these evaluations often addressed transitive and symbolic gestures separately, while non-symbolic gestures were frequently excluded⁵⁵. Over time, as knowledge of apraxia has expanded, so too have the tools for assessment. Presently, ULA evaluations encompass a broader range of movements, gestures, and tasks⁴⁶, enhancing their sensitivity and specificity in identifying ULA manifestations.

An effective evaluation of ULA must consider a broad range of components to certainly assess praxis abilities. This thorough assessment involves an extensive combination of: i) sensory pathways, ii) types of commands given, iii) gesture types, iv) the presence or absence of a real tool in the case of transitive gestures, and v) the characteristics of the movements executed.

In the context of ULA assessment, sensory pathways refer to the principal routes through which sensory information about action is received. This includes various modalities, such as visual, auditory, and tactile pathways, and a combination of them⁵⁶.

Each of these sensory pathways plays a basic role in how movements and gestures are perceived, planned, and executed⁵⁷. The visual and the auditory pathways pertain to interpreting visual and verbal information, respectively, which are translated into motor performance⁵⁸. The tactile pathway relates to the sensory feedback received through touch, influencing the precision with which gestures are executed⁵⁹. Understanding these sensory pathways helps in determining how sensory input is integrated into praxis actions.

The types of commands given refer to the nature of the instructions provided for performing a movement or gesture, which can be categorised into four main types: imitation, pantomime, real object use, and gesture recognition. The imitation command requires the ability to receive and process visual information and translate it into precise movements⁶⁰. Pantomime command requires a more abstract ability. The individuals must imagine and plan how the gesture would be performed and, if appropriate, how the object would be represented in hand or what the gesture's intended meaning⁶¹. Real object use requires the manipulation of the tools, so this type of evaluation gives valuable information about how ULA impacts in a real context⁶². Gesture recognition, on the other hand, involves the comprehension of gestures and their contextual meaning, which is essential to comprehending the environment¹⁸.

Gesture type refers to the categorisation of gestures based on both their meaning, symbolic or non-symbolic and their relation to object use, transitive or intransitive¹⁸. Symbolic gestures are often tied to social or cultural contexts. These gestures require knowledge the significance they hold within a particular community or situation. In terms of object use, transitive gestures require comprehending and representing the function of the objects and their correct spatial orientation in the hand³¹.

The presence or absence of real tools in the case of transitive gestures is a key element of the ULA assessment. When real objects are involved, they introduce an additional sensory component: touch. The interaction provides tactile and kinaesthetic feedback essential for proper action execution in daily life⁶³. Assessing this helps reveal the repercussions of ULA in real-life settings⁶⁴. On the other hand, the absence of real tools tests the ability to conceptualise and mentally simulate actions without relying on direct sensory feedback, offering insight into the cognitive aspects of ULA⁶⁵.

The characteristics of the movements executed in apraxia assessments cover several key aspects: movement complexity, spatial direction, and upper-limb implication. Complexity refers to the nature of the movement, which can be categorised into simple, repetitive or multistep movements⁴². Simple movements consist of basic, single actions, such as specific hand or finger positions. Repetitive movements involve the continuous repetition of the same action, like repeatedly turning a door⁶⁶. On the other hand, multistep movements require performing a sequence of actions in a specific order⁶⁷. Spatial direction focuses on the trajectory of the movement concerning the body. Movements can be directed either towards or away from the body or involve both directions⁶⁵. For movements directed towards the body, further distinctions are made: they may be aimed at the same side of the body (hemibody), the central body area, or the opposite side (contralateral). Lastly, upper-limb implication refers to whether the movement is performed using one or both hands.

Given the complexity of ULA, assessment tools must account for the full continuum of apraxic manifestations by incorporating this wide range of components. Table 1 summarises the main components for evaluating ULA, with respective justifications for their feasibility. This detailed approach allows evaluators to objectively

capture the diverse possibilities and emphasise the significance of each component. Furthermore, in ULA assessment, it is fundamental to capture the apraxic errors exhibited during movements, and utilising a sufficient combination of components provides a more objective means of recording these errors.

Table 1. Main components for evaluating upper limb apraxia^{18,31,57–65}

Which is the principal sensory pathway involved?	What type of command is used to request the gesture?	What type of gesture is being evaluated in terms of meaning?	What type of gesture is being evaluated in relation to the implication of object use?	Is the real object available during evaluation?	Is it feasible to use this type of item in ULA assessments?	Justification for the possibility or impossibility of using the item
Visual	Imitation	Symbolic	Transitive	Only the evaluator has the object	No	This combination could be included in ULA assessments, to evaluate the ability to recognise and mentally simulate object use, even without physically handling it.
				Absence of real object	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ²⁶ .
		Intransitive	–	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ⁶⁸ .	
		Non-symbolic	Transitive	Only the evaluator has the object	Yes	This combination could be included in ULA assessments because the patient not having the real object means they do not need to learn its use. The focus remains on the imitation process ⁶⁹ .

				Absence of real object	No	This combination is not feasible for ULA assessments, as it is not possible to perform a non-symbolic, transitive gesture or movement without the presence of real objects.
			Intransitive	–	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ⁶⁰ .
Auditory	Pantomime	Symbolic	Transitive	Absence of real object	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ⁶⁵ .
			Intransitive	–	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ³¹ .
		Non-symbolic	Transitive	Absence of real object	No	This combination is not feasible for ULA assessments because, without the real object, there is no context for the non-symbolic gesture.
			Intransitive	–	Yes	This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ⁷⁰ .

Tactile	–	–	–	–	No	This combination is not feasible for ULA assessments as the tactile pathway by itself is insufficient for guiding gestures. It lacks the visual feedback necessary for spatial and contextual understanding, which can lead to biased interpretations of errors.
Combination of visual, auditory, and tactile	Imitation	Symbolic	Transitive	Only the patient has the object	Yes	This combination could be included in ULA assessments to provide information about the transfer of observed actions into functional movements.
				Both have the object	Yes	This combination could be included in ULA assessments as it ensures an accurate assessment of the ability to imitate precise gestures.
		Non-symbolic	Transitive	Only the patient has the object	No	This combination is not feasible for ULA assessments because of the risk of learning bias. Since the gesture is non-symbolic and new to the patient, any errors made may be attributable to learning difficulties rather than to ULA itself.
				Both have the object	No	This combination is not feasible for ULA assessments because of the risk of learning bias. Since the gesture is non-symbolic and new to the patient, errors may be attributable to learning difficulties rather than ULA itself.

Pantomime	Symbolic	Transitive	Only the evaluator has the object	Yes	This combination could be included in ULA assessments because the evaluator can show the object while the patient simulates its use without holding it.
			Only the patient has the object	No	This combination is not feasible for ULA assessments because if the patient has the object in hand, it transitions to “real object use” rather than pantomime.
			Both have the object	No	This combination is not feasible for ULA assessments because the essence of pantomime is to simulate gestures without holding the real objects.
	Non-symbolic	Transitive	Only the evaluator has the object	No	This combination is not feasible for ULA assessments because the patient is not familiar with the use of the object (as it is non-symbolic), which could introduce learning biases.
			Only the patient has the object	No	This combination is not feasible for ULA assessments because the patient is not familiar with the use of the object (as it is non-symbolic), which could introduce learning biases and confound the assessment of ULA. Additionally, if the patient has the object, it transitions to “real object use”
			Both have the object	No	This combination is not feasible for ULA assessments because the patient is not familiar with the use of the object (as it is non-symbolic), which could introduce learning biases and confound the

						assessment of ULA. Additionally, the essence of pantomime is to simulate gestures without holding the real objects.
Real object use	Symbolic	Transitive	Only the patient has the object	Yes		This combination should be included in ULA assessments, as it represents an objective evaluation of ULA supported by scientific evidence ⁶³ .
	Non-symbolic	Transitive	Only the patient has the object	No		This combination is not feasible for ULA assessments because the patient is not familiar with the use of the object (as it is non-symbolic), which could introduce learning biases and confound the assessment of ULA.
Gesture recognition	Symbolic	Transitive	With an object or image	Yes		This combination could be included in ULA assessments, to evaluate the ability to recognise the use of objects ⁷¹ .
			Without object	Yes		This combination could be included in ULA assessments to evaluate the ability to recognise pantomime of the use of objects ⁷¹ .
	Intransitive	—	Yes		This combination could be included in ULA assessments to evaluate the ability to recognise the pantomime of communicative gestures ⁷¹ .	
	Non-symbolic	Transitive	With object	No		This combination is not feasible because the absence of meaning makes it impossible for the patient to recognise the gesture correctly.

				Without object	No	This combination is not feasible because the absence of meaning makes it impossible for the patient to recognise the gesture correctly.
			Intransitive	—	No	This combination is not feasible because the absence of meaning makes it impossible for the patient to recognise the gesture correctly.

Note: ULA = Upper Limb Apraxia

1.2.5.1. Instruments for the assessment of upper limb apraxia

Various instruments to evaluate ULA have been developed in the framework of ULA assessment. Among them, the Test for Upper Limb Apraxia (TULIA)²⁶ and the Activities of Daily Living (ADL) Observations scale⁶² are two of the most used and complete tools for detecting and evaluating ULA.

1.2.5.1.1. Test for upper limb apraxia (TULIA)

The TULIA Apraxia test is a standardised tool designed to detect and evaluate upper limb apraxia in post-stroke individuals. It assesses ULA through imitation and pantomime tasks, covering symbolic, non-symbolic, transitive, and intransitive gestures. The TULIA Apraxia test is one of the most used instruments to evaluate ULA both in clinical and research settings due to its deep approach. Originally developed for post-stroke patients, its utility has been proven effective in detecting ULA in various conditions, including dementia⁷², depressive disorders⁷³, and schizophrenia^{20,74}. Moreover, the TULIA Apraxia test has been used to assess changes in ULA after post-stroke rehabilitation programs⁵³, interhemispheric facilitation techniques⁷⁵, and transcranial magnetic stimulation treatments⁷⁶. While a short screening version derived from the TULIA Apraxia test has been validated for various populations and languages, the full TULIA Apraxia test itself has not yet been validated for use in other languages, including Spanish.

1.2.5.1.2. Activities of daily living (ADL) Observations scale

The ADL Observations scale is an assessment tool conceptualised to evaluate the impact of ULA on daily life activities. It provides detailed information into how apraxia affects four activities performed with real objects: personal hygiene, dressing, feeding,

and a fourth activity selected by the evaluator. Performance is assessed across four key parameters that describe the actions: independence, initiation, execution, and control. The ADL Observations scale offers a focused perspective on the consequences of ULA that more general assessments may overlook⁷⁷. Its application extends across various conditions, including dementia, to assess the effects of living in small-scale care units on cognitive function⁷⁸, and in post-stroke cases to evaluate specific interventions for apraxia⁷⁹. Additionally, it has been used to track the progression of ULA and its effect on daily functioning over a five-month period⁸⁰. Despite its utility, the ADL Observations scale has not yet been validated for use with Spanish-speaking post-stroke patients, which underscores the need for its adaptation and validation to ensure its applicability and accuracy in diverse contexts.

1.2.6. Components of upper limb apraxia construct

The construct of ULA is complex and multidimensional, as mentioned earlier. For this reason, an analysis of the variability registered by the TULIA Apraxia Test and the ADL Observations Scale is necessary. By examining each item in terms of the combinations of sensory pathways, command types, gesture types, and movement characteristics, it becomes possible to understand how well these instruments capture the full continuum of praxis abilities. Table 2 provides a detailed analysis of each item and component within these tests, emphasising the diversity of assessment conditions. This approach ensures that the instruments are thoroughly evaluated for their capacity to detect a wide range of apraxic errors, ultimately supporting more accurate and exhaustive ULA assessments.

Table 2. Item variability in the TULIA Apraxia test and the ADL Observations scale

Instrument / Items	Sensory pathway	Command type	Type of gesture in terms of meaning	Type of gesture in terms of object use	Presence or absence of a real tool	Movement characteristics		
						Complexity	Spatial direction	Upper-limb implication
TULIA								
Apraxia test								
1. Put index finger on top of nose	Visual	Imitation	Non-symbolic	Intransitive	–	Simple	Towards the middle line of the body	One
2. Bring thumb extended on forehead, other fingers point upwards	Visual	Imitation	Non-symbolic	Intransitive	–	Simple	Towards the middle line of the body	One

3.	Bring back of the hand under chin, shoulder 90° abducted	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Towards the middle line of the body	One
4.	Place the hand flat on top of the head	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Towards the middle line of the body	One
5.	Lift only the hand from the table	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Away from the body	One
6.	Spread little finger outwards	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Away from the body	One
7.	Extend the arm sideward up to shoulder height	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Away from the body	One
8.	Lift middle finger	Visual	Imitation	Non-symbolic	Intransitive	—	Simple	Away from the body	One

9. Make a catholic cross sing	Visual	Imitation	Symbolic	Intransitive	—	Simple	Away from the body	One
10. Show as if someone is crazy	Visual	Imitation	Symbolic	Intransitive	—	Repetitive	Towards the hemibody	One
11. Wipe dust from shoulder	Visual	Imitation	Symbolic	Intransitive	—	Repetitive	Could be toward the hemibody or towards the contralateral body	One
12. Salute like a soldier	Visual	Imitation	Symbolic	Intransitive	—	Simple	Towards the hemibody	One
13. Hitch for a car	Visual	Imitation	Symbolic	Intransitive	—	Simple	Away from the body	One
14. Make a stop sign	Visual	Imitation	Symbolic	Intransitive	—	Simple	Away from the body	One

15. Clasp fingers	Visual	Imitation	Symbolic	Intransitive	—	Simple	Away from the body	One
16. Point to a bird in the sky	Visual	Imitation	Symbolic	Intransitive	—	Simple	Away from the body	One
17. Drink from a glass	Visual	Imitation	Symbolic	Transitive	Absence of real tool	*Could be simple or multistep	Both, first away from the body, then, towards the middle line of the body	One
18. Comb hair	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Repetitive	Could be toward the middle line of the body, the hemibody or the contralateral body	One

19. Pick up telephone	Visual	Imitation	Symbolic	Transitive	Absence of real tool	*Could be simple or multistep	Both, first away from the body, then, towards the hemibody	One
20. Smoke a cigarette	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Simple	Towards the middle line of the body	One
21. Use a hammer	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Repetitive	Away from the body	One
22. Use a key	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Repetitive	Away from the body	One
23. Use scissors	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Repetitive	Away from the body	One
24. Use a stamp to post-mark	Visual	Imitation	Symbolic	Transitive	Absence of real tool	Simple	Away from the body	One
25. Place your hand flat on your head	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Towards the middle line of the body	One

26. Put your hand on your right (or left) shoulder	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Could be toward the hemibody or towards the contralateral body	One
27. Take your left (or right) ear between thumb and index finger	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Could be toward the hemibody or towards the contralateral body	One
28. Put your extend thumb on your forehead, other fingers point upwards	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Towards the middle line of the body	One

29. Extend your arm sideward up to shoulder height	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Away from the body	One
30. Bend your elbow and look at the palm of your hand	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Away from the body	One
31. Lift only your hand from the table	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Away from the body	One
32. Lift your index finger from the table	Auditory	Pantomime	Non-symbolic	Intransitive	—	Simple	Away from the body	One
33. Salute like a soldier	Auditory	Pantomime	Symbolic	Intransitive	—	Simple	Towards the hemibody	One
34. Throw me a kiss	Auditory	Pantomime	Symbolic	Intransitive	—	Multistep	First towards the middle line	One

							of the body, then away from the body	
35. Show as if someone is crazy	Auditory	Pantomime	Symbolic	Intransitive	—	Repetitive	Towards the hemibody	One
36. Scratch your head	Auditory	Pantomime	Symbolic	Intransitive	—	Repetitive	Towards the middle line of the body	One
37. Point to a bird in the sky	Auditory	Pantomime	Symbolic	Intransitive	—	Simple	Away from the body	One
38. Wave goodbye	Auditory	Pantomime	Symbolic	Intransitive	—	Repetitive	Away from the body	One
39. Make a stop sign	Auditory	Pantomime	Symbolic	Intransitive	—	Simple	Away from the body	One
40. Make a threatening sign	Auditory	Pantomime	Symbolic	Intransitive	—	Repetitive	Away from the body	One

41. Brush your teeth	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Repetitive	Towards the middle line of the body	One
42. Comb your hair	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Repetitive	Could be towards the middle line of the body, to the hemibody or to the contralateral body	One
43. Eat soup	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Simple	Both, first away from the body, then, towards the middle line of the body	One

44. Smoke a cigarette	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Simple	Towards the middle line of the body	One
45. Use a screwdriver	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Repetitive	Away from the body	One
46. Use a key	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Repetitive	Away from the body	One
47. Use a stamp to post-mark	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Simple	Away from the body	One
48. Cut bread that is put on the table	Auditory	Pantomime	Symbolic	Transitive	Absence of real tool	Simple	Away from the body	One

ADL Observations scale

1. Personal hygiene: washing the face and upper body	Auditory, visual, tactile	Real object use	Symbolic	Transitive	The patient has the real tool	Multistep	Towards the middle line of the body, hemibody and	Both
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								contralateral body	
2. Dressing: putting on a shirt or blouse	Auditory, visual, tactile	Real object use	Symbolic	Transitive	The patient has the real tool	Multistep	Towards the middle line of the body, hemibody and contralateral body	Both	
3. Feeding: preparing and eating a sandwich	Auditory, visual, tactile	Real object use	Symbolic	Transitive	The patient has the real tool	Multistep	First, away from the body, then towards the middle line of the body	Both	
4. An activity is chosen by the therapist	Auditory, visual, tactile	Real object use	Symbolic	Transitive	The patient has the real tool	—	—	—	

Note: ADL = Activities of Daily Living

1.2.7. Apraxic errors

Apraxic errors consisted of a broad spectrum of movement deficits associated with ULA. These errors serve as fundamental indicators in identifying apraxia through the analysis of movements, gestures, and tasks. One of the earliest approaches to apraxic error analysis was presented in Haaland and Flaherty's 1984 study, which identified and detailed error types including incorrect hand positioning, inappropriate hand movement, clumsiness, delays, unrelated responses, and body part as object errors⁸¹. Later, in 1988, Rothi and Mack advanced this analysis by classifying apraxic errors committed by post-stroke patients into four categories: temporal, spatial, content, and others⁸². Over the following years, various studies, such as those by McDondals, Tate, and Rigby, compared brain-damaged patients with control groups to determine which types of errors were specifically attributable to ULA⁸³. Currently, recent studies have focused on elucidating the relationship between these errors and the aetiology of apraxia, aiming to better understand the nature and causes of this deficit^{25,84}. The most reported apraxic errors in the literature are summarised in Table 3. Although classifications can vary depending on the study, these errors are generally categorised into three main types: temporal errors, spatial errors, and content errors^{25,84}.

The apraxic errors are important not only because they hinder directly movement performance, but also because they can affect all aspects of daily life. Individuals with ULA frequently report a sense of generalised clumsiness with their hands due to these errors that limit their ability to manage daily life.

Table 3. Classification of the most reported apraxic errors in the literature

Error category	Apraxic error name	Definition	Rationale to be included in this category
Temporal	Timing	Delay in initiating the requested task, alterations in speed (accelerated or slowed), or irregular production rates ⁸⁵ .	Timing errors disrupt the expected temporal flow of the gesture.
	Occurrence	The gesture includes an inappropriate increase or decrease in the number of movement cycles ⁶³ .	Occurrence errors altered the temporal pattern of the gesture.
Spatial	Amplitude	The gesture is directed toward the target but spatially deviates slightly in space ⁸⁵ .	Amplitude errors are categorised as spatial errors because they involve deviations in the spatial accuracy of the movement.
	Internal configuration	Errors in the positioning of the fingers or hand when configuring the gesture. This includes omissions of body parts in the gesture ²⁵ .	Internal configuration errors are categorised as spatial errors, as they involve inaccuracies in the placement and arrangement of body parts relative to the intended gesture. These errors reflect difficulties in spatially coordinating the body to achieve the correct gesture configuration.
	External configuration	Incorrect spatial orientation or positioning of the fingers, hand, or arm relative to the target of the movement ²⁵ .	External configuration errors are classified as spatial, as they affect how the gesture aligns spatially with the context.

Body part as an object	Using a body part, such as a finger, hand, or arm, as if it were the imagined tool during the execution of transitive gestures. This error persists even after corrective feedback from the evaluator ⁸⁶ .	Proper execution of transitive gestures necessitates accurate spatial representation and alignment of the tool, which is disrupted when a body part is inappropriately used as the tool.	
Movement	The movement trajectory is defective, or the expected dexterity is not accomplished ⁶³ .	Movement error is considered a spatial error because it pertains to the spatial coordination and alignment of the movement. When the trajectory of a gesture is flawed, it indicates that the spatial aspects of the action are not being properly managed.	
Content	Substitutions	<ul style="list-style-type: none"> • Related: For transitive gestures: the requested gesture is replaced by a related action using a different but similar object from the same category⁸⁷. • Non-related: For intransitive gestures: the requested gesture is replaced by another related movement that conveys a similar symbolic meaning but is not the exact gesture requested⁶³. 	Substitution errors are categorised as content errors because they involve replacing the requested gesture with another action. This reflects a misunderstanding or misinterpretation of the desired content or function of the gesture, whether it is related or unrelated to the original request.

- Non-related: the requested gesture is replaced by an action where the object or symbolic meaning is unrelated to the intended gesture⁶³.

Object omission	The gesture is performed without the real or imagined object ⁸⁸ .	Object omission is categorised as a content error because the omission is a misunderstanding of the content requirements of the action.
Sequencing	The steps required to perform a multistep gesture are omitted, added, or rearranged ⁸⁹ .	Sequencing errors are categorised under content because they involve alterations in the essential elements of the action. Unlike temporal errors, which pertain to the timing and speed of movements, sequencing errors affect the intrinsic structure and order of the gesture, thereby altering the intended content or meaning of the gesture.
Unrecognisable movement	A movement that deviates significantly from the expected movement that it no longer represents the original gesture ⁸²	Unrecognisable errors are categorised as content errors because they fundamentally disrupt the intended meaning and recognisable structure of the action.

1.3. Factors potentially related to upper limb apraxia: human occupation and health factors

Daily life consists of multiple factors that influence how individuals manage and evolve over time. Among them, human occupational and health factors are fundamental, as they determine how well a person manages daily activities, remains integrated into society, and adapts to evolving needs and goals⁹⁰. Both human occupation and health factors have shown an influence on well-being, quality of life, and levels of autonomy^{91,92}. Moreover, they are integrated into individuals' lifestyles, making them key elements in health promotion, and primary and secondary prevention^{93,94}. Chronic conditions, such as stroke, can have lasting effects on both human occupation and health factors, limiting a person's ability to manage daily life. However, the specific reasons behind these effects are not yet fully understood. Understanding these reasons could aid in the recovery of these patients since human occupation and health factors play a role in activity participation^{95,96}. Therefore, early identification and evaluation of the conditions that may deteriorate both is essential. These actions could improve prognosis and guide future preventive and rehabilitation approaches.

1.3.1. Human occupation

Human occupation refers to the set of daily activities that individuals perform, along with the meaning and subjective value these activities provide. Needs, interests, desires, values, and opportunities form occupations⁹². Human occupation involves engaging in activities within a specific temporal, physical, and sociocultural context. This engagement is motivated, performed, and patterned based on the three human occupation factors: performance capacity, volition, and habituation⁹⁷. Performance capacity encompasses the physical and mental abilities required to perform activities, reflecting

how effectively individuals can participate based on their capabilities⁹⁸. Volition refers to the motivation or intention behind participating in activities, focusing on why a person chooses to engage in certain occupations. On the other hand, habituation involves the development of patterns that organise daily occupations, including the formation of habits and roles. These patterns help to respond to environmental demands and manage time and resources⁹⁹.

Habituation is a process that enables individuals to adapt to their community, time frames, and social structure. Habits and roles structure, organise, and provide stability across life stages⁹⁷. Roles, in particular, are an essential component of habituation, as they define how individuals interact with their environment and fulfil responsibilities. Disruptions in habits and roles can negatively affect the quality of life, increase stress and uncertainty, and disrupt personal identity^{100,101}.

1.3.1.1. Role participation

Human roles are defined as sets of behaviours, responsibilities, and principles guiding how individuals engage and participate in the activities of daily living¹⁰²⁻¹⁰⁴. Role participation reflects a balance between needs, personal desires, and social expectations, providing a sense of purpose to daily activities¹⁰⁵. This purpose is grounded in an individual's sense of responsibility towards their roles¹⁰⁶, which, in turn, contributes to defining their personal identity¹⁰⁷. Personal identity enables individuals to feel represented by their actions and interpret feedback from others through the lens of their own values. Roles shape this identity by providing individuals with a context for their performance, which is closely linked to their personal values¹⁰⁴. The comprehension of how individuals manage their role participation and fulfil their responsibilities based on their values provides necessary knowledge about their needs, desires, and

expectations¹⁰⁸. Changes in role participation can affect lifestyle organisation, personal identity, and community interaction^{103,108}. Moreover, participation can vary during different stages or after life-changing events such as a stroke¹⁰⁹. For these reasons, it is necessary to understand current participation levels, any deviations from past involvement, and future expectations for addressing the needs of patients in their daily lives.

The level of role participation often declines following a stroke, partly due to cognitive factors¹¹⁰. Overall, cognitive impairment is a strong predictor of engagement in daily activities 6 to 12 months post-stroke¹¹¹. Specifically, research has shown that cognitive deficits, such as those in memory, executive function, and attention, are associated with reduced levels of activity participation¹¹². The mechanisms involved in this association may be because role participation demands high cognitive effort, as it requires performing complex activities, adaptability, responsibility, and social interaction with others¹¹³. However, understanding whether other underdiagnosed cognitive deficits, such as apraxia, are related to role participation remains unexplored.

The Role Checklist is the most common questionnaire that evaluates participation in roles and their assigned value¹¹⁴. It is part of the Model of Human Occupation (MOHO)¹⁰⁶, which describes how occupational behaviour contributes to the construction of personal identity. Since 1985, six editions of MOHO have been published^{90,98,99,106,115,116}. The Role Checklist has evolved alongside MOHO, resulting in three versions, with the original being the most widely used in clinical and research settings^{117,118}. This version has been studied in people with various health conditions, including chronic obstructive pulmonary disease¹¹⁹, traumatic spinal cord injury¹²⁰, and brain damage¹²¹. However, its use with Spanish-speaking clinical populations has not

been studied, making it necessary to confirm whether the Role Checklist has adequate psychometric properties to evaluate role participation in Spanish-speaking post-stroke patients before using it.

In post-stroke patients, the Role Checklist can register changes in role participation and help to understand the assigned value to each role¹²². After a stroke, individuals tend to reduce role participation due to physical, cognitive, and psychosocial sequelae¹²³. This decrease influences the emotional state¹²⁴, satisfaction of personal needs, and perceived quality of life¹²⁵. Post-stroke patients may need to restructure their occupations, which relates to decreased motivation and a lack of meaning in daily routines¹²⁶. Knowing role participation levels could help detect needs, tailor rehabilitation plans, and prevent secondary complications. Therefore, it is essential to have reliable instruments for evaluating role participation. Understanding the psychometric characteristics of the Role Checklist would allow for more precise assessments of role participation in post-stroke patients.

The Role Checklist has been validated for use with individuals with chronic obstructive pulmonary disease¹¹⁹, young mothers¹²⁷, and university students¹¹⁴. As well, it has been translated and adapted into Spanish¹²⁸, Portuguese¹¹⁹, and Malay¹²⁹. Even though the original version of the Role Checklist is very used, its content validity and reliability specifically for Spanish-speaking post-stroke patients have not been evaluated.

1.3.2. Health factors

Health factors refer to a range of biological, psychological, social, and environmental elements that influence an individual's overall health and well-being, affecting both the risk of developing conditions and/or the ability to manage or recover from them¹³⁰. Some of these health factors are associated with performance capacity and

the volition, both described in the MOHO¹⁰⁶. Volition is composed of personal causation, values, and interests. Personal causation refers to the sense of competence and effectiveness in performing tasks and activities. It involves two components: the sense of personal capacity and self-efficacy. The perception of personal capacity is how individuals view their own physical, intellectual, and social abilities. On the other hand, self-efficacy is the belief in one's ability to effectively apply these capacities to accomplish daily tasks and goals. Both components are important health factors as they influence the ability to manage health parameters, cope with health-related challenges, and recover from illnesses¹³¹.

As volition is a process that changes over time according to the learning or experiences of individuals, it is important to maintain a constant evaluation to detect any anomalies, for example, after a stroke which experience, and which sequelae can affect the personal causation and therefore, the health factors.

1.3.2.1. General self-efficacy

General self-efficacy is commonly defined as the belief in one's capability to effectively perform actions aimed at managing personal and everyday life goals. Bandura identifies four primary sources that characterise self-efficacy: direct mastery experiences, vicarious experiences, verbal persuasion, and physiological states¹³². These sources can influence emotions, thoughts, and behaviours, which, in turn are closely related to health outcomes and performance in health-related activities. Self-efficacy plays a key role in modulating efforts to achieve health goals, adhere to treatment, and build resilience in challenging contexts¹³³. In individuals who have suffered a stroke, self-efficacy can influence the recovery process. Higher levels of self-efficacy are associated with increased motivation and involvement in activities, facilitating the achievement of

clinical goals¹³⁴. This association may be attributable to the relationship between self-efficacy and various factors, such as improvements in mobility, balance, fall risk, community reintegration¹³⁵, perceived health status^{133–135}, and quality of life¹³⁶. Furthermore, individuals diagnosed with stroke may experience inconsistencies or incongruences in their sense of self. These incongruences can affect their levels of self-efficacy, which may not always be addressed in their rehabilitation plans¹³⁷.

1.3.2.2. Domain-specific self-efficacy for managing symptoms

Domain-specific self-efficacy for managing symptoms refers to the belief in one's ability to perform actions aimed at achieving specific goals related to symptom management. These goals may include recognising and adapting to symptoms, evaluating risk situations, and preventing health complications¹³⁸. Domain-specific self-efficacy empowers individuals who have experienced a stroke¹³⁹. The World Health Organization supports the importance of patient autonomy in symptom management plans. The treatment of domain-specific self-efficacy can facilitate autonomy and improve decision-making in illness control¹³⁸. Recent studies have shown that self-efficacy affects health status as well as physical and psychological symptoms in chronic illness^{131,140–142}. In stroke patients, higher levels of domain-specific self-efficacy have been related to better health outcomes¹⁴². Moreover, self-efficacy levels are closely related to behaviour, altering self-management¹⁴³.

2. RATIONALE FOR THIS THESIS

A stroke is a medical condition with an increasing incidence that progressively affects younger populations. The main consequences of stroke, which are often chronic, include cognitive, physical, and emotional impairments. This leads to important life pattern changes and an obligated reorganisation of personal priorities. All these changes affect the quality of life, self-perception, psychological well-being, and social interactions¹⁴⁴. In the long term, this causes the personal identity of survivors may differ from who they were before¹⁴⁵. Furthermore, stroke is strongly associated with chronic disability, meaning its effects extend beyond the individual, placing a burden on families, caregivers and healthcare systems. In this line, it is important to note that the socioeconomic impact of stroke is considerable¹⁴⁶ and that is why early detection of stroke-related sequelae is one of the major challenges today. Timely identification can prevent further complications, facilitate early interventions, improve quality of life, and alleviate the long-term strain on healthcare resources.

Upper limb apraxia is a neurological syndrome that affects a high percentage of stroke survivors, yet it remains one of the most underdiagnosed and undertreated conditions in the rehabilitation area. The reasons for this underdiagnosis can be summarised into three main causes. First, there is a lack of solid knowledge that properly defines ULA, including its aetiology, symptoms, and implications for individuals. Second, ULA often goes unnoticed in patients, either because clumsiness caused by ULA is frequently attributable to other stroke sequelae, or because patients may lack awareness of their deficits, complicating detection further. In natural environments, patients receive external cues that facilitate task performance so that ULA is not as evident as when assessed in clinical settings. In addition, individuals try to compensate for these

deficiencies by hiding the issue or participating in fewer activities than before the stroke. Over time, however, this behaviour leads to a decline in functionality, masked by the underdiagnosis. Third, the lack of appropriate instruments to detect and evaluate ULA, particularly in non-English-speaking contexts, contributes to the underdiagnosis. Additionally, the existing instruments have not been sufficiently validated for broader use. The scarcity of methodological rigour in the design of these instruments further hinders the progress of knowledge about apraxia. The use of validated instruments that provide psychometric data is the first step toward the accurate diagnosis, treatment, and research of ULA. It is the foundation on which solid evidence can be built.

Regarding the ULA assessment, the TULIA Apraxia test and the ADL Observations scale are two of the most comprehensive instruments available for evaluating this syndrome. The variability among their items allows for the identification of apraxic errors across the broad continuum of praxis manifestations. As well, these instruments enable not only the identification of the presence of ULA but also the understanding of its consequences on daily life. For these reasons, assessing whether the TULIA Apraxia test and the ADL Observations scale are valid and reliable instruments for evaluating upper limb apraxia in Spanish-speaking post-stroke patients could enhance early detection of stroke sequelae, optimise clinical reasoning, and support ULA research. Furthermore, a validation and reliability analysis could promote the TULIA Apraxia test and the ADL Observations scale as gold standards in research and clinical areas.

ULA seems logically related to human occupation and health factors. ULA, yet there is limited understanding of these potential relationships in post-stroke patients. Apraxia disrupts essential daily movements, including object manipulation and non-verbal communication^{58,147}, which are fundamental for participating in roles. Moreover,

apraxic errors cause imprecision in deliberate actions that increase dependence on activities of daily living⁶⁴; consequently, this increased dependence may reduce levels of role participation. Evidence shows that ULA can affect particular roles, such as the ability to return to work⁴⁹. Given that roles are an essential part of post-stroke rehabilitation, personal identity, and community reintegration^{148,149}, understanding the deficits that may be disrupting them can be relevant for identifying the real needs of patients, guiding treatment plans, promoting social participation, and improving the quality of life of this population.

On the other hand, the presence of ULA can lead to perceptions of decreased perceived self-efficacy. As ULA affects non-verbal communication, this may result in deficits in social skills and a diminished ability to interact effectively with the environment⁵⁰. Both conscious and unconscious awareness of these limitations can affect an individual's self-concept. When self-concept is compromised, individuals often experience frustration, inefficiency, and decreased self-esteem^{150,151}. This combination of negative perception and reduced interaction with the environment can impair an individual's ability to cope with daily stressors^{150,151}. How an individual perceives their ability to face daily challenges, demands, and stressors is influenced by levels of general self-efficacy as well as self-efficacy related to managing symptoms in post-stroke patients¹³¹. Given that this population frequently exhibits ULA, it is plausible to hypothesise that higher levels of ULA are associated with lower levels of self-efficacy. Exploring whether ULA affects self-efficacy levels is important for identifying possible limitations in recovery and for planning interventions.

In summary, the lack of knowledge about the ULA assessment in post-stroke patients must be addressed due to the number of individuals who could benefit from

advancements in the diagnostic process. To achieve this, the first step is to focus on the evaluation instruments for ULA. Translating, cultural adapting, and assessing their validity, reliability, and diagnostic accuracy across post-stroke patients will provide effective tools for managing apraxia. This, in turn, enables the exploration of the potential relation between ULA's and human occupations or health factors.

3. OBJECTIVES

3.1. Overall objectives

- To analyse the psychometric properties of two instruments for detecting and evaluating upper limb apraxia in Spanish-speaking post-stroke patients.
- To explore whether upper limb apraxia is related to human occupation and health factors in post-stroke patients.

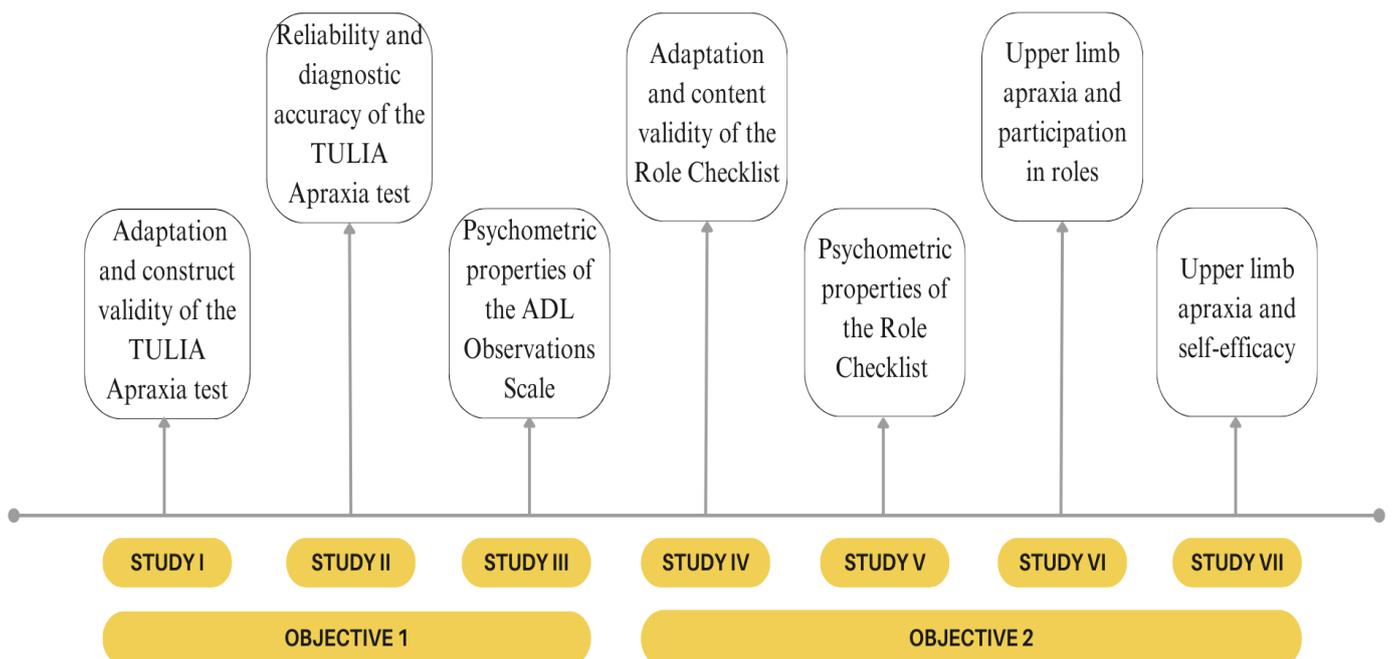
3.2. Specific objectives

- To cross-cultural adapt the TULIA Apraxia test for Spanish-speaking post-stroke patients.
- To determine if the Spanish version of the TULIA Apraxia test has adequate construct validity in post-stroke patients.
- To assess the reliability of the Spanish version of the TULIA Apraxia test in post-stroke patients.
- To analyse the diagnostic accuracy of the TULIA Apraxia test in Spanish-speaking post-stroke patients.
- To cross-cultural adapt the ADL Observations scale for Spanish-speaking post-stroke patients.
- To determine if the Spanish version of the ADL Observations scale has adequate construct validity in post-stroke patients.
- To evaluate the reliability of the Spanish version of the ADL Observations scale.
- To analyse the diagnostic accuracy of the ADL Observations scale in Spanish-speaking post-stroke patients.

- To evaluate if upper limb apraxia and role participation are associated in post-stroke patients.
- To explore whether upper limb apraxia and general self-efficacy and self-efficacy for managing symptoms are related in post-stroke patients.

II

Methods



4. METHODS

4.1. Study I: “Cross-cultural adaptation and construct validity of the Spanish version of the TULIA Apraxia test for post-stroke patients”

4.1.1. Study design

This study had an observational cross-sectional design and was conducted in two phases. The first phase involved translating and cross-cultural adapting the TULIA Apraxia test using the back-translation methodology¹⁵². In the second phase, the construct validity of the Spanish version of the TULIA Apraxia test was analysed using Confirmatory Factor Analysis (CFA). Convergent validity was also assessed. The adherence to the COnsensus-based Standards for the selection of health status Measurement INstruments (COSMIN) guidelines and checklist ensured the quality of the entire research process^{153,154}.

4.1.2. Sample selection criteria and sample size estimation

The sample selection criteria were: i) confirmed stroke diagnosis; ii) mild-moderate stroke sequelae assessed by the National Institutes of Health Stroke Scale (NIHSS)¹⁵⁵; iii) age 18 years or older; and iv) fluent Spanish proficiency. Exclusion criteria included: i) any diagnosis of brain damage other than stroke; ii) moderate to severe cognitive impairment reported in the clinical history¹⁵⁶; iii) diagnosis of severe intellectual disability; iv) diagnosis of severe mental disorder; v) musculoskeletal disorder; vi) peripheral nervous system injuries; and vii) uncorrected sensory impairments. Participants were recruited from randomly selected public primary care centres from the province of Granada (Andalusia).

The sample size estimation was determined using the Arifin formula (A Web-based Sample Size Calculator for Reliability Studies) for CFA. The analysis included 48 items and six factors²⁶. Expected parameters included the Comparative Fit Index (CFI) of 0.900¹⁵⁷, average factor loading of 0.600, and a factor correlation of 0.300¹⁵⁸. The significance level was set at two-tailed with a value of 0.05, and the power was estimated at 80%^{159,160}. Accordingly, the calculated sample size for this study was 199 participants.

4.1.3. Description of the participants

Participants were described in terms of socio-demographic, lifestyle behaviours, and clinical characteristics. An *ad hoc* questionnaire was used to register the data. Socio-demographic information included sex (men, women), age (in years), marital status (single, married, divorced, widowed), and educational level (primary, secondary, vocational, university education). Self-reported lifestyle behaviours were smoking habit (non-smoker, smoker, ex-smoker, number of cigarettes per day), alcohol and caffeine consumption (non-drinker, drinker, number of alcohol and caffeine units per day), daily sleep duration (average in hours), and physical activity (no, yes, average in minutes per day). Clinical characteristics covered types of strokes (ischaemic, haemorrhagic, lacunar), affected hemisphere (right, left, both, indeterminate), time since stroke onset (in months), stages of stroke (subacute, chronic)¹⁶¹, and the presence of hemiplegia (absent, present). Participants' socio-demographics, lifestyle behaviours, and clinical data were summarised and reported using frequencies, means, percentages, and standard deviations, as appropriate. All descriptive data were analysed using the software SPSS version 28.0 for Windows.

4.1.4. Description of the TULIA Apraxia test

The TULIA Apraxia test is composed of 48 items distributed across six subtests: non-symbolic imitation, intransitive imitation, transitive imitation, non-symbolic pantomime, intransitive pantomime, and transitive pantomime. Each subtest contains eight items, which provides the diverse range of movements for ULA evaluation. Ratings are on a 6-point Likert scale ranging from zero to five. The scoring method is highly specific: first, the movement goal is assessed, categorising scores as either 0 and 1 if the goal is not achieved or 2-5 if the goal is achieved. It is considered that the goal is not achieved if the gesture's trajectory is severely disrupted or if the semantic content of the action is incorrect in symbolic gestures. The trajectory considers spatial orientation, including the movement plane to the target objective, joint coordination, and movement shape. Second, apraxic errors are assessed in detail, determining the final score. The total score of the test ranges from zero to 240 points, with lower scores reflecting more severe upper limb apraxia. The TULIA Apraxia test has demonstrated robust psychometric properties, including high internal consistency (Cronbach's alpha values ranging from 0.67 to 0.90) and strong correlation with the De Renzi test ($r = 0.82$)²⁶.

4.1.5. Methodological phases of the study

4.1.5.1. Phase I: Translation and cross-cultural adaptation of the TULIA Apraxia test

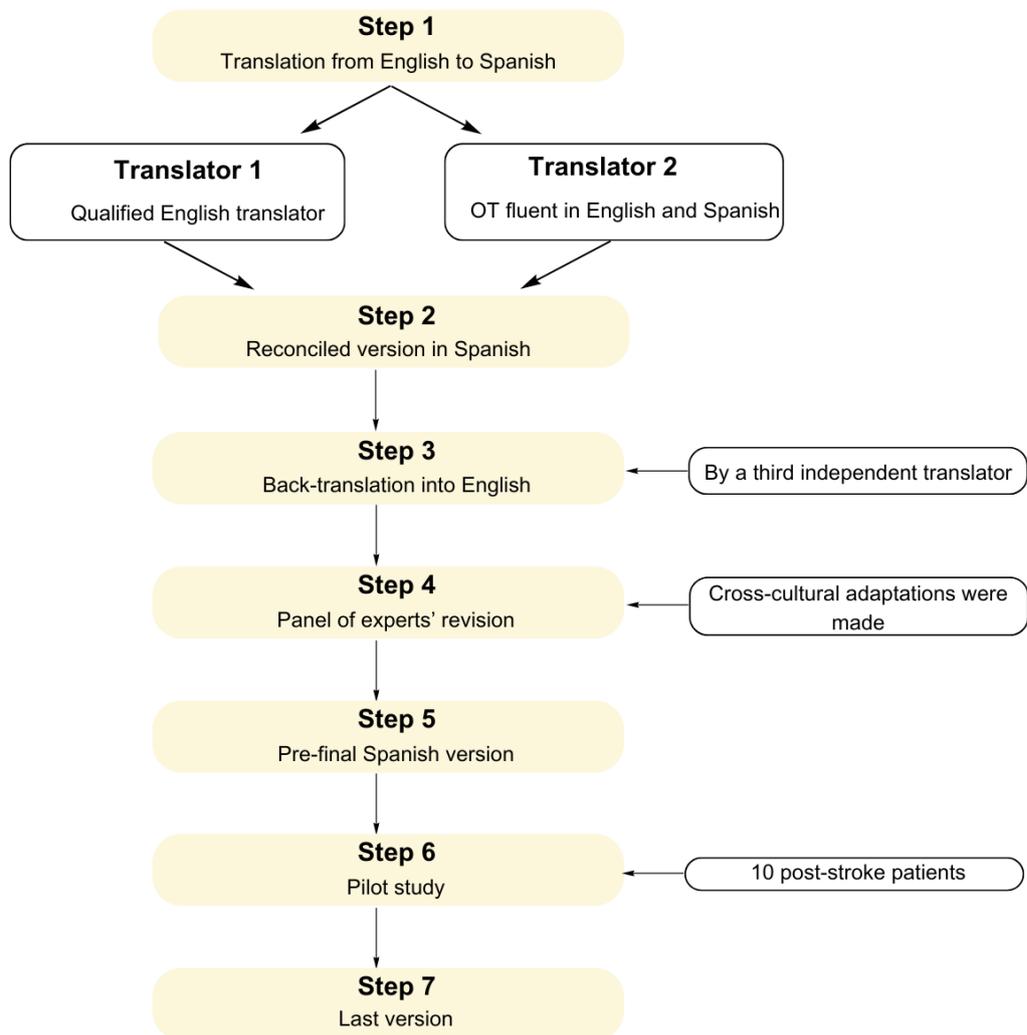
The translation and cross-cultural adaptation of the TULIA Apraxia test followed the back-translation methodology according to the recommended guidelines^{162,163} through a thorough seven-step process.

In the first step, two independent experts translated the original TULIA Apraxia test from English to Spanish. The first expert was a qualified English translator unfamiliar

with health terminology and the construct of the TULIA Apraxia test but familiar with the source language and culture. The second expert was an occupational therapist fluent in English and Spanish as the mother tongue with extensive experience in stroke evaluations, apraxia, and psychometry. In the second step, a panel of experts analysed and compared the two Spanish translations' instructions, items, and the scoring method of the TULIA Apraxia test. Ambiguities and discrepancies in words, sentences, and meaning were discussed and assessed¹⁶⁴. Decisions were based on comprehensibility, cultural, grammatical, and terminology criteria. Finally, through consensus, a reconciled Spanish version of the TULIA Apraxia test was developed. The third step involved the back-translation of the reconciled Spanish version of the TULIA Apraxia test to English by a third independent qualified translator blind to the original version. A back-translated version of the TULIA Apraxia test was obtained. In the fourth step, the panel of experts compared the original TULIA Apraxia test and the English back-translation to ensure equivalence in the format, wording, meaning, relevance, and grammatical structure of the sentences¹⁶⁵. Cross-cultural adaptations were made, involving semantic, conceptual, and operational equivalences between the two languages¹⁵². The cultural meanings of the gestures included in the test and colloquialisms were discussed and resolved. Gender-inclusive language was applied in the Spanish version. In the fifth step, the panel of experts synthesised the pre-final Spanish version of the TULIA Apraxia test. In the sixth step, a pilot study was conducted to assess the comprehensibility of the adapted Spanish version of the TULIA Apraxia test. The sample size consisted of 10 post-stroke patients¹⁶⁵. In the seventh step, the panel of experts analysed the results of the pilot study and finalised the last Spanish version of the TULIA Apraxia test based on the premise of clarity, specificity, and precision of instructions, items, and the scoring method. Figure 1 shows a schema of the process, and Annexe I provides the full reasoning process behind

the translation and cross-cultural adaptation of the TULIA Apraxia test. Next phase of the study involved the assessment of the construct validity of the Spanish version of the TULIA Apraxia test.

Figure 1. Process of translation and cross-cultural adaptation of the TULIA Apraxia test



Note: OT = Occupational Therapist

4.1.5.2. Phase II: Assessment of the construct validity of the Spanish version of the TULIA Apraxia test

4.1.5.2.1. Confirmatory factor analysis

To assess the construct validity of the Spanish version of the TULIA Apraxia test and examine the theoretical six-factor structure, CFA was conducted. The six-factor structure of the TULIA Apraxia test includes: i) imitation, non-symbolic; ii) imitation, intransitive; iii) imitation, transitive; iv) pantomime, non-symbolic; v) pantomime, intransitive; and vi) pantomime, transitive. Data analysis was performed using the software Analysis of Moment Structures (AMOS) version 28 for Windows. Before conducting the CFA, the adequacy of the data and sample size for factor analysis was assessed using Kaiser-Meyer-Olkin (KMO)¹⁶⁶ and Bartlett's test of sphericity¹⁶⁷. A KMO value greater than 0.60 was considered acceptable¹⁶⁶, and a Bartlett's test with a p-value <0.05 indicated satisfactory compatibility of the indicators. Additionally, a preliminary reliability study was conducted with a sample of 30 participants to assess the TULIA Apraxia test's performance across the six expected factors. The CFA process encompassed specification, identification, estimation, assessment, and re-specification¹⁶⁸. A maximum likelihood estimator was employed, as all variables were normally distributed and there were no missing data. To assess the model's goodness of fit, a path diagram and several indices were used with the following thresholds: ratio of chi-square and degrees of freedom (χ^2/df) ≤ 3.000 ¹⁶⁹, Root Mean Square Error Of Approximation (RMSEA) ≤ 0.050 with 90% of confidence interval¹⁷⁰, CFI ≥ 0.900 ¹⁵⁷, Tucker-Lewis Index (TLI) ≥ 0.900 ¹⁷¹, and Standardised Root-Mean-Square Residual (SRMR) ≤ 0.050 ¹⁷². Modification indices and theoretical considerations were utilised for the model adjustment. On the other hand, in addition to the evaluation of the TULIA Apraxia test, a set of 20 gesture items (10 imitations and 10 pantomimes) was also

assessed to ensure a variety of items were available in case any original item did not perform well in the confirmatory factor analysis. These gesture items were selected from a variety of other apraxia tests^{173,174}.

4.1.5.2.2. Convergent validity

Convergent validity was assessed to determine if the TULIA Apraxia test correlates well with other standardised measures of upper limb apraxia, thereby confirming if it accurately assesses the same construct. The Pearson's correlation coefficient¹⁷⁵ was used to calculate the correlation between the scores of each six factors of the TULIA Apraxia test and the scores from three other ULA tests. Coefficients were interpreted as negligible (0.00 – 0.10), weak (0.10 – 0.39), moderate (0.40 – 0.69), strong (0.70 – 0.89), and robust correlation (0.90 – 1.00)¹⁷⁶. The three standardised instruments for ULA evaluations employed were the demonstration-of-use test, the ideomotor apraxia test, and the ADL Observations scale.

In the demonstration-of-use test, patients should demonstrate the use of ten common objects presented one by one. The demonstration is using gestures, without handling the objects. Scoring ranges from zero to two points, with two attempts allowed for each object use demonstration. An incorrect performance after the second attempt scores zero. Correct performance on the second attempt or with minor errors scores one point. Correct performance on the first attempt is scored with two points. The total score ranges from zero to 20, with lower scores indicating worse praxis performance⁵⁴. The test's internal consistency for this study sample was 0.809.

The ideomotor apraxia test requires patients to imitate ten symbolic gestures. Performance is rated on a three-point scale. Two points are given for precise imitation. One point is given when the goal of the movement is achieved with minor temporal or

spatial errors. Zero points are given for any other type of error. The total score ranges from zero to 20, with lower scores indicating worse praxis performance⁵⁵. Internal consistency for this study sample had a Cronbach's alpha of 0.728.

The ADL Observations scale assesses praxis performance during activities of daily living. This scale evaluates praxis function during four ADL tasks: personal hygiene, dressing, feeding, and a fourth activity chosen by the evaluator, which in this study was brushing teeth. Each activity is scored from zero to three, considering four specific performance parameters: independence, initiation, execution, and control. The total score ranges from zero to 48 points, with a higher score indicating lower levels of praxis execution during the performance of ADLs. The ADL Observations scale exhibits adequate validity and strong internal consistency, reflected in a Cronbach's alpha of 0.940⁶². For the study sample, internal consistency evaluated with Cronbach's alpha was 0.959.

4.1.6. Ethical considerations

The study obtained approval from the Ethics Committee for Biomedical Research CEI-Granada in the province of Granada (Andalusia, Spain) under reference number 1503-N-21. The research process adhered to ethical guidelines outlined in the Declaration of Helsinki, ensuring ethical conduct throughout the entire research process, including data collection. The participants were informed about their right to participate or withdraw at any time, as well as the confidentiality of their information. Afterwards, they signed the informed consent form, retaining a copy for themselves and providing another copy to the researcher.

Before starting the study, the authors of this research contacted the original authors of the TULIA Apraxia test to inform them about the cross-cultural adaptation and validation process of the instrument for Spanish-speaking post-stroke patients.

4.2. Study II: “Reliability and optimal cut-off points of the TULIA Apraxia test for Spanish-speaking post-stroke patients”

4.2.1. Study design

This research has a cross-sectional and prospective design focused on psychometric analysis of the TULIA Apraxia test. The study adhered to the Standards for Reporting of Diagnostic Accuracy (STARD) guidelines for reporting diagnostic accuracy studies¹⁷⁷.

4.2.2. Sample selection criteria and sample size estimation

The study sample was recruited from public primary care centres randomly selected from the province of Granada (Andalusia). The study participants met the following eligibility criteria: i) a confirmed stroke diagnosis; ii) mild-moderate stroke sequelae assessed by the NIHSS¹⁵⁵; iii) being 18 years of age or older; and iv) having fluent Spanish proficiency. Exclusion criteria included: i) any diagnosis of brain damage other than stroke; ii) moderate to severe cognitive impairment reported in the clinical history¹⁵⁶; iii) a diagnosis of severe intellectual disability; iv) a diagnosis of severe mental disorder; v) musculoskeletal disorder; vi) peripheral nervous system injuries; and vii) uncorrected sensory impairments.

Sample size estimation was calculated using the formula by Bonett for Cronbach's alpha^{178,179}. A minimum Cronbach's alpha value (H_0) of 0.700^{180,181} was established, and an expected value (H_1) of 0.800 was assumed²⁶. A significance level (α) of 0.050 and a statistical power of 90% were accepted. Considering a possible dropout rate of 31%¹⁸², the estimated required sample size was 190 post-stroke participants.

4.2.3. Description of the participants

Baseline demographic data were collected using an *ad hoc* questionnaire and included sex (men, women), age (in years), marital status (single, married, divorced, widowed), and educational level (primary, secondary, vocational, university education). Self-reported lifestyle behaviours were asked as well, including smoking habits (non-smoker, smoker, ex-smoker, and the number of cigarettes per day), alcohol and caffeine consumption (non-drinker, drinker, and the number of alcohol units per day), daily sleep duration (average in hours), and physical activity (no, yes, and average in minutes per day). Clinical characteristics were obtained from the patient's clinical history, covering aspects such as stroke type (ischaemic, haemorrhagic, lacunar), affected hemisphere (right, left, both, indeterminate), time since stroke onset (in months), stroke phases (subacute or chronic)¹⁶¹, and the presence of hemiplegia (absent, present).

4.2.4. Description of the TULIA Apraxia test

Idem section 4.1.4

4.2.5. Statistical methods

The software SPSS version 28.0 for Windows was used to analyse the data of the study. Participants' socio-demographics, lifestyle behaviours, and clinical characteristics were summarised and reported using means, frequencies, percentages, and standard deviations, as appropriate. Descriptive statistics obtained for the TULIA Apraxia test were summarised in means, standard deviations, ranges, minimums, maximums, and percentiles (25th, 50th, and 75th).

4.2.5.1. Internal consistency

The reliability of the TULIA Apraxia test was assessed in terms of internal consistency using Cronbach's alpha with a 95% confidence interval (CI) across its six subtests¹⁸³. A coefficient above 0.700 was considered to indicate satisfactory internal consistency^{180,181}.

4.2.5.2. Identification of cut-off points

Optimal cut-off points to distinguish apraxia were identified for each subtest of the TULIA Apraxia test and stratified for age (≤ 65 years, >65 years)¹⁸⁴ to ensure more accuracy^{185,186}. The decision to stratify the sample was driven by the possible influence of ageing on musculoskeletal and cognitive skills. Three methods were employed to calculate the cut-off points. First, the Receiver Operating Characteristic (ROC) analysis was performed. Second, the Area Under the Curve (AUC) with a 95% confidence interval^{187,188} was calculated, and third, the Youden Index were examined. ROC analysis graphically evaluates the diagnostic performance of a binary classifier by plotting the true positive rate (sensitivity) against the false positive rate ($1 - \text{specificity}$) at different thresholds¹⁸⁹. The area under the curve analysis assesses the diagnostic accuracy of the test, interpreted as no discrimination (<0.500), acceptable (0.600 to 0.800), and excellent discrimination (>0.800)¹⁹⁰. The Youden Index is used to identify the optimal cut-off point by maximising the sum of sensitivity and specificity¹⁹¹. Participants were dichotomised as patients with or without apraxia using the cut-off point of a reference standard, the Apraxia Screen of TULIA (AST)^{192,193}. Both the TULIA Apraxia test and the AST TULIA test were administered in the same evaluation session. This approach allowed for a robust analysis of the participants, ensuring that the screening process was both sensitive and specific in identifying relevant cases.

4.2.5.3. Diagnostic accuracy

To assess the diagnostic accuracy of the TULIA Apraxia test, various indices were calculated for each subtest and adjusted for age: i) sensitivity, ii) specificity, iii) positive predictive value, and iv) negative predictive value. These four indices were calculated with their respective 95% confidence interval. Sensitivity indicates the ability of the test to identify patients with ULA correctly. Conversely, specificity refers to the test's ability to correctly identify individuals without apraxia¹⁹⁴. The positive predictive value represents the probability that individuals identified as have apraxia by the test have it, while the negative predictive value indicates the probability that individuals identified as not have upper limb apraxia truly do not have it¹⁹⁵. These indices are very useful as they provide a thorough understanding of the test's performance in distinguishing upper limb apraxia. Besides, a contingency table was created to compare the TULIA Apraxia test results with those of the AST TULIA test for each subtest. This contingency table shows the number of patients with and without the condition across both tests, indicating the relationship between them and, thus the diagnostic accuracy of the TULIA Apraxia test.

4.2.6. Ethical considerations

Idem section 4.1.6

4.3. Study III: “Cross-cultural adaptation and psychometric properties of the Activities of daily living (ADL) Observations Scale for Spanish-speaking post-stroke patients”

4.3.1. Study design

This cross-sectional and prospective study was conducted in two phases. The first phase involved the translation and cross-cultural adaptation of the ADL Observations scale following the back translation method¹⁵². In the second phase, the psychometric properties of the Spanish version of the ADL Observations scale were assessed in post-stroke patients. These properties included construct validity, internal consistency, estimation of cut-off points, and analysis of predictive values. The study adhered to the recommendations of COSMIN to ensure the methodological rigour of the entire research process^{153,154}. Additionally, the STARD guidelines for reporting diagnostic accuracy studies were followed¹⁷⁷.

4.3.2. Sample selection criteria and sample size estimation

Post-stroke patients were recruited from randomly selected public primary care centres in the province of Granada (Andalusia). Participants were required to meet the following inclusion criteria: i) a confirmed stroke diagnosis; ii) mild to moderate stroke sequelae assessed by the NIHSS¹⁵⁵; iii) age 18 years or older; and iv) fluency in Spanish. The exclusion criteria included: i) a diagnosis of brain damage unrelated to vascular causes; ii) moderate to severe cognitive impairment reported in the clinical history¹⁵⁶; iii) a diagnosis of severe intellectual disability; iv) a diagnosis of severe mental disorder; v) musculoskeletal disorder; vi) peripheral nervous system injuries; and vii) uncorrected sensory impairments.

The sample size was estimated based on the requirements for conducting a CFA. The Arifin formula (a web-based sample size calculator for reliability studies) was applied to calculate it, considering 16 items distributed across four factors⁶⁴. The expected RMSEA was set at 0.05¹⁷¹ with a significance level of 0.05 (two-tailed) and a statistical power (1 - β) of 85%^{159,160}. The final calculated sample size required for the study was 181 participants.

4.3.3. Description of the participants

Participants were described based on socio-demographic and clinical information. The variables registered were sex (men, women), age, educational level (primary, secondary, vocational, university education), stroke type (ischaemic, haemorrhagic, lacunar), affected hemisphere (right, left, both, indeterminate), time since stroke onset (<6 months, 7 – 12 months, 13 – 24 months, >25 months), and presence of hemiplegia (absent, present). Descriptive statistics for the ADL Observations scale were summarised using means, standard deviations, ranges, minimums, maximums, and percentiles (25th, 50th, and 75th). SPSS v.28 for Windows was utilised for all descriptive analyses.

4.3.4. Description of the ADL Observations scale

The ADL Observations scale evaluates the praxis execution in four daily activities: personal hygiene (washing the face and upper body), dressing (putting on a shirt), feeding (preparing a sandwich), and a fourth activity selected by the evaluator (brushing teeth). Each activity is assessed based on four specific performance parameters: independence, initiation, execution, and control, so the scale includes 16 items in total. Independence refers to the ability to complete the activity autonomously. Initiation evaluates the ability to comprehend instructions, plan the action, and begin the task. Execution assesses the ability to perform the activity in the correct sequence and using

the appropriate objects. Control refers to the ability to monitor and correct the performance and the results during the activity. Each performance parameter is scored on a scale from zero to three points, with zero indicating adequate praxis ability and no requirement of assistance during the activity. The total score ranges from zero to 48 points, being higher scores at lower levels of praxis performance. The ADL Observations scale exhibits strong internal consistency, with a Cronbach's alpha of 0.94⁶⁴.

The assessment of the ADL Observations scale was conducted individually in a distraction-free, quiet room with a standard temperature. As recommended by the original author, the evaluator received preliminary training sessions before starting the evaluations.

4.3.5. Methodological phases of the study

4.3.5.1. Phase I: Translation and cross-cultural adaptation of the ADL Observations scale

The translation and cross-cultural adaptation process of the ADL Observations scale was conducted using the back-translation methodology^{162,163} and followed a seven-step process. First, the scale was independently translated from English to Spanish by two experts. One expert was a qualified English translator without knowledge of ULA, and the second expert was a healthcare professional fluent in both English and Spanish with knowledge of post-stroke evaluations. Second, a panel of experts compared the two Spanish translations, identifying possible discrepancies in instructions, items, and scoring methods. They discussed and reached a consensus on meaning, ambiguities, and terminology, ensuring comprehensibility and conceptual equivalence with the original scale¹⁶⁴. This resulted in a reconciled version of the ADL Observations scale. Third, the reconciled version was independently back-translated into English by a third independent

translator, who was blinded to the original scale. Fourth, the panel of experts reviewed and compared the first two translations, the reconciled version, the back-translated version, and the original scale to determine if there was equivalence in format, wording, meaning, relevance, and grammatical structure of the sentences with the original one^{106,128} Furthermore, cross-cultural adaptations and gender-inclusive language were applied in this step. A Spanish prefinal version of the ADL Observations scale was produced, addressing conceptual, item, semantic, and operational equivalence¹⁵². Fifth, a pilot study with 10 post-stroke participants¹⁶⁵ was conducted to evaluate the comprehensibility of the pre-final version. Sixth, based on the study results, the final version of the scale was synthesised, maintaining the premise of clarity, specificity, and precision. Annexe II presents the detailed process of translation and cross-cultural adaptation. Finally, in the seventh step, the assessment of the psychometric properties of the Spanish version of the ADL Observations scale was conducted with a larger sample size.

4.3.5.2. Phase II: Assessment of the psychometric properties of the Spanish version of the ADL Observations scale

4.3.5.2.1. Construct validity

The construct validity of the Spanish version of the ADL Observations scale was assessed to explore the multidimensionality structure of the scale based on a four-factor structure. These factors were independence, initiation, execution, and control. Each factor was composed of four items, corresponding to the activities assessed. CFA was conducted using AMOS version 28 for Windows. CFA is a statistical method used to evaluate whether observed variables correspond to one or multiple underlying factors. This method requires defining the model, determining the parameters to estimate,

estimating the model, assessing the model's fit, and re-specifying the model if necessary¹⁶⁸. A maximum likelihood estimator was employed, and to evaluate the model's goodness of fit, a path diagram and several indices were used with their respective thresholds: ratio of chi-square and degrees of freedom (χ^2/df) ≤ 3.000 ¹⁶⁹, RMSEA ≤ 0.080 with 90% confidence interval¹⁷¹, CFI ≥ 0.900 ¹⁵⁷, TLI ≥ 0.900 ¹⁷¹, and SRMR ≤ 0.050 ¹⁷². Modification indices, along with theoretical considerations, were applied to refine and adjust the model if necessary. Also, a preliminary reliability study was conducted with a sample of 30 participants to assess the ADL Observations scale's performance across the four expected factors.

4.3.5.2.2. Internal consistency

Internal consistency of the ADL Observations scale was examined for each of the four factors using Cronbach's alpha with a 95% confidence interval. A coefficient exceeding 0.700 was considered indicative of satisfactory internal consistency^{180,181}.

4.3.5.2.3. Identification of cut-off points and diagnostic accuracy of the ADL Observations scale

The optimal cut-off points for the ADL Observations scale were determined and adjusted based on age groups (≤ 65 years, >65 years)¹⁸⁴ to improve diagnostic precision^{185,186}. The stratification of the sample was chosen due to the possible effects of ageing on musculoskeletal and cognitive abilities. ROC analysis, AUC with 95% confidence interval^{187,188}, and the Youden index were employed to identify the optimal cut-off points. ROC analysis visually examines the diagnostic performance of a binary classifier by plotting sensitivity against 1 – specificity at different thresholds¹⁸⁹. The AUC measures the diagnostic accuracy of the scale, categorising it as no discrimination (<0.500), acceptable (0.600 to 0.800), or excellent discrimination (>0.800)¹⁹⁰. The

Youden index identifies the optimal cut-off point by maximising the sum of sensitivity and specificity¹⁹¹. The AST TULIA test^{192,193} was used to dichotomise the participants, as it allows a clear distinction between individuals with and without ULA. Both the ADL Observations scale and the AST TULIA test were administered in the same evaluation session to ensure rigorous comparison and analysis.

The diagnostic accuracy of the ADL Observations scale was further assessed using four indices, each with their corresponding 95% confidence interval: sensitivity, specificity, positive predictive value, and negative predictive value. Sensitivity reflects the capacity of the scale to accurately identify individuals whose daily lives are significantly disrupted by ULA, while specificity indicates how well the scale recognises those whose daily functioning remains unaffected¹⁹⁴. The positive predictive value represents the probability that individuals identified by the scale as having their ADLs affected by ULA do indeed experience that affectation. The negative predictive value shows the probability that individuals identified as not experiencing ADL difficulties truly have no significant affectation from ULA¹⁹⁵. Together, these metrics provide an extensive overview of the ADL Observations scale's effectiveness in capturing the practical implications of ULA on daily activities.

4.3.6. Ethical considerations

Idem section 4.1.6

Before starting the study, the original authors of the ADL Observations scale were contacted to inform them about the validation process of the instrument for Spanish-speaking post-stroke patients.

4.4. Study IV: “Cross-cultural adaptation and content validity of the Spanish version of the Role Checklist”

4.4.1. Study design

The design of this study is observational and cross-sectional. It was conducted in two phases. In the first phase, the translation and cross-cultural adaptation of the Role Checklist were made through the back-translation methodology¹⁵². In the second phase, the content validity was analysed by a panel of experts and then quantified using Aiken’s V coefficient. The study followed COSMIN guidelines to ensure the quality of the entire process^{153,154}.

4.4.2. Description of the Role Checklist

The Role Checklist is a questionnaire that assesses individuals’ role participation and the value or importance they assign to role participation. It consists of two parts. The first part includes 30 items assessing role participation in the past, present, and expected future participation within ten roles: student, worker, volunteer, caregiver, home maintainer, friend, family member, religious participant, hobbyist/amateur, and participant in organisations. The responses are dichotomous, with options “yes” or “no” for each temporal assessment. The second part comprises 10 items that measure the value or importance each individual assigns to the participation in each role, using a three-point scale response ranging from “not valued at all” to “highly valued”. The Role Checklist was previously translated into Spanish, and demonstrated a strong idiomatic correlation, with a Kappa index of 0.91 for the first part of the instrument and 0.80 for the second part¹²⁸.

4.4.3. Methodological phases of the study

4.4.3.1. Phase I: Translation and cross-cultural adaptation of the Role Checklist

The first step consisted of the translation of the English version of the Role Checklist into Spanish. This translation was performed by two independent experts. One expert was a professional English translator who was not familiar with the construct of role participation but was knowledgeable about the source language and culture. The other expert was a researcher who was fluent in English and Spanish as her mother tongue and had extensive experience in stroke evaluations. Next, a panel of experts reviewed and compared both translations of the Role Checklist and the previously translated version by Colón et al¹²⁸. The panel assessed the translations based on comprehensibility, cultural relevance, grammatical accuracy, and terminology criteria. After reaching a consensus, a reconciled Spanish version of the Role Checklist was produced. A third independent translator, who was unaware of the original version, back-translated the reconciled version of the Role Checklist into English. Then, the back-translated English version of the Role Checklist was compared with the original Role Checklist by the expert panel to ensure that there exists equivalence in the format, wording, meaning, relevance, and grammatical structure¹⁶⁵. Cross-cultural adaptations were made to maintain the semantic, conceptual, and operational equivalence between the two languages¹⁵². Gender-inclusive language was applied in the Spanish version, and the influence of gender on role definitions was reviewed. Following this, the panel of experts synthesised the last Spanish version of the Role Checklist, which was qualitatively and quantitatively evaluated by independent experts in Phase II. Annexe III provides the entire process of translation and cross-cultural adaptation of the Role Checklist.

4.4.3.2. Phase II: Assessment of the content validity of the Spanish version of the Role Checklist

A group of independent experts conducted the assessment of the content validity of the definitive Spanish version of the Role Checklist obtained in Phase I. To do this, first, a content validation questionnaire was developed following COSMIN recommendations, based on relevance, comprehensiveness, and comprehensibility¹⁵³. Annexe IV shows the complete questionnaire. This document provided detailed instructions and guidelines for assessing the content validity of the Role Checklist. It included: i) three structured questions about the clarity and relevance of the Role Checklist instructions; ii) four questions addressing each of the ten role definitions; iii) seven questions evaluating the past role participation part; iv) seven questions about the current role participation part; v) six questions regarding expectations of the future role participation part; vi) six questions addressing the assigned value to roles; and vii) two general questions about the entire Role Checklist. All responses were rated on a Likert scale from zero to four. Next, a group of 14 independent experts was selected to complete this content validation questionnaire¹⁹⁶. The experts were chosen based on various criteria: clinical expertise, relevant training, professional background, and geographic location¹⁹⁷. Priority was given to ensuring a diverse and heterogeneous group to offer a wide range of insight into the content validity of the Role Checklist¹⁹⁸. Finally, Aiken's V coefficient and its respective confidence interval¹⁹⁹ were applied to the responses to the content validation questionnaire, and values greater than 0.80 were considered indicative of adequate content validity²⁰⁰. Aiken's V coefficient is the statistical measure used to calculate an index of agreement between the judges evaluating each item²⁰¹. In this case, it assesses the degree of agreement, which indicates the coherence of the judgments. Microsoft Excel 2019 was used to calculate Aiken's V coefficient.

4.5. Study V: “Psychometric properties of the Role Checklist for Spanish-speaking post-stroke patients”

4.5.1. Study design

The design of the present study is observational and cross-sectional. To ensure the quality of the methodological process, it adhered to COSMIN guidelines.

4.5.2. Sample selection criteria and sample size estimation

Study participants met the following inclusion criteria: i) clinical diagnosis of stroke; ii) mild or moderate sequelae, measured by the NIHSS¹⁵⁵; iii) over 18 years of age; and iv) fluency in Spanish. The exclusion criteria were: i) any diagnosis of brain damage other than stroke; ii) moderate to severe cognitive impairment reported in the clinical history¹⁵⁶; iii) severe intellectual disability; iv) diagnosis of severe mental disorder, in the acute phase; v) diagnosis of movement disorder; vi) musculoskeletal disorder; vii) uncorrected sensory deficits; and viii) difficulties in understanding verbal or written language.

Two different sample sizes were calculated to estimate a representative sample of Spanish-speaking post-stroke patients: one for the internal consistency analysis and another for the test-retest and inter-rater analyses. For internal consistency analysis, Bonett’s formula for Cronbach’s alpha sample size was used^{178,179}. A minimum Cronbach’s alpha value (H_0) of 0.70 was established as the baseline^{180,181}, with an expected value (H_1) of 0.80¹⁷⁹. A significance level (α) of 0.05 and a statistical power of 85% were assumed¹⁷⁹. Considering a possible 30% sample loss¹⁸², the estimated required sample size was 177 post-stroke patients. For the test-retest and inter-rater analyses, Bonett’s formula for calculating Intraclass Correlation Coefficients (ICC) sample sizes was applied²⁰². A minimum ICC value (p_0) of 0.60²⁰³ and an expected ICC value (p_1) of

0.90¹²⁹ with two observations were defined. Assuming a significance level (α) of 0.05, a statistical power of 80%¹⁷⁹, and a possible 5% sample loss, the required sample size was 15 post-stroke patients.

4.5.3. Description of the participants

Socio-demographic, lifestyle, and clinical data were collected to describe study participants, including sex, age, marital status, educational level, sleep pattern, daily physical activity, type of stroke and phase of stroke¹⁶¹.

4.5.4. Description of the Role Checklist

Idem section 4.4.2

4.5.5. Data collection

Participants were recruited from randomly selected primary care centres in the province of Granada (Andalusia). After the initial evaluations, 30 participants were randomly selected for a second evaluation. These 30 participants had to meet the following inclusion criteria: i) no new stroke; ii) no other brain damage; iii) no hospitalisation; iv) no osteoarticular injuries or trauma affecting functionality; v) no diagnosis of psychiatric disorder; and vi) no institutionalisation. These criteria were verified the day before the session through a brief telephone interview. Of these 30 participants, 15 were assigned to the test-retest evaluation, and the other 15 to the inter-rater evaluation. For the test-retest evaluations, the same researcher administered the Role Checklist again two weeks after the first session. The decision to repeat the evaluations over a time interval of two weeks was based on previous studies that found good test-retest reliability within this timeframe²⁰⁴. On the other hand, an independent researcher with clinical experience and training in post-stroke patients administered the

Role Checklist two days after the first evaluation to conduct the inter-rater evaluation. This researcher was blinded to the participants' responses from the first evaluation. Both the test-retest and the inter-rater evaluations aimed to replicate the same environmental conditions as the first session, and participants received the same instructions as in the first evaluation.

4.5.6. Statistical methods

SSPSS version 28 for Windows was used for performing the analysis of the study. The descriptive data was summarised by utilising descriptive statistics that include means, standard deviations, frequencies, percentages, ranges, minimums, maximums, and percentiles.

The reliability of the Role Checklist was assessed in terms of homogeneity. First, the internal consistency of each part (role participation and value or importance assigned to each role) was calculated using Cronbach's alpha coefficient¹⁸³. Cronbach's alpha is used to assess the reliability of measurement instruments, indicating the relationship or homogeneity among the items within a specific part¹⁸³. A Cronbach's alpha value greater than 0.70 was considered acceptable internal consistency^{180,181}. A CI of 95% was calculated for each analysis. Second, the item-total correlations of each part were examined to identify items that might not be adequately correlated with the measurement construct. The Pearson coefficient was employed to perform the correlations, with a value greater than 0.20 considered acceptable¹⁷⁶.

The reliability of the Role Checklist was also evaluated in terms of stability. Firstly, the temporal consistency was evaluated using a test-retest analysis. Secondly, the consistency of responses when the Role Checklist was administered by different evaluators was examined with an inter-rater analysis. Both analyses were performed by

calculating the ICC for the two parts of the Role Checklist, with a two-way random effects model and 95% CI. Correlations higher than 0.50 were considered acceptable²⁰⁵. Regarding inter-rater reliability, the values obtained by the first evaluator were compared with those obtained by the second evaluator.

4.5.7. Ethical considerations

Idem 4.1.6

4.6. Study VI: “Upper limb apraxia is related to role participation in post-stroke patients”

4.6.1. Study design

This study has a cross-sectional correlational design, and it adhered to the STROBE guidelines for observational studies²⁰⁶.

4.6.2. Sample selection criteria and sample size estimation

The sample selection criteria were: i) a diagnosis of stroke; ii) mild to moderate stroke sequelae assessed by the NIHSS¹⁵⁵; iii) age 18 years or older; and iv) fluent in Spanish. Exclusion criteria were: i) diagnosis of brain damage other than stroke; ii) cognitive impairment reported in the clinical history¹⁵⁶; iii) diagnosis of severe intellectual disability; iv) diagnosis of severe mental disorder; v) musculoskeletal disorders; vi) peripheral nervous system injuries; and vii) uncorrected sensory impairments. Post-stroke patients were recruited from randomly selected public primary care centres from the province of Granada (Andalusia).

The study sample size was determined using G*Power. A priori computed required sample size estimation was conducted using an F test family with a linear multiple regression fixed model. The analysis was based on seven predictors, the seven ULA components, and an R^2 deviation from zero. A total of 153 participants were the estimated sample size required to ensure the representativeness of the study's results, considering a moderate effect size of $f^2 = 0.15$ ^{159,160}, a desired statistical power of 95%, and a significance level of 0.05.

4.6.3. Study variables

4.6.3.1. Socio-demographic data, lifestyle behaviours, and clinical characteristics

The study variables registered in this study were grouped into socio-demographic, lifestyle behaviours, and clinical characteristics. First, using an *ad hoc* questionnaire, the socio-demographic and lifestyle behaviours were collected. This included information about sex, age, marital status, educational level, smoking, alcohol and caffeine consumption, daily sleep duration, and physical activity. Then, the clinical characteristics of the participants were compiled from the medical histories and covered the dominant hand, stroke type, affected hemisphere, time since stroke onset, presence of hemiplegia, and whether the participants had received occupational therapy rehabilitation after the stroke.

4.6.3.2. Upper limb apraxia

ULA was evaluated in this study across non-symbolic imitation, intransitive imitation, transitive imitation, non-symbolic pantomime, intransitive pantomime, transitive pantomime, and praxis execution during the performance of ADL. The instruments used were the TULIA Apraxia test, as described in section 4.1.4, and the ADL Observations scale, as described in section 4.3.4. The tone, strength, and muscular endurance of both limbs were observationally assessed before the start of the upper limb apraxia evaluations. If the participant exhibited hemiparesis or hemiplegia in the dominant limb, the movement was first requested with the dominant limb and then with the non-dominant limb.

4.6.3.3. Role participation

The Role Checklist was used to evaluate role participation, as described in section 4.4.2. From this checklist, six indices were extracted based on previous evidence¹⁰⁷. They are explained below and in Table 4.

- Level of current role participation: this index measures the number of roles in which individuals participate. The score ranges from 0 to 10 points, with higher scores indicating participation in a greater number of roles.
- Changes in role participation after stroke: this index compares pre- and post-stroke role participation. The score ranges from -10 to 10 points with positive scores indicating a decrease in role participation, and negative scores indicating an increase in the number of roles in which individuals participate. A score of 0 points indicates no change in role participation after stroke. The interpretation of the negative and positive scores is different than the other indexes.
- Expectations of future role participation: this index measures the number of roles expected to engage in the future. The score ranges from 0 to 10 points, where higher scores mean a greater expectation of role participation.
- Comparison between future expectations and current role participation: this index measures the gap between future role expectations and current role participation. The score ranges from -10 to 10 points. Positive scores show an increase in expected future participation. On the other hand, negative scores indicate a decrease in expected future role participation. A score of 0 points means that future expectations are equal to current role participation.
- Comparison between future expectations and pre-stroke role participation: this index measures the difference between individuals' expectations for future

participation and their participation before the stroke. The score ranges from -10 to 10 points. Positive ratings indicate increased expectations for future participation compared to pre-stroke levels, while negative scores reflect decreased expectations. A score of 0 points means that future expectations are the same as pre-stroke participation.

- Assigned value or importance to role participation: this index measures the value individuals assign to role participation. The score of this index ranges from zero to 20 points, with higher scores indicating a greater value placed on role participation, regardless of whether individuals are actively participating in it.

Table 4. Summary of the Role Checklist indices

Index	Before the stroke	Present	Future	Values	Scores range	Interpretation
Level of current role participation	–	X	–	–	From 0 to 10 points	Higher scores indicate participation in a greater number of roles currently
Changes in role participation after stroke	Minuend	Subtrahend	–	–	From -10 to 10 points	Higher scores indicate less participation Negative scores indicate more participation now compared to before the stroke
Expectations for future role participation	–	–	X	–	From 0 to 10 points	Higher scores indicate higher expected role participation in future
Comparison between future expectations and current role participation	–	Subtrahend	Minuend	–	From -10 to 10 points	Higher scores indicate higher expected role participation compared to current participation Negative scores indicate lower future expectations compared to present

Comparison between future expectations and pre-stroke role participation	Subtrahend	–	Minuend	–	From -10 to 10 point	Higher scores indicate increased future expectations compared to pre- stroke participation Negative scores = lower future expectations compared to pre-stroke participation
Assigned value to the total number of roles	–	–	–	X	From 0 to 20 points	Higher scores indicate a greater value placed on roles

4.6.4. Statistical methods

The analyses of this study were performed using SPSS version 28.0. Socio-demographic data, lifestyle behaviours, and clinical variables were summarised employing these descriptive statistics: means, standard deviations, frequencies, and percentages. The TULIA Apraxia test and the ADL Observations scale responses were summarised using ranges, minimums, maximums, and percentiles. To evaluate if ULA was associated with role participation, six stepwise linear regression models were conducted. Each model corresponded to a different dependent variable, which is the six role participation indices. The main independent variables were the seven ULA measures (non-symbolic imitation, intransitive imitation, transitive imitation, non-symbolic pantomime, intransitive pantomime, transitive pantomime, and the score from the ADL Observations scale). Additionally, socio-demographic, lifestyle, and clinical variables were also considered in the analysis. In this line, the regression models were structured in blocks as follows: Block 1 included socio-demographic variables: sex (men and women), age, marital status (single, married, divorced, and widowed), and educational level (primary, secondary, vocational, and university education). The reference categories were men, married, and university education. Block 2 involved self-reported lifestyle behaviours: number of cigarettes smoked per day, number of alcohol units consumed per day, number of coffees or tea consumed per day, hours of sleep, and minutes per day of physical activity. Block 3 integrated clinical characteristics: stroke type (ischaemic, haemorrhagic, and lacunar), affected hemisphere (right, left, both, and indeterminate), and months since stroke. The reference categories in this block were ischaemic stroke and the right hemisphere. Block 4 combined significant variables from the previous blocks along with ULA outcomes. A 95% confidence interval was estimated for the unstandardised coefficient (B) and the statistical significance was determined with a *p*-

value below 0.05. The normality of variable distributions was assessed before the regression analyses. Also, the presence of multicollinearity was analysed using the variance inflation factor.

4.6.5. Ethical considerations

Idem section 4.1.6

4.7. Study VII: “The impact of upper limb apraxia on general and domain-specific self-efficacy in post-stroke patients”

4.7.1. Study design

The design of this study is cross-sectional and observational, and the entire research process adhered to the STROBE guidelines²⁰⁶.

4.7.2. Sample selection criteria and sample size estimation

The inclusion criteria for participants were: i) diagnosis of stroke; ii) mild to moderate stroke sequelae, assessed using the NIHSS¹⁵⁵; iii) age over 18 years; and iv) native or fluent proficiency in Spanish. The exclusion criteria were: i) history of non-vascular brain damage; ii) neurodegenerative disease; iii) moderate-severe cognitive decline¹⁵⁶; iv) severe intellectual disability; v) diagnosis of severe mental disorder; vi) musculoskeletal disorder; vii) peripheral nervous system injuries; viii) uncorrected sensory impairments; and ix) communication impairments. Post-stroke patients were recruited from randomly selected primary care centres from the province of Granada (Andalusia).

G*power was used to determine the sample size. It used an a priori sample size estimation following the t-test family and linear multiple regression. A fixed model single regression coefficient was employed, including seven predictors and one-tailed. Assuming a moderate effect size of $f^2 = 0.15$ ^{159,160}, a desired statistical power of 95%, and a significance level of 0.05, the required sample size was 74 participants. To account for possible losses during the study, the sample size was increased by 10%, resulting in a total sample of 82 post-stroke patients.

4.7.3. Study variables

4.7.3.1. Socio-demographic data, lifestyle behaviours, and clinical characteristics

Descriptive information registered consisted of socio-demographic data (sex, age, marital status, educational level, and occupation), self-reported lifestyle behaviours (smoking and alcohol consumption, hours of sleep, and physical activity), and clinical information (stroke type, time since stroke onset, hemiplegia, and rehabilitation).

4.7.3.2. Upper limb apraxia

The TULIA Apraxia test, as previously described in Section 4.1.4 and the ADL Observations scale, as described in Section 4.3.4, were used to evaluate ULA.

4.7.3.3. Self-efficacy dimensions

The General Self-efficacy scale was employed to evaluate general self-efficacy. This scale consists of 10 items that measure self-perceived ability to cope with stressful situations. Each item is scored on a 10-point Likert scale, ranging from 0, which indicates “completely disagree”, to 10, meaning “completely agree”. Higher scores show better levels of perceived self-efficacy. The psychometric properties of the scale within the Spanish-speaking population show strong internal consistency, with a Cronbach’s alpha of 0.87 and a Spearman-Brown of 0.88²⁰⁷. For this study, the scale had a strong level of internal consistency as well, with a Cronbach’s alpha of 0.86.

The Self-efficacy in Symptom Management scale after traumatic brain injury was used to assess self-efficacy for managing symptoms. This scale is composed of 13 items distributed across three dimensions: perception of self-efficacy in managing social and community situations (social-home integration self-efficacy), management of physical or

cognitive symptoms (cognitive self-efficacy), and management of emotional symptoms (emotional self-efficacy). The scale showed strong internal consistency for the Spanish-speaking population. The Cronbach's alpha for the social-home integration, cognitive, and emotional dimensions, as well as the total score, were 0.66, 0.93, 0.89, and 0.89, respectively²⁰⁸.

4.7.4. Statistical methods

SPSS version 28.0 was used to conduct the study analyses. Descriptive statistics, including means, standard deviations, frequencies, percentages, ranges, minimum and maximum, and percentiles, were employed to summarise the key variables. To examine whether ULA was associated with self-efficacy, five separate multiple linear regression analyses were performed following a stepwise approach. The independent variables were the seven ULA components: non-symbolic imitation, intransitive imitation, transitive imitation, non-symbolic pantomime, intransitive pantomime, transitive pantomime, and the score from the ADL Observations scale. On the other hand, the dependent variables included general self-efficacy and self-efficacy for managing symptoms dimensions (social-home self-efficacy, cognitive self-efficacy, emotional self-efficacy, and the total score of self-efficacy for managing symptoms). The normality of variable distributions and the presence of multicollinearity were assessed before conducting the regression analyses. Statistical significance was determined with a p-value <0.05.

4.7.5. Ethical considerations

Idem section 4.1.6

III

Results



5. RESULTS

5.1. Study I: “Cross-cultural adaptation and construct validity of the Spanish version of the TULIA Apraxia test for post-stroke patients”

5.1.1. Description of the participants

A total of 201 patients diagnosed with stroke were included in the study. Of this sample, 134 were men (67%) and 67 were women (33%) with an average age of 64 years. The most prevalent type of stroke was ischaemic, and 88% of the participants were in the chronic phase of stroke. Table 5 presents the rest of the socio-demographic, lifestyle, and clinical characteristics of the participants.

Table 5. Socio-demographic, lifestyle, and clinical characteristics of the sample of Study I and Study II

Sample descriptive data	Participants (N = 201)	
Socio-demographic data	n / Mean	% / SD
Sex, men	134	66.70
Age (years)	64.06	12.03
Marital status		
Single	21	10.40
Married	136	67.70
Divorced	25	12.40
Widowed	19	9.50
Educational Level		
Primary education	79	39.30
Secondary education	57	28.40
Vocational training	31	15.40
University education	34	16.90
Self-reported lifestyle behaviours		
Smoking habits		
Smoker	51	25.40
Ex-smoker	50	24.90
Number of cigarettes per day	2.01	5.12
Alcohol consumption		
Drinker	55	27.40
Number of units per day	0.46	0.90
Caffeine consumption		
Drinker	73	36.30
Number of cups per day	0.48	0.769
Hours of sleep	6.97	1.84
Physical activity	128	63.70
Physical activity (minutes per day)	40.27	46.34
Clinical characteristics		
Stroke type		
Ischaemic stroke	136	67.70
Haemorrhagic stroke	31	15.40
Lacunar stroke	34	16.90
Affected hemisphere		
Right	86	42.80
Left	83	41.30
Both	7	3.50
Indeterminate	25	12.40
Time since stroke onset (months)	23.01	30.49
Subacute stroke	23	11.40
Chronic stroke	178	88.60
Presence of hemiplegia	27	13.40

Note: SD = Standard Deviation

5.1.2. Translation and cross-cultural adaptation of the TULIA Apraxia test

The translation process was conducted without significant difficulties. Initial translations by the two independent translators were consistent and similar across most instructions, items, and the scoring method. Then, the panel of experts reviewed and discussed both translated versions of the TULIA Apraxia test. During this process, potential cross-cultural adaptations were analysed, leading to a consensus on a reconciled Spanish version of the TULIA Apraxia test. This version was back-translated to English, and the panel of experts ensured that the Spanish version was conceptually equivalent to the original TULIA Apraxia test. Finally, 10 post-stroke patients were evaluated with this pre-final Spanish version of the TULIA Apraxia test. The definitive Spanish version of the TULIA Apraxia test is shown in Table 6.

Table 6. Spanish version of the TULIA Apraxia test

TULIA Apraxia test

Instrucciones preliminares: El/La evaluador/a recibirá a la persona evaluada y le explicará, de forma clara y sencilla, en qué consiste el TULIA Apraxia test, cuánto tiempo va a emplear y qué es lo que van a realizar.

Para realizar la prueba, el/la evaluador/a y la persona evaluada se encuentran sentados/as uno/a en frente del otro/a, con una mesa separando a ambos/as. Tienen las manos encima de la mesa.

Antes de empezar cada sub-test, el/la evaluador/a informará sobre si los siguientes gestos tienen o no significado. En los sub-tests de imitación, los gestos deberán imitarse como si fueran el reflejo de un espejo, de la forma más precisa posible e inmediatamente después de la demostración. En el caso de los gestos transitivos, se le pedirá, explícitamente, que imagine que sujeta con la mano la herramienta u objeto. En los sub-tests de pantomima, la persona evaluada deberá hacer el gesto de la forma más precisa posible inmediatamente después de la petición verbal.

Instrucción para dar a la persona evaluada antes de comenzar los sub-tests de imitación: voy a realizar una serie de gestos con las manos. Debe observar atentamente y cuando termine cada uno, usted debe imitarlos. Imítelos como si estuviera frente a un espejo y de la manera más precisa posible. Los primeros gestos que voy a hacer no tienen significado.

Imitación no simbólica

Gestos que realiza el/la evaluador/a:

1. Poner el dedo índice sobre la punta de la nariz.
2. Colocar el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba.
3. Colocar el dorso de la mano bajo la barbilla, con el hombro en abducción a 90°

4. Colocar la mano plana sobre la cabeza.
 5. *Instrucción para el/la evaluador/a: colocar la mano y el antebrazo apoyados sobre la mesa en decúbito prono. Desde esa posición, el gesto es levantar solo la mano de la mesa, dejando el antebrazo apoyado.
 6. *Instrucción para el/la evaluador/a: : colocar la mano y el antebrazo apoyados sobre la mesa en decúbito prono. Desde esa posición, el gesto es extender hacia fuera el dedo meñique.
 7. Extender el brazo lateralmente hasta la altura del hombro.
 8. *Instrucción para el/la evaluador/a: colocar la mano y el antebrazo apoyados sobre la mesa en decúbito prono. Desde esa posición, el gesto es levantar el dedo corazón dejando el resto de la mano y el antebrazo apoyados.
-

Imitación intransitiva

Instrucción para la persona evaluada: los gestos que le voy a pedir que imite ahora, si tienen significado.

9. Hacer una cruz con los dedos índices de cada mano.
 10. Hacer el gesto de indicar que alguien está loco. Alternativa: Cómo le diría a alguien que está loco, con las manos.
 11. Hacer el gesto de sacudirse el polvo del hombro.
 12. Hacer el gesto de saludar como un/a soldado.
 13. Hacer el gesto de autostop.
 14. Hacer la señal de stop. Alternativa: Haga la señal de “alto” para que alguien se detenga.
 15. Entrecruzar los dedos de ambas manos.
 16. Hacer el gesto de señalar un pájaro en el cielo.
-

Imitación transitiva

Instrucción para la persona evaluada: para los gestos que vamos a imitar ahora, imagine que sostiene el objeto en la mano.

17. Hacer el gesto de beber de un vaso.
 18. Hacer el gesto de cepillarse el pelo con un cepillo.
 19. Hacer el gesto de llevarse un teléfono móvil al oído.
 20. Hacer el gesto de fumar un cigarrillo.
 21. Hacer el gesto de utilizar un martillo.
 22. Hacer el gesto de utilizar la llave para abrir la puerta de casa.
 23. Hacer el gesto de utilizar unas tijeras.
 24. Hacer el gesto de utilizar un matasellos de tinta sobre un papel.
-

Pantomima no simbólica

Instrucción para la persona evaluada: ahora le voy a pedir que sea usted quién realice los gestos. Escuche atentamente y haga cada uno de ellos de la forma más precisa que pueda.

Los primeros gestos que vamos a hacer no tienen significado.

25. Coloque su mano derecha (izquierda) plana sobre su cabeza.
26. Toque su hombro derecho (izquierdo) con su mano derecha (izquierda).
27. Tome su oreja derecha (izquierda) entre los dedos pulgar e índice.
28. *Coloque su pulgar extendido sobre su frente, con los demás dedos apuntando hacia arriba.*
29. *Extienda el brazo lateralmente hasta la altura del hombro.*

30. Doble el codo y mírese la palma de la mano.

31. **Instrucción para el/la evaluador/a: indicarle al paciente que coloque la mano y el antebrazo apoyados sobre la mesa en decúbito prono. Instrucción para la persona evaluada: levante solo la mano de la mesa, dejando el antebrazo apoyado.*

32. **Instrucción para el/la evaluador/a: indicarle al paciente que coloque la mano y el antebrazo apoyados sobre la mesa en decúbito prono. Instrucción para la persona evaluada: levante solo el dedo índice, dejando el resto de la mano y el antebrazo apoyados.*

Pantomima intransitiva

Instrucción para la persona evaluada: los gestos que le voy a pedir ahora sí que tienen significado.

33. Haga el gesto de saludar como un/a soldado.

34. Haga el gesto de tirar un beso a alguien.

35. *Haga el gesto de indicar que alguien está loco. Alternativa: Cómo le diría a alguien que está loco, con las manos.*

36. Haga el gesto de rascarse la cabeza.

37. *Haga el gesto de señalar un pájaro en el cielo.*

38. Haga el gesto de decir adiós con la mano.

39. *Haga la señal de "stop". Alternativa: Haga la señal de "alto" para que alguien se detenga.*

40. Haga el gesto de reñir o regañar a alguien.

Pantomima transitiva

Instrucción para la persona evaluada: ahora, para los siguientes gestos, imagine que sostiene el objeto en sus manos.

41. Haga el gesto de cepillarse los dientes.

42. Haga el gesto de cepillarse el pelo con un cepillo.

43. Haga el gesto de tomar sopa con una cuchara.

44. Haga el gesto de fumar un cigarrillo.

45. Haga el gesto de utilizar un destornillador.

46. Haga el gesto de utilizar la llave para abrir la puerta de casa.

47. Haga el gesto de utilizar un matasellos de tinta sobre un papel.

48. Haga el gesto de utilizar un cuchillo para cortar una barra de pan que está sobre la mesa.

Note: Italic items are those repeated in both imitation and pantomime to compare performance; Items marked with an asterisk (*) include additional instructions for the evaluator

Some changes were implemented across instructions, items, and the scoring method in the Spanish version of the TULIA Apraxia test during the translation process. Cultural adaptations were applied to ensure comprehension among Spanish-speaking populations. Gender language issues were identified during the forward translation, as the translators used only the masculine generic. Items where the language could be made more inclusive were identified, and the necessary improvements were implemented. Regarding the instructions, preliminary information was provided to set the context before assessing ULA. To ensure consistency across evaluators administering the TULIA Apraxia test, specific and standardised instructions were developed for each subtest: i) in the imitation subtests, gestures should be imitated as in a mirror reflection, as accurately as possible and immediately after the demonstration; ii) in pantomime subtests, gestures should be performed as accurately as possible immediately after the verbal request; iii) in symbolic subtests, the evaluator should inform that the gestures carry meaning; and iv) for transitive gestures, the evaluated individual should be explicitly requested to imagine holding the tool.

Regarding the items' construction, changes were implemented in the instruction of some items to standardise the gestures and reduce subjectivity while maintaining semantic, conceptual, and operational equivalence with the original version of the TULIA Apraxia test. In the subtests involving transitive and intransitive symbolic gestures, almost every item was prefaced with "make the gesture of". In the item "*Make a catholic cross sign*", the term "catholic" was removed to avoid religious connotations and make the test more neutral. For the items "*Show as if someone is crazy*" and "*Make a stop sign*", alternative explanations were added to provide context for the gestures. In the item "*Comb hair*" the action "comb" was replaced by "brush" to ensure consistency across different interpretations based on hairstyles. During the pilot study, individuals

interpreted “comb” based on their hair length. For instance, individuals with short hair adjusted their part, while those with long hair combed the entire length. Using “brush” ensures uniformity in gesture performance regardless of hair type. The item “*Pick up the telephone*” presented a generational conflict, as most phones today do not require picking up. This led to varying interpretations between older and younger participants, who might think of landlines or mobile phones, respectively. Both phones occupy different spaces in the hands, so the evaluation of this item could have bias. To mitigate this, “pick up” was replaced by “take”, “telephone” was replaced by “a mobile phone”, and “to your ear” was added. In the item “*Use a key*”, some participants asked about the type of key, such as a car key, a wrench, or a house key, prompting the addition of “to open the front door” to clarify. In the item “*Eat soap*”, some participants took a bowl in their hands and put it in their mouths. For that reason, the requirement of “with a spoon” was added. Similarly, in the item “*Use a stamp to post-mark*” some individuals asked if the stamp was a postage stamp, so “ink stamp” and “in a piece of paper” were added.

Regarding the scoring method, efforts were made to maintain fidelity to the original version with minor adjustments during the translation and adaptation process. In the five points, imitation and pantomime were distinguished to clarify the criteria for evaluating correct movement execution. Imitation scoring was defined as “the individual replicating an identical movement demonstrated by the evaluator”. Pantomime involved “precisely performing the gesture (in terms of time, space, and/or semantic content) and achieving the goal of the verbal request”. The score of 0 specified that attempted actions might be erratic or disorganised. The remaining scores remained unchanged. Table 7 presents the translated and adapted scoring method for the Spanish version of the TULIA Apraxia test.

Table 7. Scoring method of the Spanish version of the TULIA Apraxia test

Description	Points
Imitación: la persona realiza un movimiento idéntico al mostrado por el/la evaluador/a.	5
Pantomima: la persona realiza el gesto de forma precisa (en términos de tiempo, espacio y/o contenido semántico) y cumple con el objetivo de la petición verbal.	5
Se alcanza el objetivo del movimiento, pero con pequeños errores que no afectan a la trayectoria (el movimiento se realiza en el plano adecuado en relación con el objetivo [objeto o propio cuerpo], la coordinación articular es correcta y también la forma del movimiento). Los pequeños errores pueden ser en la temporalidad (movimiento demasiado lento, vacilante o robótico) o errores espaciales (amplitud ligeramente reducida).	4
Se alcanza el objetivo del movimiento, pero ocurren errores que afectan sutilmente a la trayectoria y son corregidos durante el curso de la acción.	3
Estos errores pueden incluir movimientos adicionales u omisiones (principalmente en partes distales del cuerpo) o errores de contenido, como sustituciones o perseveraciones.	3
Se alcanza el objetivo del movimiento, pero ocurren errores que afectan sutilmente a la trayectoria y no son corregidos. Estos errores pueden incluir movimientos adicionales y omisiones (principalmente en partes distales del cuerpo) o el uso del cuerpo como objeto.	2
El objetivo del movimiento no se alcanza. Pueden ocurrir errores que afecten gravemente a la trayectoria, resultando en una posición final incorrecta, como movimientos adicionales (principalmente en las partes proximales del cuerpo) o errores graves en la orientación espacial.	1
También puede ocurrir que el contenido semántico del gesto sea incorrecto, que haya sustituciones persistentes (relacionadas o no) o perseveraciones.	

A pesar de ello, el patrón general del movimiento sigue siendo reconocible.

No se ejecuta ningún movimiento o este es irreconocible. Se observan movimientos erráticos, desorganizados, sin relación temporal o espacial con el gesto solicitado.

0

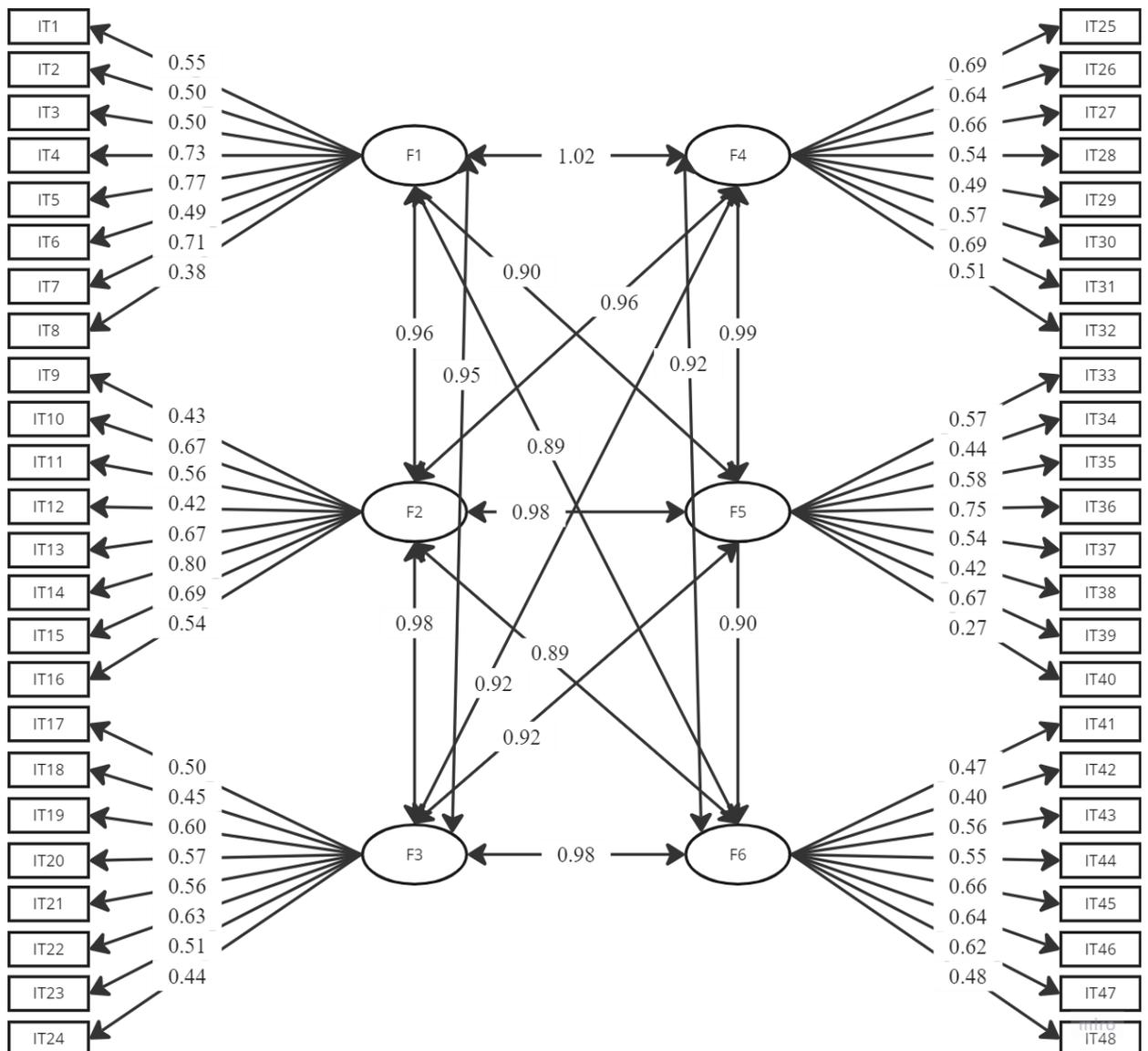
5.1.3. Assessment of the construct validity of the Spanish version of the TULIA Apraxia test

The data were considered excellent for factor analysis based on a KMO value of 0.930 and a chi-square of 4680.174 with 1128 degrees of freedom ($p < 0.001$) for Bartlett's test of sphericity.

5.1.3.1. Models of confirmatory factor analysis

CFA was conducted on four different models to compare with the theoretical six-factor structure proposed by the authors: i) Model 1, an unifactorial model; ii) Model 2, representing the theoretical six-factor structure as per the original validation of the TULIA Apraxia test; iii) Model 3, a refined six-factor model removing two problematic items; and iv) Model 4, an alternative six-factor structure integrating two new equivalent items in place of the removed ones. Model 2 confirmed the underlying six-factor structure of the Spanish version of the TULIA Apraxia test, as previously established. The model fit statistics reported by AMOS software were robust, showing less susceptibility to sample size, model misspecification, and model complexity. Figure 2 illustrates the path diagram, confirming satisfactory item-factor agreement.

Figure 2. Path diagram of Model 2 of confirmatory factor analysis of the Spanish version of the TULIA Apraxia test



Note: F1 = Factor 1 (imitation, non-symbolic); F2 = Factor 2 (imitation, intransitive); F3 = Factor 3 (imitation transitive); F4 = Factor 4 (pantomime, non-symbolic); F5 = Factor 5 (Pantomime, intransitive); F6 = Factor 6 (pantomime, transitive); IT = Item

Regarding the model fit indices, the RMSEA and SRMR values were excellent, while CFI and TLI values approached the expected threshold for optimal model fit. Standardised residual covariances were addressed to refine the model. Two items, “*Smoke a cigarette*” and “*Wave goodbye*”, were identified as problematic and subsequently removed in Model 3. This new model showed considerable improvement in coefficients without these items. However, Model 4 was tested to offer an alternative model, replacing these two conflicting items with two new items in line with the original 48-item test proposal. The two items with the highest equivalence were selected from the battery of gestures concurrently evaluated with the TULIA Apraxia assessment: “*Make the gesture of opening a bottle of water*” replaced “*Smoke a cigarette*” and “*Make the gesture of pointing to someone and asking him/her to come*” replaced “*Wave goodbye*”. This new Model 4 produced similar indices to Model 3, though Model 3 showed slightly better results. The fit indices of all four models tested are presented in Table 8.

Table 8. Fit indices of the four tested confirmatory factor analysis models of the Spanish version of the TULIA Apraxia test

Model	χ^2/df	χ^2/df p- value	RMSEA	RMSEA 90%CI	CFI	TLI	SRMR
1	1.606	<0.001	0.055	0.050–0.060	0.836	0.828	0.057
2	1.415	<0.001	0.046	0.040–0.051	0.891	0.882	0.052
3	1.343	<0.001	0.041	0.035–0.047	0.913	0.905	0.051
4	1.323	<0.001	0.042	0.036–0.047	0.906	0.898	0.051

Note: Model 1 = Unifactorial; Model 2 = Six-factor model according to the original validation of the TULIA Apraxia test; Model 3 = Six-factor model after removing two problematic items; Model 4 = Alternative six-factor model replacing the two problematic items with two new equivalent items; χ^2/df = Chi-square and degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardised Root Mean Square Residual

5.1.3.2. Convergent validity

Convergent validity showed moderate Pearson's correlation coefficients between the six factors of the Spanish version of the TULIA Apraxia test from the CFA Model 2 and the demonstration-of-use test, the ideomotor apraxia test, and the ADL Observations scale. The ranges were from -0.386 to 0.685, as detailed in Table 9.

Table 9. Convergent validity of the six-factor Spanish version of the TULIA Apraxia test

TULIA Apraxia test	Demonstration of use test (r)	Ideomotor apraxia test (r)	ADL Observations scale total (r)
Factor 1: imitation non-symbolic	0.592*	0.595*	-0.403*
Factor 2: imitation intransitive	0.595*	0.597*	-0.392*
Factor 3: imitation transitive	0.603*	0.532*	-0.387*
Factor 4: pantomime non-symbolic	0.591*	0.544*	-0.386*
Factor 5: pantomime intransitive	0.575*	0.547*	-0.423*
Factor 6: pantomime transitive	0.685*	0.467*	-0.395*

Note: (r) = Pearson's correlation coefficient; ADL = Activities of Daily Living; * = p <0.001

5.2. Study II: “Reliability and optimal cut-off points of the TULIA Apraxia test for Spanish-speaking post-stroke patients”

5.2.1. Description of the participants

This study enrolled a total of 201 post-stroke patients. The socio-demographic, lifestyle, and clinical characteristics of the participants are detailed in Table 5. Descriptive statistics for the TULIA Apraxia test are also provided in Table 10, showing mean scores ranging from 26.55 to 34.87 points across the six subtests. In this study, there were no missing data and no indeterminate results.

Table 10. Descriptive statistics for the TULIA Apraxia test

TULIA Apraxia subtests	Mean	SD	Range	Minimum	Maximum	Percentiles		
						25 th	50 th	75 th
Non-symbolic imitation	32.48	5.61	27	13	40	29.00	34.00	37.00
Intransitive imitation	33.94	5.11	25	15	40	31.00	36.00	38.00
Transitive imitation	26.55	6.14	28	11	39	22.00	27.00	31.00
Non-symbolic pantomime	32.57	6.16	26	12	40	29.00	34.00	37.00
Intransitive pantomime	34.87	4.81	31	9	40	33.00	36.00	38.00
Transitive pantomime	28.91	6.03	32	8	40	25.00	30.00	33.00

Note: SD = Standard Deviation

5.2.2. Internal consistency

The Cronbach's alpha values for each subtest of the TULIA Apraxia test in Spanish-speaking post-stroke patients were good. First, imitation non-symbolic, exhibited a Cronbach's alpha value of 0.824 (95% CI 0.784 – 0.858). Second, imitation intransitive, showed an $\alpha = 0.805$ (95% CI 0.761 – 0.843). Third, imitation transitive, had an $\alpha = 0.772$ (95% CI 0.721 – 0.817). Fourth, pantomime non-symbolic, displayed an $\alpha = 0.814$ (95% CI 0.773 – 0.851). Fifth, pantomime intransitive, indicated an $\alpha = 0.716$ (95% CI 0.653 – 0.772). Sixth, pantomime transitive, had an $\alpha = 0.792$ (95% CI 0.745 – 0.833).

5.2.3. Identification of cut-off points and diagnostic accuracy

ROC curves were constructed for each subtest of the TULIA Apraxia test, adjusting for age (≤ 65 years, > 65 years), and using the established cut-off of 9 points on the AST TULIA test. The area under the curve ranged from 0.820 to 0.901, indicating that the TULIA Apraxia test had discriminative accuracy greater than 82%. The curve coordinates combined with the Youden Index showed that the optimal cut-off points for the TULIA Apraxia test ranged from ≤ 25 to ≤ 35 across the six subtests. For participants aged ≤ 65 years, the cut-offs for the imitation transitive (≤ 25) and pantomime non-symbolic (≤ 33) subtests both had a sensitivity of 0.773 (95% CI 0.636 – 0.879) and specificity of 0.884 (95% CI 0.795 – 0.945), indicating the best balance between sensitivity and specificity. For participants aged > 65 years, the imitation transitive cut-off (≤ 26) presented the most adjusted balance between sensitivity with 0.846 (95% CI 0.713 – 0.936) and specificity, with 0.796 (95% CI 0.670 – 0.892). Table 11 summarises the results of the cut-off points, sensitivity, and specificity analysis.

Table 11. Characteristics of the ROC analysis of the Spanish version of the TULIA Apraxia test: area under the curve, Youden index, cut-off points, sensitivity, specificity, and confidence interval for each subtest, adjusted for age

≤65 years old (n = 113)											
TULIA Apraxia subtests	AUC	95% CI AUC		Youden index	Cut-off points	Sensitivity	95% CI Sensitivity		Specificity	95% CI Specificity	
		Lower bound	Upper bound				Lower bound	Upper bound		Lower bound	Upper bound
Imitation non-symbolic	0.901	0.841	0.961	0.640	≤31	0.727	0.585	0.844	0.913	0.832	0.964
Imitation intransitive	0.870	0.804	0.935	0.605	≤34	0.750	0.610	0.861	0.855	0.760	0.925
Imitation transitive	0.892	0.832	0.952	0.657	≤25	0.773	0.636	0.879	0.884	0.795	0.945
Pantomime non-symbolic	0.898	0.842	0.954	0.657	≤33	0.773	0.636	0.879	0.884	0.795	0.945
Pantomime intransitive	0.849	0.778	0.921	0.537	≤34	0.682	0.537	0.806	0.855	0.760	0.925
Pantomime transitive	0.883	0.821	0.945	0.619	≤30	0.909	0.801	0.971	0.710	0.597	0.808

	>65 years old (n = 88)										
Imitation non-symbolic	0.830	0.744	0.915	0.514	≤33	0.821	0.682	0.919	0.694	0.557	0.811
Imitation intransitive	0.826	0.738	0.914	0.596	≤34	0.821	0.682	0.919	0.776	0.646	0.876
Imitation transitive	0.869	0.791	0.947	0.642	≤26	0.846	0.713	0.936	0.796	0.670	0.892
Pantomime non-symbolic	0.820	0.731	0.910	0.504	≤33	0.769	0.622	0.882	0.735	0.601	0.844
Pantomime intransitive	0.838	0.757	0.918	0.489	≤35	0.795	0.652	0.901	0.694	0.557	0.811
Pantomime transitive	0.866	0.793	0.938	0.559	≤27	0.641	0.485	0.779	0.918	0.820	0.974

Note: ROC = Receiver Operating Characteristic, AUC = Area Under the Curve; CI = Confidence Interval

Regarding the positive predictive values presented in Table 12, these ranged from 0.667 (95% CI 0.542 – 0.777) to 0.862 (95% CI 0.708 – 0.955), indicating that the TULIA Apraxia subtests correctly classified more than 67% of the post-stroke patients with upper limb apraxia. The highest positive predictive values were observed in the group aged ≤ 65 years. On the other hand, negative predictive values ranged from 0.763 (95% CI 0.644 – 0.859) to 0.925 (95% CI 0.833 – 0.976), showing that the TULIA Apraxia subtests accurately identified more than 76% of participants without upper limb apraxia, regardless of age. The negative predictive values were relatively similar across both age groups. Annexes V and VI show the contingency tables with the TULIA Apraxia subtest results in relation to the AST TULIA test results, adjusted for age.

Table 12. Predictive values and confidence interval adjusted for age of the Spanish version of the TULIA Apraxia test

TULIA Apraxia subtests	≤65 years old (n =113)					
	PPV	95% CI PPV		NPV	95% CI NPV	
		Lower bound	Upper bound		Lower bound	Upper bound
Imitation non-symbolic	0.842	0.706	0.934	0.840	0.746	0.911
Imitation intransitive	0.767	0.628	0.876	0.843	0.746	0.915
Imitation transitive	0.810	0.674	0.908	0.859	0.766	0.927
Pantomime non-symbolic	0.810	0.674	0.908	0.859	0.766	0.927
Pantomime intransitive	0.750	0.603	0.866	0.808	0.708	0.887
Pantomime transitive	0.667	0.542	0.777	0.925	0.833	0.976
>65 years old (n = 88)						
Imitation non-symbolic	0.681	0.540	0.802	0.829	0.696	0.923
Imitation intransitive	0.744	0.602	0.858	0.844	0.721	0.930
Imitation transitive	0.767	0.628	0.876	0.867	0.748	0.945
Pantomime non-symbolic	0.698	0.552	0.821	0.800	0.668	0.898
Pantomime intransitive	0.674	0.532	0.797	0.810	0.674	0.908
Pantomime transitive	0.862	0.708	0.955	0.763	0.644	0.859

Note: PPV = Positive Predictive Value; CI = Confidence Interval; NPV = Negative Predictive Value

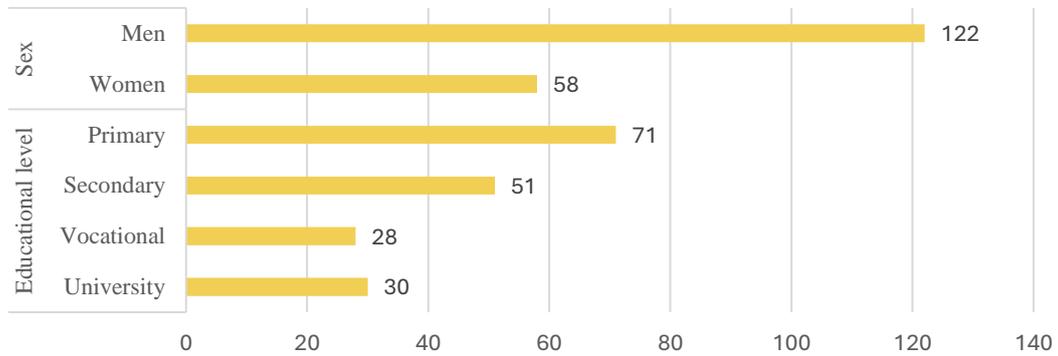
5.3. Study III: “Cross-cultural adaptation and psychometric properties of the Activities of daily living (ADL) Observations Scale for Spanish-speaking post-stroke patients”

5.3.1. Description of the participants

A total of 413 patients referred from public primary care centres met the inclusion criteria and did not meet the study's exclusion criteria. According to the sample size estimation, 180 individuals were randomly selected for inclusion in the study with an average age of 64 years (± 11.8). The socio-demographic and clinical characteristics that describe study participants are presented in Figure 3. For the ADL Observations scale, scores ranged from 0 to 10 points, with complete descriptive data shown in Table 13. There were no indeterminate results, and no data were missing in the study.

Figure 3. Descriptive data of the participants of the Study III

Sociodemographic characteristics of the sample (N = 180)



Clinical information of the sample (N = 180)

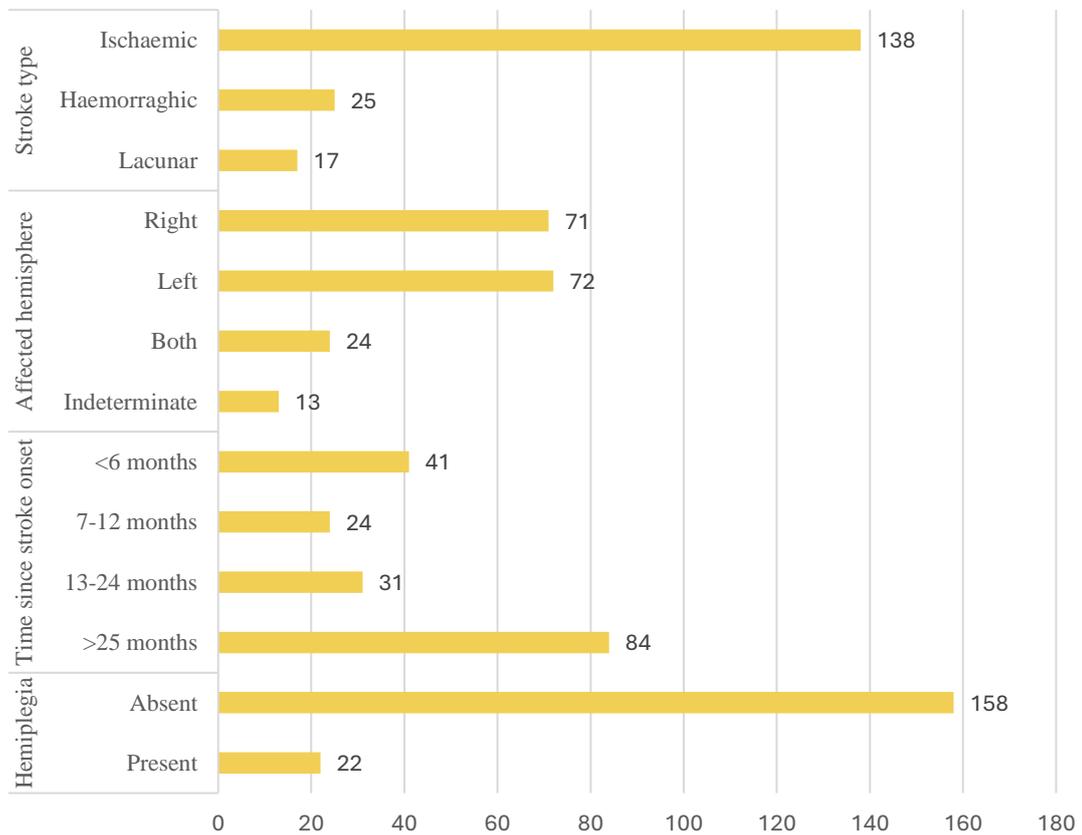


Table 13. Descriptive statistics for the ADL Observations scale

	Mean	SD	Range	Min	Max	Percentiles		
						25 th	50 th	75 th
ADL Observations scale performance parameters								
Independence	2.56	2.87	10	0	10	0.00	1.00	5.00
Initiation	0.66	1.21	6	0	6	0.00	0.00	1.00
Execution	2.32	2.67	10	0	10	0.00	1.00	4.00
Control	0.92	1.45	7	0	7	0.00	0.00	2.00

Note: ADL = Activities of Daily Living; SD = Standard Deviation; Min = Minimum; Max = Maximum; CI = Confidence Interval

5.3.2. Translation and cross-cultural adaptation

The ADL Observations scale was translated and cross-cultural adapted without difficulties. However, some modifications to improve clarity and consistency were applied. First, preliminary instructions have been added to the scale to guide the evaluator before the assessment, and then explicit instructions have been provided to participants, ensuring they clearly understand the expectations during the evaluation. Activity descriptions were made more detailed, following the original authors' suggestions. Additionally, the dressing activity was standardised by replacing the original item "shirt or blouse", with a sanitary gown with button closures. In the scoring method, each performance parameter was defined, evaluation criteria were simplified, and, when appropriate, enumerated. The final Spanish version of the ADL Observations scale obtained is presented in Table 14.

Table 14. Spanish version of the ADL Observations scale – Escala del impacto de la apraxia de los miembros superiores sobre las actividades de la vida diaria (AVD)

ADL Observations scale – Escala del impacto de la apraxia de los miembros superiores sobre las actividades de la vida diaria (AVD)

Instrucciones preliminares: antes de la llegada de la persona que se va a evaluar, el/la evaluador/a deberá colocar sobre la mesa todo el material necesario para llevar a cabo la evaluación. Una vez que la persona llegue, el/la evaluador/a le explicará de forma clara y sencilla en qué consiste la ADL Observations scale, cuanto tiempo va a emplear y qué es lo que va a realizar.

Instrucción para dar a la persona evaluada: a continuación, le voy a pedir que realice cuatro actividades. Como ve, en la mesa hay varios objetos. Por favor, para cada actividad elija el/los objetos necesarios y utilícelos como lo haría en su vida diaria. Intente realizar la actividad de la forma más precisa posible.

Actividades

1. Actividad: higiene personal. Lavarse la cara y la parte superior del cuerpo.

Objeto: esponja

Instrucciones para dar a la persona evaluada: haz como si se lavara la cara y la parte superior del cuerpo (hasta la cadera y sin contar la espalda), incluyendo los brazos, tal como lo haría en su rutina diaria de ducha. Recuerde que debe utilizar uno de los objetos que están en la mesa.

2. Actividad: ponerse una bata de sanitario.

Objeto: bata de sanitario

Instrucciones para la persona evaluada: póngase la bata que está sobre la mesa acomódesela y abroche los botones.

3. Actividad: preparar y comer un sándwich.
-

Objetos: pan de molde, queso y jamón cocido; alternativa: lechuga, tomate; tenedor y cuchillo

Instrucciones para la persona evaluada: prepare un sándwich utilizando los ingredientes que están encima de la mesa. Después, coma un trozo de sándwich utilizando los cubiertos.

4. La cuarta actividad es escogida por el/la evaluador/a, ya sea una actividad relevante para la persona evaluada o una actividad estándar.

Propuesta:

Actividad: lavarse los dientes.

Objetos: cepillo de dientes y pasta de dientes.

Instrucciones para la persona evaluada: lávese los dientes como lo haría en su rutina diaria, durante al menos un minuto. Utilice los objetos disponibles sobre la mesa para realizar la actividad.

Parámetros de rendimiento y método de puntaje

Independencia: capacidad para realizar las actividades sin ayuda externa

0 puntos	La persona realiza la actividad sin necesidad de ayuda
----------	--

1 punto	La persona es capaz de realizar la actividad, pero necesita asistencia verbal, ya sean indicaciones generales o instrucciones detalladas
---------	--

2 puntos	La persona es capaz de realizar la actividad, pero necesita cualquier tipo de ayuda física
----------	--

3 puntos	La persona no puede realizar la actividad, incluso recibiendo una asistencia completa
----------	---

Iniciación: la capacidad para comprender las instrucciones y comenzar la actividad

0 puntos	No se observan problemas, el paciente entiende las instrucciones e inicia la actividad
1 punto	Se da al menos uno de los siguientes supuestos: 1) la instrucción verbal debe adaptarse o ampliarse para facilitar el inicio de la actividad; 2) el/la evaluador/a debe realizar la actividad primero o mostrar cómo se inicia; 3) el/la evaluador/a debe mostrar imágenes o proporcionar las instrucciones escritas para ayudar a la persona a comenzar; 4) los objetos deben ser entregados a la persona evaluada para poder iniciar la actividad
2 puntos	Se da al menos uno de los siguientes supuestos: 1) el/la evaluador/a debe comenzar la actividad junto con el paciente; 2) la actividad debe adaptarse para que la persona pueda comenzarla de manera adecuada
3 puntos	La persona no puede iniciar la actividad y es el/la evaluador/a quién tiene que hacerse cargo.
Ejecución: capacidad para realizar las actividades en el orden correcto y utilizando los objetos adecuados	
0 puntos	No se observan dificultades realizando la actividad
1 punto	Se da al menos de los siguientes supuestos: 1) la persona necesita orientación verbal para realizar la actividad; 2) la orientación verbal debe combinarse con gestos, mímica o entonación para realizar la actividad
2 puntos	La persona requiere una orientación física para realizar la actividad
3 puntos	El/la evaluador/a debe hacerse cargo de la actividad
Control: capacidad de supervisar, ajustar y corregir el desempeño durante la actividad	
0 puntos	No se observan problemas, la persona no requiere retroalimentación

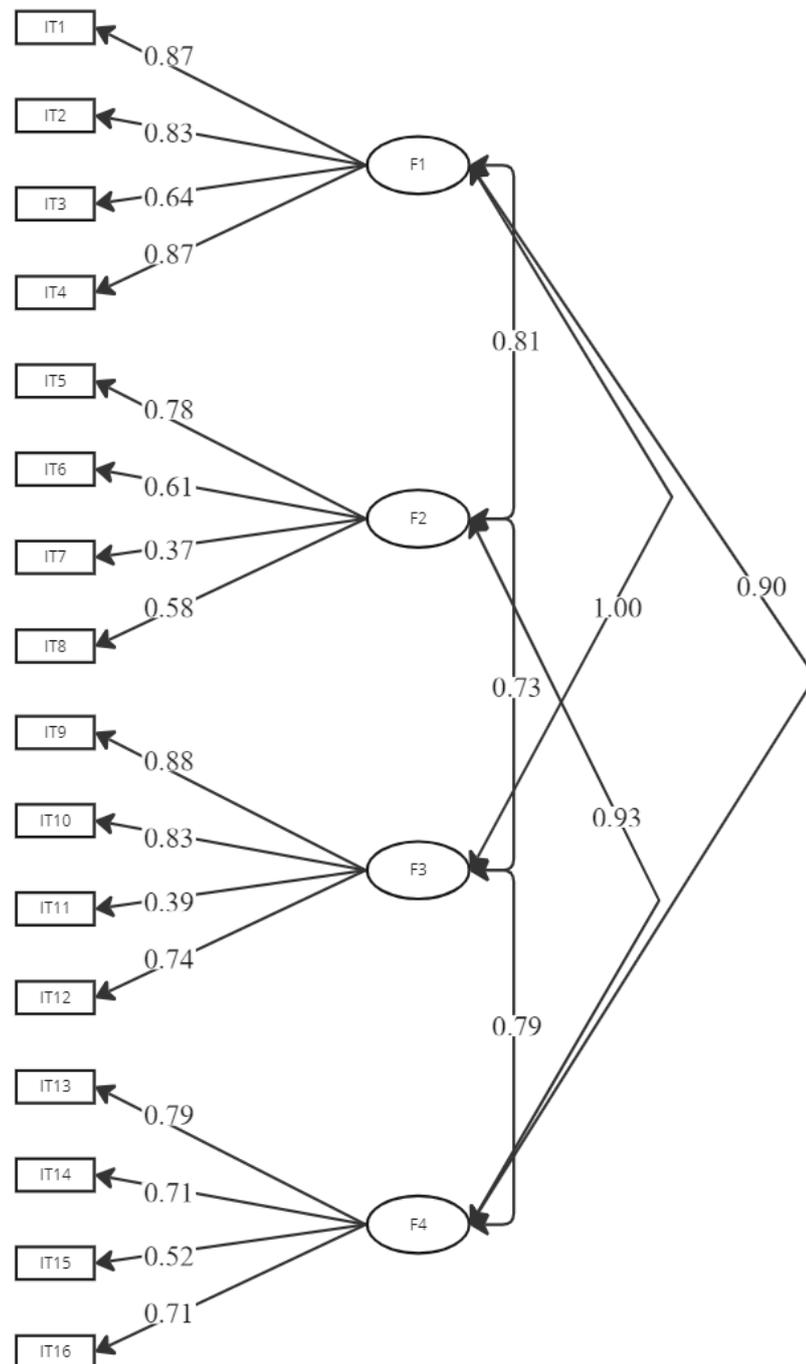
1 punto	Se da al menos uno de los siguientes supuestos: 1) la persona necesita retroalimentación verbal sobre el resultado de la actividad; 2) la persona necesita retroalimentación física sobre el resultado de la actividad
2 puntos	Se da al menos uno de los siguientes supuestos: 1) la persona necesita retroalimentación verbal sobre la ejecución de la actividad; 2) la persona necesita retroalimentación física sobre la ejecución de la actividad; 3) la persona requiere el uso de espejos o grabaciones en video que permitan a la persona observar su ejecución
3 puntos	El/la evaluador/a debe corregir la actividad en su totalidad

5.3.3. Psychometric properties of the Spanish version of the ADL Observations scale

5.3.3.1. Construct validity

Two models were evaluated using CFA to compare a unifactorial structure with a four-factor model based on the performance parameters: independence, initiation, execution, and control. The model fit statistics provided by AMOS software showed that the four-factor model had a significantly better fit to the data compared to the unifactorial model. Figure 4 shows the path diagram of that four-factor model. The fit indices of both models are presented in Table 15.

Figure 4. Path diagram of Model 2 of confirmatory factor analysis of the Spanish version of the ADL Observations scale



Note: F1 = Factor 1 (independence); F2 = Factor 2 (initiation); F3 = Factor 3 (execution); F4 = Factor 4 (control); IT = Item

Table 15. Fit indices for the confirmatory factor analysis of the Spanish version of the ADL Observations scale

Model	χ^2/df	<i>p-value</i>	RMSEA	90%CI	CFI	TLI	SRMR
1	3.932	<0.001	0.128	0.115–0.141	0.848	0.824	0.720
2	2.095	<0.001	0.078	0.62–0.094	0.952	0.934	0.045

Note: Model 1 = Unifactorial; Model 2 = Four-factor model with the performance components (independence, initiation, execution, and control); χ^2/df = Chi-square and degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardised Root Mean Square Residual

5.3.3.2. Internal consistency

The internal consistency using Cronbach's alpha was calculated for each factor of the ADL Observations scale. The results indicated good levels of internal consistency except for the initiation factor, which was slightly below the threshold with a Cronbach's alpha of 0.641 (95% CI 0.495 – 0.753). Conversely, the factor of independence showed a Cronbach's alpha of 0.886 (95% CI 0.839 – 0.921), the execution factor had a Cronbach's alpha of 0.855 (95% CI 0.796 – 0.900), and the control factor indicated a Cronbach's alpha of 0.775 (95% CI 0.683 – 0.845).

5.3.3.3. Identification of cut-off points and diagnostic accuracy

Cut-off points and their accuracy were estimated for each of the four factors composing the ADL Observations scale and adjusted for age. ROC curve analysis was conducted and showed AUC values ranging from 0.687 to 0.932. These values indicated that the ADL Observations scale has a discrimination accuracy greater than 69%. The optimal cut-off points identified using the Youden index ranged between ≥ 1 and ≥ 4 points. Based on these points, the optimal balance between sensitivity and specificity was found for the execution factor in participants under 65 years old, with a sensitivity of 0.861 (95% CI 0.725 – 0.948) and a specificity of 0.806 (95% CI 0.697 – 0.891). For participants over 65 years old, the optimal balance was achieved with the independence factor, showing a sensitivity of 0.829 (95% CI 0.683 – 0.928) and a specificity of 0.872 (95% CI 0.758 – 0.947). Table 16 summarises the results of the cut-off points, sensitivity, and specificity analysis.

Table 16. Characteristics of the ROC analysis of the Spanish version of the ADL Observations scale: area under the curve, Youden index, cut-off points, sensitivity, specificity, and confidence interval for each subtest, adjusted for age

≤65 years old (n =98)											
ADL Observations scale factors	AUC	95% CIAUC		Youden index	Cut-off points	Sensitivity	95% CI Sensitivity		Specificity	95% CI Specificity	
		Lower bound	Upper bound				Lower bound	Upper bound		Lower bound	Upper bound
		Independence	0.894				0.823	0.966		0.637	≥3
Initiation	0.687	0.570	0.804	0.368	≥1	0.417	0.266	0.579	0.952	0.879	0.988
Execution	0.880	0.804	0.956	0.668	≥2	0.861	0.725	0.948	0.806	0.697	0.891
Control	0.821	0.723	0.918	0.614	≥1	0.694	0.534	0.828	0.919	0.835	0.970
>65 years old (n =82)											
ADL Observations scale factors	AUC	95% CIAUC		Youden index	Cut-off points	Sensitivity	95% CI Sensitivity		Specificity	95% CI Specificity	
		Lower bound	Upper bound				Lower bound	Upper bound		Lower bound	Upper bound
		Independence	0.932				0.877	0.987		0.701	≥4

Initiation	0.787	0.682	0.891	0.559	≥ 1	0.771	0.616	0.888	0.787	0.657	0.887
Execution	0.884	0.809	0.960	0.687	≥ 3	0.857	0.718	0.946	0.830	0.706	0.918
Control	0.820	0.720	0.920	0.551	≥ 2	0.657	0.493	0.799	0.894	0.785	0.960

Note: ADL = Activities of Daily Living; ROC = Receiver Operating Characteristic, AUC = Area Under the Curve; CI = Confidence Interval

The positive predictive values for the ADL Observations scale ranged from 0.721 (95% CI 0.675 – 0.937) to 0.833 (95% CI 0.623 – 0.956), indicating that the scale effectively identifies more than 72% of patients with ULA that have affected their daily living activities, regardless of age. Conversely, the negative predictive values ranged from 0.738 (95% CI 0.635 – 0.825) to 0.909 (95% CI 0.815 – 0.966), which indicates that the ADL Observations scale can identify correctly more than 74% of individuals who do not exhibit ULA affecting daily activities. The remaining results are presented in Table 17.

Table 17. Predictive values and confidence interval adjusted for age of the Spanish version of the ADL Observations scale

≤65 years old (n =98)						
ADL						
Observations scale factors	PPV	95% CI PPV		NPV	95% CI NPV	
		Lower bound	Upper bound		Lower bound	Upper bound
Independence	0.794	0.640	0.906	0.859	0.761	0.930
Initiation	0.833	0.623	0.956	0.738	0.635	0.825
Execution	0.721	0.577	0.840	0.909	0.815	0.966
Control	0.833	0.675	0.937	0.838	0.739	0.912
>65 years old (n =82)						
Independence	0.829	0.683	0.928	0.872	0.758	0.947
Initiation	0.730	0.574	0.854	0.822	0.694	0.915
Execution	0.789	0.643	0.898	0.886	0.771	0.958
Control	0.821	0.655	0.932	0.778	0.656	0.874

Note: ADL = Activities of Daily Living; PPV = Positive Predictive Value; CI = Confidence Interval; NPV = Negative Predictive Value

5.4. Study IV: “Cross-cultural adaptation and content validity of the Spanish version of the Role Checklist”

5.4.1. Translation and cross-cultural adaptation of the Role Checklist

The Spanish version of the Role Checklist was obtained after the translation and cross-cultural adaptation process. Table 18 presents the definitive version. Initial translations by the two expert translators and the translated version by Colón et al¹²⁸ were consistent and similar across instructions, role definitions, and both parts of the Role Checklist. The panel of experts carefully reviewed all the versions and applied some changes to the reconciled version, which was then back-translated into English. As the original version and the back-translated version were conceptually equivalent, the 14 independent experts qualitatively evaluated this reconciled version in terms of relevance, comprehensiveness, and comprehensibility²⁰⁹. Some changes were suggested by these external experts and the most pertinent ones were applied in the final version. Regarding the Role Checklist instructions, these were specified and standardised to ensure consistency across evaluators. Preliminary information and literal instructions for the evaluated person were provided. An attempt was also made to define the concept of “role” in a simple and accessible manner for all populations. All role definitions were clarified, extended, and specified with examples to ensure that the person understands what participation in each role entails. In terms of Part I, which evaluates role participation, and Part II, which assesses the assigned value to each role, a specific question was formulated for each time frame and each value.

Table 18. Spanish version of the Role Checklist – Listado de roles

Role Checklist – Listado de roles

Instrucciones preliminares: el/la evaluador/a recibirá a la persona evaluada y le explicará de forma clara y sencilla en qué consiste el Listado de roles, cuánto tiempo va a tomar la prueba y en qué van a consistir las preguntas. Para la evaluación, el/la evaluador/a y la persona evaluada deberán estar sentados/as uno/a en frente del otro/a, con una mesa separando a ambos/as.

Instrucción para dar a la persona evaluada: este cuestionario tiene como propósito conocer su participación en diez roles, que son las diferentes funciones que las personas desempeñan en su vida diaria, como ser amigo/a o trabajador/a. Para ello, primero le leeré la definición de cada rol. Después le preguntaré si ha participado en ese rol en el pasado, si participa en él actualmente y si cree que participará en el futuro. Por último, le pediré que valore la importancia de cada rol para usted, independientemente de si ha participado, participa o espera participar.

Es importante tener en cuenta que este cuestionario se centra en la participación con una frecuencia de al menos una vez por semana. Por ejemplo, usted puede verse a sí mismo/a como miembro de una familia, pero si su familia reside fuera y comparte poco tiempo con ella, es posible que no cumpla con el criterio de participación que registran estas preguntas.

SECCIÓN I. PARTICIPACIÓN EN ROLES

1. Rol de estudiante: asistir a la escuela, instituto o universidad, o realizar algún curso o formación en la edad adulta, ya sea a tiempo completo, a tiempo parcial u online. Por ejemplo, algún curso de idiomas, de informática, ESO/Bachillerato, diplomados, capacitaciones, universidad para mayores, etc.

Participación en el pasado: ¿Alguna vez fue a la escuela o realizó alguna formación?	Sí	No
--	----	----

Participación en el presente: ¿Actualmente está estudiando algún curso o realizando alguna formación?	Sí	No
---	----	----

Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, estudiará algún curso o realizará alguna formación?	Sí	No
2. Rol de trabajador/a: tener un empleo remunerado, ya sea a tiempo completo o tiempo parcial o bien dedicarse a tiempo completo al cuidado del hogar.		
Participación en el pasado: ¿Alguna vez ha tenido un empleo, ya sea a tiempo completo o tiempo parcial, o se ha dedicado a tiempo completo al cuidado del hogar?	Sí	No
Participación en el presente: ¿Actualmente tiene un empleo, ya sea a tiempo completo o parcial, o se dedica a tiempo completo al cuidado del hogar?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, tendrá un empleo o se dedicará a tiempo completo al cuidado del hogar?	Sí	No
3. Rol de voluntario/a: prestar algún tipo de servicio o ayuda, como acompañar a personas mayores, en hospitales, vecindarios, comunidades, asociaciones, etc., o a través de plataformas de voluntariado virtual. Esta ayuda es de manera desinteresada y sin recibir ninguna remuneración económica, y con una periodicidad de al menos una vez a la semana.		
Participación en el pasado: ¿Alguna vez ha prestado algún tipo de ayuda de manera desinteresada, al menos una vez a la semana?	Sí	No
Participación en el presente: ¿Actualmente presta algún tipo de ayuda de manera desinteresada, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, prestará algún tipo de ayuda de manera desinteresada, al menos una vez a la semana?	Sí	No

-
4. Rol de cuidador/a: responsabilizarse del cuidado de hijos/as, nietos/as, pareja, padres, madres, familiares, amigos/as, mascotas, etc., Realizando asistencia en la alimentación, desplazamientos, cuidados médicos, etc. sin ánimo de lucro al menos una vez a la semana.
-

Participación en el pasado: ¿Alguna vez ha tenido la responsabilidad de cuidar a otra persona, al menos una vez a la semana?

	Sí	No
--	----	----

Participación en el presente: ¿Actualmente tiene la responsabilidad de cuidar a otra persona, al menos una vez a la semana?

	Sí	No
--	----	----

Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, tendrá la responsabilidad de cuidar a otra persona, al menos una vez a la semana?

	Sí	No
--	----	----

5. Rol de responsable del hogar: responsabilizarse de tareas de mantenimiento del hogar, como organización y gestión del hogar, aprovisionamiento, cuidado del bienestar familiar, responsabilidad de la limpieza, cocina, cuidado de la ropa, etc., sin remuneración económica y al menos una vez a la semana.
-

Participación en el pasado: ¿Alguna vez se ha responsabilizado, de tareas del hogar, al menos una vez a la semana?

	Sí	No
--	----	----

Participación en el presente: ¿Actualmente se responsabiliza al de tareas del hogar, al menos una vez a la semana?

	Sí	No
--	----	----

Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, se responsabilizará de tareas del hogar, al menos una vez a la semana?

	Sí	No
--	----	----

6. Rol de amigo/a: Dedicar tiempo o realizar alguna actividad con amigos/as como tomar café, pasear, tener una conversación, ir al cine, llamar por teléfono, etc., al menos una vez a la semana.
-

Participación en el pasado: ¿Alguna vez ha pasado tiempo con amigos/as, al menos una vez a la semana?	Sí	No
Participación en el presente: ¿Actualmente pasa tiempo con amigos/as, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, pasará tiempo con amigos/as, al menos una vez a la semana?	Sí	No
<p>7. Rol de miembro de familia: Dedicar tiempo o realizar alguna actividad con algún miembro de la familia, como hijos/as, nietos/as, pareja, padres, madres, abuelos/as primos/as, entre otros. Esto puede incluir eventos como comidas familiares, excursiones, paseos, o simplemente conversar, al menos una vez a la semana.</p>		
Participación en el pasado: ¿Alguna vez ha pasado tiempo con su familia, al menos una vez a la semana?	Sí	No
Participación en el presente: ¿Actualmente pasa tiempo con su familia, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, pasará tiempo con su familia, al menos una vez a la semana?	Sí	No
<p>8. Rol de miembro activo de un grupo religioso o grupo espiritual: participar en actividades o reuniones relacionadas con alguna religión o con la espiritualidad, al menos una vez a la semana.</p>		
Participación en el pasado: ¿Alguna vez ha participado como miembro activo de un grupo religioso o espiritual, al menos una vez a la semana?	Sí	No

Participación en el presente: ¿Actualmente participa como miembro activo de un grupo religioso o espiritual, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, participará como miembro activo de algún grupo religioso o espiritual, al menos una vez a la semana?	Sí	No
<p>9. Rol de aficionado/a: participar en alguna afición o actividad de ocio durante el tiempo libre, ya sea de forma autodidacta o en clases, solo/a o acompañado/a, como coser, tocar algún instrumento, conducir vehículos, cuidar del huerto, bailar, practicar deporte, hacer teatro, etc., al menos una vez a la semana.</p>		
Participación en el pasado: ¿Alguna vez ha participado en alguna afición o actividad de ocio, al menos una vez a la semana?	Sí	No
Participación en el presente: ¿Actualmente participa en alguna afición o actividad de ocio, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, participará en alguna afición o actividad de ocio, al menos una vez a la semana?	Sí	No
<p>10. Participante en organizaciones: participar en organizaciones o asociaciones, como la asociación de padres, algún club, por ejemplo, de montaña, peña de fútbol, equipos, etc., al menos una vez a la semana.</p>		
Participación en el pasado: ¿Alguna vez ha participado en alguna organización o asociación, al menos una vez a la semana?	Sí	No
Participación en el presente: ¿Actualmente participa en alguna organización o asociación, al menos una vez a la semana?	Sí	No

Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, participará en alguna organización o asociación, al menos una vez a la semana?	Sí	No
11. Otros roles: cualquier otro rol no incluido en la lista que haya desempeñado en el pasado, esté desempeñando actualmente o espere participar en el futuro.		
Participación en el pasado: ¿Alguna vez ha participado en algún otro rol que no hayamos nombrado, al menos una vez a la semana?	Sí	Sí
Participación en el presente: ¿Actualmente participa en ese rol, al menos una vez a la semana?	Sí	No
Expectativas de participación en el futuro: ¿Cree que más adelante, en el futuro, participará en ese rol al menos una vez a la semana?	Sí	No

SECCIÓN II. VALOR ASINGADO A LOS ROLES

¿Qué valor o importancia le da al rol de estudiante?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de trabajador/a?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de voluntario/a?	Nada de valor, no es importante para mi	Algo de valor, una importancia	Mucho valor, es muy

		media para mi	importante para mi
¿Qué valor o importancia le da al rol de cuidador/a?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de responsable del hogar?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de amigo/a?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de miembro de familia?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de miembro activo de un grupo religioso o espiritual?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da al rol de aficionado/a?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi

	importante para mi	media para mi	importante para mi
¿Qué valor o importancia le da al rol de participante en organizaciones?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi
¿Qué valor o importancia le da a ese otro rol?	Nada de valor, no es importante para mi	Algo de valor, una importancia media para mi	Mucho valor, es muy importante para mi

5.4.2. Assessment of the content validity of the Spanish version of the Role Checklist

A group of 14 independent experts evaluated content validity²¹⁰, including seven occupational therapists with experience in brain damage, geriatrics, and research, three neurologists, two neuropsychologists, and one physiotherapist specialising in neurorehabilitation. Table 19 summarises the professional characteristics of experts. The group was carefully selected to include professionals from various regions in Spain, including islands, and other Spanish-speaking countries to ensure a diverse range of perspectives and cultural relevance. The values of Aiken's V coefficient, detailed in Table 20, show a strong level of agreement among experts.

Table 19. Demographic and professional characteristics of experts

Descriptive data	Sample (N = 14)	
	n / Mean	% / SD
Sex, women	12	85.7
Age	29.36	6.09
Profession		
Occupational therapist	7	50
Psychologist	2	14.3
Physiotherapist	1	7.1
Neurologist	3	21.4
Neuropsychologist	1	7.1
Area of expertise		
Neurology and neurorehabilitation	7	50
Adults	3	21.4
Dementia and older adults	1	7.1
Research and teaching	1	7.1
Neurology and research	2	14.3
Education		
Bachelor's degree	5	35.7
Bachelor's degree and master's degree	6	42.9
Bachelor's degree, master's degree, and pursuing a PhD	2	14.3
Bachelor's degree, master's degree, and PhD	1	7.1

Note: SD = Standard Deviation

Table 20. Values of the Aiken's V coefficient and confidence interval for estimating the content validity of the Spanish version of the Role Checklist

Dimensions	Aiken's V coefficient	95% CI	
		Lower bound	Upper bound
General questions	0.92	0.832	0.963
Instructions	0.93	0.845	0.969
Role definitions			
Student	0.92	0.835	0.963
Worker	0.94	0.858	0.975
Volunteer	0.92	0.832	0.963
Caregiver	0.86	0.759	0.922
Home maintainer	0.92	0.832	0.963
Friend	0.86	0.759	0.922
Family member	0.89	0.795	0.943
Religious participant	0.91	0.820	0.957
Hobbyist	0.91	0.820	0.957
Participant in organisations	0.91	0.820	0.957
Past role participation	0.92	0.832	0.963
Current role participation	0.94	0.858	0.975
Expectations of future participation	0.91	0.820	0.957
Assigned value to roles	0.83	0.725	0.900

Note: CI = Confidence Interval

5.5. Study V: “Psychometric properties of the Role Checklist for Spanish-speaking post-stroke patients”

5.5.1. Description of the participants

A total of 179 post-stroke patients were included in the study. From them, 30 individuals (17%) were also enrolled in the test-retest and inter-rater analyses.

The descriptive data of the participants revealed that 124 individuals (69.30%) were men. The average age of the total sample was 63 years old (SD = 11.60). There were 10.60% of single participants, 70.40% married, 11.70% divorced, and 7.30% widowed. Regarding educational level, 38% of the participants had primary education, 27.90% secondary education, 15.70% vocational training, and 18.40% university education. Concerning lifestyle, participants reported an average of 7 hours of sleep per night (SD = 1.83). 63.70% of the participants realised daily physical activity, with an average duration of 40.45 minutes (SD = 45.32). The most prevalent type of stroke was ischaemic with 67% of individuals, followed by lacunar stroke with 16.80% and haemorrhagic with 16.20%. Most of the participants (87.70%) were in the chronic phase of stroke, while only 12.30% were in the subacute phase. Table 21 summarises the descriptive data of the two parts of the Role Checklist. Before the stroke, individuals participated in an average of seven roles, which subsequently declined to two roles. However, their expectations for future role participation indicate that post-stroke patients see themselves participating in an average of five roles again.

Table 21. Descriptive statistics of the Role Checklist

The Role Checklist parts	Mean	SD	Variance	Range	Minimum	Maximum	Percentiles		
							25th	50th	75th
Role participation	15.95	4.14	17.14	21	5	26	13	16	19
Past role participation	7.12	1.59	2.52	5	5	10	5.25	7	8
Current role participation	2.56	1.93	3.72	7	0	7	1	2	4
Expectations of future role participation	5.13	2.42	5.85	9	0	9	3.25	5	7
Assigned value to roles	16.54	2.21	4.98	14	6	20	15	17	18

Note: SD = Standard Deviation

5.5.2. Internal consistency

The internal consistency of the Role Checklist for Spanish-speaking post-stroke patients showed different values. The Cronbach's alpha value for the part assessing role participation was 0.73 (95% CI 0.57 – 0.74), while the part evaluating the value or importance assigned to each role was 0.45 (95% CI 0.33 – 0.57). Analysis of the item-total correlations for each part showed that, among the 40 items, only three correlations were not significant: “worker in the past”, “family member in the past”, and “religious participant in the past”. Table 22 details the results obtained.

Table 22. Item-total correlations of the Role Checklist

The Role Checklist parts / items	Pearson's r	p-value
Role participation		
Past role participation		
Student	0.20	<0.008*
Worker	0.09	<0.242
Volunteer	0.35	<0.001*
Caregiver	0.43	<0.001*
Home maintainer	0.19	<0.013*
Friend	0.22	<0.003*
Family member	0.11	<0.159
Religious participant	0.13	<0.087
Hobbyist / Amateur	0.16	<0.037*
Participants in organisations	0.41	<0.001*
Current role participation		
Student	0.33	<0.001*
Worker	0.26	<0.001*
Volunteer	0.34	<0.001*
Caregiver	0.42	<0.001*
Home maintainer	0.51	<0.001*
Friend	0.41	<0.001*
Family member	0.25	<0.001*
Religious participant	0.26	<0.001*
Hobbyist / Amateur	0.28	<0.001*
Participants in organisations	0.43	<0.001*
Expectations of future role participation		
Student	0.40	<0.001*
Worker	0.44	<0.001*
Volunteer	0.53	<0.001*
Caregiver	0.33	<0.001*
Home maintainer	0.53	<0.001*
Friend	0.44	<0.001*

Family member	0.23	<0.002*
Religious participant	0.26	<0.001*
Hobbyist / Amateur	0.33	<0.001*
Participants in organisations	0.57	<0.001*
<hr/> Assigned value to roles <hr/>		
Student	0.28	<0.001*
Worker	0.44	<0.001*
Volunteer	0.49	<0.001*
Caregiver	0.47	<0.001*
Home maintainer	0.32	<0.001*
Friend	0.50	<0.001*
Family member	0.23	<0.002*
Religious participant	0.47	<0.001*
Hobbyist / Amateur	0.40	<0.001*
Participants in organisations	0.56	<0.001*

Note: * = Significant correlations

5.5.3. Test-retest reliability

The temporal consistency of the Role Checklist was confirmed as the ICC of the test-retest analysis, which showed good agreement between the two evaluations and for both parts of the Role Checklist (>0.80). Past role participation obtained an ICC value of 0.88, current participation a value of 0.86, expected future participation a value of 0.84, and importance assigned to each role a value of 0.84, as well.

5.5.4. Inter-rater reliability

The consistency of responses when the Role Checklist was administered by two independent evaluators was very high in both parts. The ICC was excellent, remaining above 0.99. The values obtained by the first evaluator for each part compared with those obtained by the second evaluator are summarised in Table 23.

Table 23. Mean scores obtained from both evaluators and inter-rater reliability of the Spanish version of the Role Checklist (n = 15)

The Role Checklist parts	Rater 1	Rater 2	ICC
Role participation	17.16 (6–24)	17.37 (6–24)	0.99*
Past role participation, mean (min-max)	7.58 (4–10)	7.58 (4–10)	1.00*
Current role participation, mean (min-max)	3.68 (1–7)	3.89 (1–7)	0.99*
Expectations of future role participation, mean (min- max)	5.89 (1–9)	5.89 (1–9)	0.99*
Assigned value to roles, mean (min-max)	16.26 (7–20)	16.05 (6–20)	0.99*

Note: (min-max) = (Minimum-maximum); ICC = Intraclass Correlation Coefficient; *
= p < 0.001

5.6. Study VI: “Upper limb apraxia is related to role participation in post-stroke patients”

5.6.1. Description of the participants

A total of 332 participants were approached in this study. From this potential sample, 153 post-stroke patients were included in the study. Of them, 70% were men, with an average age of 63 years. Hemiplegia was present in 12 participants, and no participants had difficulties with walking abilities. Only 16% had undergone occupational therapy rehabilitation. Table 24 shows the baseline characteristics of the participants. The descriptive statistics presented in Table 25 depict the scores of role participation and ULA among the sample. There were no missing data in any variable of the study.

Table 24. Socio-demographic, lifestyle, and clinical characteristics of the sample of the study VI

Sample descriptive data	Participants (N = 153)	
Socio-demographic data	n/Mean	%/SD
Sex, men	107	69.90
Age (years)	63.15	11.87
Marital status		
Single	15	9.80
Married	110	71.90
Divorced	18	11.80
Widowed	10	6.50
Educational level		
Primary education	61	39.90
Secondary education	41	26.80
Vocational training	21	13.70
University education	29	19
Self-reported lifestyle behaviours		
Smoking habits		
Smoker	39	25.50
Ex-smoker	13	8.50
Number of cigarettes per day	2	4.55
Alcohol consumption		
Drinker	13	8.50
Number of units per day	0.41	0.88
Caffeine consumption		
Drinker	59	38.60
Number of cups per day	0.50	0.76
Hours of sleep	6.92	1.80
Physical activity	92	60.10
Physical activity (minutes per day)	40.39	47.33
Clinical characteristics		
Dominant hand		
Right-handed	137	89.50
Left-handed	7	4.60
Ambidextrous	9	5.90
Stroke type		
Ischaemic stroke	123	80.40
Haemorrhagic stroke	17	11.10
Lacunar stroke	13	8.50
Affected hemisphere		
Right	63	41.20
Left	57	37.30
Both	23	15
Indeterminate	10	6.50
Time since stroke onset (months)	27.82	29.02
Presence of hemiplegia	12	7.80
OT rehabilitation	24	15.70
OT rehabilitation duration (weeks)	3.76	15.57

Note: SD = Standard Deviation; OT = Occupational Therapy

Table 25. Descriptive statistics for role participation and upper limb apraxia

	Mean	SD	Range	Minimum	Maximum	Percentiles		
						25 th	50 th	75 th
Role participation								
Level of past role participation	7.10	1.46	7	3	10	6.00	7.00	8.00
Level of current role participation	3.68	1.66	8	0	8	2.50	4.00	5.00
Changes in role participation after stroke	3.42	1.86	10	-1	9	2.00	3.00	4.00
Expectations of future role participation	5.37	2.06	10	0	10	4.00	5.00	7.00
Comparison between future expectations and current role participation	1.69	1.73	9	-2	7	0.00	1.00	3.00
Comparison between future expectations and pre-stroke role participation	1.73	2.02	10	-2	8	0.00	2.00	3.00
Assigned value or importance to roles	16.59	2.21	14	6	20	15.50	17.00	18.00
ULA								
Non-symbolic imitation	33.12	5.41	27	13	40	31.00	35.00	37.00
Intransitive imitation	35.01	4.32	25	15	40	33.00	36.00	38.00
Transitive imitation	27.66	5.55	27	12	39	24.50	28.00	32.00
Non-symbolic pantomime	33.54	5.67	28	12	40	31.00	35.00	37.50
Intransitive pantomime	35.71	4.45	31	9	40	34.00	37.00	39.00
Transitive pantomime	29.85	5.83	32	8	40	26.00	31.00	34.00
ADL Observations scale score	3.03	6.01	35	0	35	0.00	0.00	3.00

Note: ULA = Upper Limb Apraxia; SD = Standard Deviation; ADL = Activities of Daily Living

5.6.2. The relationship between upper limb apraxia and role participation

The multiple linear regression analyses indicated significant associations between ULA and role participation in post-stroke patients, as shown in Table 26. Age ($\beta = -0.170$), university education ($\beta = 0.228$), and transitive pantomime ($\beta = 0.284$) were related to current role participation, predicting 20.5% of its total variance ($R^2 = 0.205$, $F [3,152] = 12.795$, $p < 0.001$). Smoking habit ($\beta = -0.234$), haemorrhagic stroke ($\beta = -0.236$), non-symbolic imitation ($\beta = -0.392$), and transitive imitation ($\beta = 0.308$) predicted 15.8% of the variance ($R^2 = 0.158$, $F [4,152] = 6.957$, $p < 0.001$) of the changes in role participation after stroke. Age ($\beta = -0.317$), hours of sleep ($\beta = -0.197$), and intransitive pantomime ($\beta = 0.174$) were associated with expectations for future role participation, explaining 17.8% of its variance ($R^2 = 0.178$, $F [3,152] = 10.776$, $p < 0.001$). Age ($\beta = 0.262$), smoking habit ($\beta = -0.165$), and time since stroke onset ($\beta = 0.199$) predicted 14.4% of the variance ($R^2 = 0.144$, $F [3,152] = 8.356$, $p < 0.001$) of the expectations for future role participation regarding the past. Furthermore, coffee habit ($\beta = -0.216$), both hemispheres affected ($\beta = 0.181$), and both non-symbolic imitation ($\beta = -0.317$) and intransitive pantomime ($\beta = 0.395$) were related to the assigned value to role participation, accounting for 16.2% of the variance ($R^2 = 0.162$, $F [4,152] = 7.170$, $p < 0.01$).

Table 26. Multiple regression models for role participation and upper limb apraxia

Model	R	R ²	Adjusted R ²	Independent variables	Unstandardised coefficients			95% CI B		Standardised coefficients β	p-value
					B	Lower bound	Upper Bound				
Level of current role participation	0.453	0.205	0.189	Age	-0.024	-0.045	-0.003	-0.170	0.025		
				University education	0.966	0.338	1.594	0.228	0.003		
				Transitive pantomime	0.081	0.039	0.123	0.284	<0.001		
Changes in role participation after stroke	0.398	0.158	0.136	Cigarettes per day	-0.096	-0.157	-0.034	-0.234	0.003		
				Haemorrhagic stroke	-1.395	-2.282	-0.508	-0.236	0.002		
				Non-symbolic imitation	-0.135	-0.207	-0.063	-0.392	<0.001		
				Transitive imitation	0.104	0.033	0.174	0.308	0.004		
Expectations of future role participation	0.422	0.178	0.162	Age	-0.055	-0.081	-0.029	-0.317	<0.001		
				Hours of sleep	-0.224	-0.392	-0.057	-0.197	0.009		
				Intransitive pantomime	0.081	0.012	0.150	0.174	0.022		
Comparison between future expectations and current role participation	–	–	–	–	–	–	–	–	>0.050		
Comparison between future expectations and pre-stroke role participation	0.379	0.144	0.127	Age	0.045	0.019	0.070	0.262	<0.001		
				Cigarettes per day	-0.073	-0.141	-0.006	-0.165	0.033		
				Months since stroke	0.014	0.003	0.024	0.199	0.010		

Assigned value to role participation	0.403	0.162	0.140	Coffees per day	-0.627	-1.064	-0.190	-0.216	0.005
				Both hemispheres affected by stroke	1.120	0.193	2.046	0.181	0.018
				Non-symbolic imitation	-0.129	-0.213	-0.046	-0.317	0.003
				Intransitive pantomime	0.196	0.095	0.298	0.395	<0.001

Note: R^2 = Coefficient of determination; B = Regression coefficient; CI = Confidence Interval; β = adjusted coefficient from multiple linear regression analysis; the dash (-) indicates non-significant findings ($p > 0.05$)

5.7. Study VII: “The impact of upper limb apraxia on general and domain-specific self-efficacy in post-stroke patients”

5.7.1. Description of the participants

Of 189 post-stroke patients who met the eligibility criteria, 82 participants were enrolled in the study. From this sample, 73% of men, with a mean age of 62 years old. Nine participants were single (11%), 61 were married (74.4%), eight were divorced (4.9%), and four were widowed (4.9%). Regarding the educational level, 32 participants had primary studies (39%), 21 had secondary studies (25.6%), 12 had vocational training (14.6%) and 17 had university studies (20.7%). 59 participants were workers (72%), 22 were retired (26.8%) and one was a student (1.2%). Concerning lifestyle behaviours, 15 individuals smoked (18.5%), and 22 individuals consumed alcohol in their daily life (26.8%). The average hours of sleep per day for all participants was 7 hours and they practiced 50 minutes of physical activity per day. The most common type of stroke was ischaemic with 71 participants (86.6%). The average time since stroke onset was 31 months. Four individuals had hemiplegia (4.9%) and 10 were going to rehabilitation after the stroke (12.2%). The descriptive statistics for ULA are shown in Table 27. The mean scores ranged from 29.55 to 36.68 points across different TULIA Apraxia subtests.

Table 27. Descriptive statistics for upper limb apraxia

ULA	Mean	SD	Range	Minimum	Maximum	Percentiles		
TULIA Apraxia test						25th	50th	75th
Non-symbolic imitation	35.96	3.14	16	24	40	35.00	37.00	38.00
Intransitive imitation	36.38	3.23	14	26	40	35.00	37.00	39.00
Transitive imitation	29.55	5.55	26	14	40	27.00	30.00	33.00
Non-symbolic pantomime	35.16	3.70	16	24	40	33.00	36.00	38.00
Intransitive pantomime	36.68	3.11	13	27	40	35.00	38.00	39.00
Transitive pantomime	32.74	4.62	20	20	40	30.75	33.00	36.00
ADL Observations scale								
Total scale score	2.32	4.36	26	0	26	0.00	0.00	3.00

Note: ULA = Upper Limb Apraxia; SD = Standard Deviation; ADL = Activities of Daily Living

5.7.2. The relationship between upper limb apraxia and self-efficacy dimensions

The results from linear regression analyses showed that intransitive imitation was significantly associated with general ($R^2 = 0.138$) and emotional self-efficacy ($R^2 = 0.104$), explaining 14% and 10% of its variance, respectively. Transitive imitation explained 12% of the variance in self-efficacy for managing global symptoms ($R^2 = 0.124$) and 5% for social-home integration symptoms ($R^2 = 0.052$). The combination of intransitive imitation, non-symbolic pantomime, and the total score of the ADL Observations scale explained 24% of the variance in cognitive self-efficacy ($R^2 = 0.248$). The complete results from the regression analyses are presented in Table 28.

Table 28. Multiple linear regression models for each self-efficacy dimension

General self-efficacy ($R^2 = 0.138$)						
Independent Variable	B	95% CI		β	SE	p-value
		Lower	Upper			
		Bound	Bound			
Intransitive imitation	1.743	0.782	2.704	0.372	0.483	<0.001
Social-home integration self-efficacy ($R^2 = 0.052$)						
Independent variable	B	95% CI		β	SE	p-value
		Lower	Upper			
		bound	bound			
Transitive imitation	0.263	0.014	0.512	0.229	0.125	0.035
Cognitive self-efficacy ($R^2 = 0.248$)						
Independent variable	B	95% CI		β	SE	p-value
		Lower	Upper			
		bound	bound			
Intransitive imitation	1.469	0.660	2.278	0.420	0.406	0.001
ADL Observations scale	-0.722	-1.261	-0.183	-0.279	0.271	0.009
Non-symbolic pantomime	-0.783	-1.480	-0.086	-0.256	0.350	0.028
Emotional self-efficacy ($R^2 = 0.104$)						
Independent variable	B	95% CI		β	SE	p-value
		Lower	Upper			
		bound	bound			
Intransitive imitation	0.865	0.301	1.429	0.323	0.283	0.003
Total score of self-efficacy for managing symptoms ($R^2 = 0.124$)						
Independent variable	B	95% CI		β	SE	p-value
		Lower	Upper			
		bound	bound			
Transitive imitation	1.282	0.524	2.039	0.352	0.381	0.001

Note: R^2 = coefficient of determination; B = regression coefficient; CI = Confidence Interval; β = adjusted coefficient from multiple linear regression analysis; SE = Standard Error; ADL = Activities of Daily Living

IV

Discussion

Conclusions



6. DISCUSSION

The findings of this doctoral thesis show that the two instruments for upper limb apraxia, the TULIA Apraxia test and the ADL Observations scale, are valid and reliable tools with strong diagnostic accuracy for detecting and evaluating upper limb apraxia in Spanish-speaking post-stroke patients. The results also suggest that upper limb apraxia is related to human occupation and health factors in post-stroke patients. Particularly, role participation levels, general self-efficacy, and self-efficacy for managing symptoms after a stroke are affected by upper limb apraxia.

6.1. Psychometric properties of two instruments for detecting and evaluating upper limb apraxia in Spanish-speaking post-stroke patients

The Spanish versions of the TULIA Apraxia test and the ADL Observations scale maintain the semantic, conceptual, and operational equivalence with the original instruments. The theoretical six-factor structure of the TULIA Apraxia test and the four-factor structure of the ADL Observations scale were supported by the results of construct validity. Moreover, the factors of both instruments showed acceptable internal consistency, and the cut-off points adjusted for age indicated strong accuracy in distinguishing between patients with and without upper limb apraxia. High sensitivity values indicated the instruments' capability to identify individuals with upper limb apraxia, while high specificity showed their ability to correctly identify individuals without upper limb apraxia. Additionally, the predictive values show that both instruments can accurately classify an elevated percentage of patients into the categories of with and without upper limb apraxia, regardless of age.

Regarding the cross-cultural adaptation of the TULIA Apraxia test, efforts were made to ensure clear and consistent interpretations of instructions, items, and the scoring

method. In this line, it is possible to standardise the test and reduce subjectivity. ULA is a complex deficit that can seem abstract, particularly for professionals unfamiliar with it²⁵, contributing to underdiagnosis. Therefore, this study's adaptation process also focused on clarifying and making more accessible the test while maintaining semantic, conceptual, and operational equivalence with the original version. Enhancing the clarity of ULA evaluations offers numerous benefits: i) improving overall comprehensibility of the test for both the evaluator and the person being evaluated, leading to more accurate ULA detection⁴⁶; ii) ensuring consistent application and interpretation of the instructions, items, and scoring among different evaluators and individuals assessed²¹¹; and iii) increasing applicability and administration efficiency, thereby reducing time and resource requirements for assessment²¹². On the other hand, the scoring method plays a decisive role in the ULA assessment by identifying patients who exhibit ULA and, if so, assessing its severity based on observed apraxic errors during gestures. Thus, in this case, efforts were made to preserve fidelity to the original scoring method to ensure consistency with the other language version of the TULIA Apraxia test. This approach is in line with previous findings that affirm the importance of maintaining consistency in test administration and scoring methods to establish reliable cross-cultural applicability^{162,165}. By achieving these adaptations, the Spanish version of the TULIA Apraxia test is a valid tool of assessment, benefiting both clinical practice and research in diverse cultural settings.

The construct validity of the Spanish version of the TULIA Apraxia test was assessed through four models to determine the optimal structure. The model composed of six factors presented a better fit compared to the unidimensional one, supporting the hypothesised six-factor structure of the TULIA Apraxia test. In this six-factor structure model, two values were slightly below the most used thresholds but approaching it, which

is reasonable when other goodness-of-fit indices are excellent²¹³. However, modification indices in this model identified two potentially problematic items, probably influenced by limited response variability. This observation led to the consideration of item modifications in the analysis. For that reason, a third model was tested after removing these problematic items. This model fit showed a slightly improved fit over the model with a structure of six factors but comprised only 46 items instead of the original 48. To preserve the original 48-item structure of the TULIA Apraxia test, a fourth model was tested replacing the two problematic items with two new equivalent items, resulting in satisfactory fit indices. Given the variability in response patterns across different samples, this study proposes using the original 48 items as shown in the model with a structure of six factors. However, if bias about limited response variability arises, substitution with the tested alternative items is recommended. On the other hand, the six subtests of the TULIA Apraxia test exhibited significant correlations with the three standardised ULA evaluations. However, these values were slightly lower compared to those reported by the original authors²⁶. This might be due to differences in sample characteristics. Nevertheless, these findings confirm that the six-factor structure, utilising the original items, effectively assesses the multifactorial construct of ULA in Spanish-speaking post-stroke patients.

Internal consistency of the TULIA Apraxia test for Spanish-speaking post-stroke patients fits with the results reported in the original study of the test²⁶. However, there are some slight variations across subtests between the original and Spanish versions. Imitation non-symbolic shows higher internal consistency in the Spanish version compared to the original, while pantomime transitive and intransitive exhibit lower internal consistency in the Spanish version. These differences between the two versions may suggest cultural or social influences on individuals' performance gestures²¹⁴. Some

cultures may emphasise communicative gestures in daily life more than others²¹⁵, which can affect the performance of intransitive gestures. The social context can also influence how people perform movements, leading to variability in their performance based on demographic characteristics, access to health services, or previous occupational background²¹⁶. The reliability of the test depends on the characteristics of the evaluated population, underlying the importance of idiomatic, cultural, and social adaptations of the instrument²¹⁷.

The cut-off points of the TULIA Apraxia test were calculated by considering the age of the participants, to improve upper limb apraxia detection across different life stages. Moreover, these cut-off points were determined for each subtest for different reasons: firstly, the various praxis abilities require an individual assessment as they can be affected at different levels^{70,218}. Cut-off points permit identifying deficits in each specific praxis ability with high levels of sensibility and specificity. Secondly, setting cut-off points for each subtest enables more personalised rehabilitation plans. Thirdly, it permits effective and specific monitoring of changes in praxis functions. Lastly, determining cut-off points for each subtest may enrich the knowledge of upper limb apraxia, allowing for a more detailed analysis of the praxis abilities and their variations.

Concerning the cross-cultural adaptation of the ADL Observations scale, the attention was focused on ensuring that the content of the activities used in the original version was also applicable to Spanish speakers. Furthermore, changes applied intended to standardise the evaluation process to reduce the potential for subjective interpretations by different evaluators. Detailed activity descriptions and clear instructions try to ensure that everyone understands what is expected, thus minimising individual variations¹⁶⁵. Furthermore, inclusive language was incorporated throughout the Spanish version of the scale, reflecting a commitment to gender neutrality. Defining each performance

parameter and simplifying the scoring criteria further enhanced the scale's precision, allowing for more consistent and replicable evaluations of praxis abilities across diverse populations¹⁶². These changes were in line with what the original authors proposed in their study.

The four-factor structure observed in the construct validity assessment of the ADL Observations scale based on the performance parameters (independence, initiation, execution, and control) reflects the complexity of praxis abilities in daily activities. These parameters allow for a differentiated assessment of each aspect involved in task performance, facilitating the identification of specific apraxic deficits. Unlike an unifactorial model, the four-factor model better captures the various components of praxis performance, enhancing the scale sensitivity to detect specific areas of difficulty. This fits with the underlying rationale of the scale, where each performance parameter is essential for assessing the patient's ability to conduct complex activities autonomously. While it is true that the original authors proposed that the entire ADL Observations scale assessed the same construct⁶², the structure presented in this study is proposed as a continuation of that theory, adding coherence to the scale.

Internal consistency of the ADL Observations Scale was also analysed for each factor to explore if the four-structure proposed by the construct validity was reliable for this population. The parameter of initiation showed the weakest value, and this contrasts with the internal consistency reported by the original authors, who identified a Cronbach's alpha of 0.81 for the initiation parameter⁶². Attending the descriptive statistics of the ADL Observations scale for this study, this may be due to the low variability in responses since a low number of participants showed difficulties in initiating tasks.

The ADL Observations Scale is a tool not for identifying upper limb apraxia *per se* but rather to evaluate the extent to which ULA affects the ability to perform ADLs. This consideration is fundamental, as ULA is a neurocognitive disorder that may or may not manifest in functional observable impairments during daily tasks⁸⁰. For this, the ADL Observations Scale is designed to capture the real consequences of ULA, offering insight into how praxis difficulties translate into challenges in everyday activities such as dressing, feeding, or personal hygiene. The practical perspective that offers this scale is essential for tailoring rehabilitation strategies. In this line, sensitivity, specificity, and predictive values help to determine the scale's accuracy in identifying individuals whose daily functioning is truly compromised by ULA.

6.2. The relationship of upper limb apraxia with human occupation and health factors in post-stroke patients

This doctoral thesis objective was achieved due to the validation and psychometric analysis of the Role Checklist. The Role Checklist, the primary instrument for assessing role participation, was not previously validated for use in Spanish-speaking post-stroke populations. Therefore, to address this objective, the instrument was first validated to ensure that its use was appropriate for the study sample.

The findings show that upper limb apraxia is related to role participation among post-stroke patients. In terms of the current participation and future expectations for participation, these were associated with difficulties in performing pantomimes. On the one hand, the current level of role participation can be explained by the communicative nature of pantomimes²⁹, since these gestures are intended to communicate information concerning object use or meaningful actions⁵⁸. Communicative tasks require the ability to execute precise movements for effective expression. Therefore, pantomimes may play

a key role in promoting social interactions⁵⁰. On the other hand, concerning future expectations for role participation, increased expectations for participation were linked to better abilities to perform pantomimes. This result may suggest that the ability to execute precise pantomimes implies a mastery of complex cognitive functions involving understanding, representing, and communicating actions²⁹. These abilities are closely tied to functional independence²¹⁹ and life satisfaction after a stroke²²⁰. Therefore, increased life satisfaction could improve confidence to engage in roles and assume responsibilities gradually.

In terms of post-stroke changes in role participation, lower participation was associated with worse non-symbolic imitation abilities but better transitive imitation abilities. This inverse relationship does not fit with usual clinical observation. A plausible explanation could be that individuals who have more difficulties performing transitive gestures may be more focused on indoor roles due to limitations in engaging in activities outside the home, which could lead to an overall increase in the number of roles in which the sample participated after the stroke²²¹. Another reason could be that these patients might have reduced their engagement in work-related activities, resulting in a restructuring of their time and a shift toward different roles¹⁴⁹.

Regarding the assigned value to roles, higher levels of importance assigned to role participation were associated with better intransitive pantomime abilities but poorer non-symbolic imitation abilities. In terms of pantomime, this result could be explained by various reasons, such as levels of motivation, cognitive abilities, emotional well-being, and treatment adherence. Firstly, individuals assigning greater importance to their roles may be more motivated²²². This heightened commitment could imply improved performance in activities involving pantomimes. Secondly, the value attached to roles may be linked to cognitive functioning, enabling them to effectively execute tasks

involving the representation of actions. Thirdly, individuals who feel satisfied and fulfilled in their roles may experience a better overall mood²²³, which could contribute to improved performance in pantomimes²²⁴. Fourthly, individuals assigning high importance to their roles may be more inclined to invest time and effort in activities aimed at improving their cognitive functions, including praxis⁵³. On the other hand, the association between higher levels of importance assigned to role participation and lower performance in non-symbolic imitation could be seen as an adaptative strategy. After a stroke, patients might shift their vital priorities or re-evaluate their activity participation²²⁵. Faced with cognitive limitations, they may refocus their attention and assign greater value to roles they perceive as more meaningful²²⁶. Therefore, despite experiencing challenges in non-symbolic imitation, these individuals may prioritise roles that provide a greater sense of personal identity¹¹⁸.

Concerning self-efficacy, the results indicated that intransitive imitation was associated with general self-efficacy and self-efficacy for managing emotional symptoms. The transitive imitation was related to self-efficacy for managing global, social, and home integration symptoms. Finally, the intransitive imitation, non-symbolic pantomime, and ULA-associated alterations in ADL performance explained the dimension of cognitive self-efficacy.

The intransitive gesture imitation was found to be related to several aspects of perceived self-efficacy in the sample of post-stroke patients. This finding may be explained because the loss of control and ability to manage daily activities can present challenges related to self-efficacy²²⁷. Self-efficacy, in turn, plays a mediating role in influencing occupational performance and occupational performance satisfaction²²⁸. Apraxic errors in gesture execution independent of objects may contribute to these challenges. This type of gesture is involved in communication tasks, interaction with the

environment, and daily routines. Intransitive gestures possess a strong social component, as they are commonly used while communicating and are highly influenced by contextual factors²²⁹. These errors in imitating intransitive gestures may be associated with the individuals' perception of their ability to respond to external demands²³⁰.

The transitive gesture imitation was associated with self-efficacy for managing global, social, and home integration symptoms, probably due to several reasons. Imitation allows for the replication and learning of movements that can be useful in daily life²³¹. When imitation involves objects, individuals focus their attention on how the objects are used rather than the specific details of the movements themselves²³². Transitive imitation leads individuals to execute the most effective movements to achieve the final goal in a real context where the use of instruments, objects, or materials has to be used²³³. The person must transform sensory information into motor responses, ensuring that their movements are in line with external demands. Individuals can adapt to the context even if the movement is not sufficiently accurate but meets the external requirements. The ability to imitate transitive movements leads to greater daily functioning⁴⁶, thereby contributing to improving the perception of domain-specific self-efficacy for managing symptoms.

Several ULA components explain the self-efficacy for managing cognitive symptoms, that is, showing a lower number of apraxic errors in imitation and ADL performance may lead to a better perception of self-efficacy when facing cognitive alterations due to stroke. Moreover, worse performance in pantomime gestures seems to be related to an increase in cognitive self-efficacy perception. These controversial findings can be explained because imitation and pantomime involve different sensory pathways in the reception of information from the external context⁷⁰. In imitation, the patient must observe and replicate a movement precisely, while in pantomime, the patient

is asked verbally to perform a gesture. When a gesture is asked verbally, the patient must mentally imagine it. If a post-stroke patient experiences difficulties in imitation, this fact can lead to feelings of frustration or incompetence. Nevertheless, if apraxic errors occur when the individual performs a pantomime, it may indicate that the mental representation of the movement is imprecise. This cognitive process may generate greater awareness of deficits compared to imitation. If individuals are aware of these difficulties, it can enhance their perception of self-efficacy in controlling cognitive symptoms.

6.3. Limitations of the thesis

Some limitations should be considered when interpreting the findings of the present doctoral thesis. Firstly, regarding the study samples, nearly all participants were European Spanish speakers, and those from other Spanish-speaking countries had lived in Spain for several years, making them familiar with the local culture and symbolic gestures. Furthermore, all participants were recruited from a Spanish region. This may limit the sample's representativeness across diverse Spanish-speaking countries. Concerning the study of the relationship between ULA and role participation, the sample did not have severe motor and cognitive impairments, although patients often present both impairments. The exclusion of these impairments was aimed at isolating the specific relationship between ULA and role participation, minimising the influence of other factors. In consequence, this study may not fully represent the broader population of post-stroke patients. Regarding methodology, the cross-sectional design of the studies limits the ability to identify temporal associations between ULA and human occupation and health factors. Future studies should consider evaluate temporal stability and consistency when different evaluators administer the TULIA Apraxia test and the ADL Observations scale to improve the methodological rigour of the instruments.

7. CONCLUSIONS

The Spanish version of the TULIA Apraxia test and the ADL Observations Scale are two valid and reliable instruments for detecting and evaluating upper limb apraxia in Spanish-speaking post-stroke patients. Both instruments maintain semantic, conceptual, and operational equivalence with the original versions after translation and cross-cultural adaptation. The TULIA Apraxia test presents a six-factor structure supported by the construct validity results, that is: i) non-symbolic imitation, ii) intransitive imitation, iii) transitive imitation, iv) non-symbolic pantomime, v) intransitive pantomime, and vi) transitive pantomime. The ADL Observations scale has a four-factor structure confirmed by the construct validity results: independence, initiation, execution, and control. The research findings also confirm the reliability of these two instruments and provide optimal cut-off points for each subtest after being adjusted for age, enhancing the tests' diagnostic accuracy. Both instruments present a high sensitivity, a high specificity, and strong positive and negative predictive values, which underscore their precision in accurately identifying individuals with and without upper limb apraxia and its affectation on daily life. Hence, to the best of our knowledge, this research is the first to translate, cross-cultural adapt and assess the construct validity, reliability, and diagnostic accuracy of the TULIA Apraxia Test and the ADL Observations Scale for use with Spanish-speaking post-stroke patients, making a significant contribution to the understanding of upper limb apraxia in diverse linguistic and cultural contexts.

Concerning the potential relation of upper limb apraxia with human occupations, the findings indicate that transitive pantomime performance was associated with current role participation. Non-symbolic imitation and transitive imitation were related to changes in role participation following a stroke. Intransitive pantomime showed a relationship with expectations for future role participation, and non-symbolic imitation

and intransitive pantomime was linked to the assigned value of role participation. On the other hand, the potential association between upper limb apraxia and health factors showed that intransitive imitation was related to general self-efficacy and self-efficacy for emotional symptoms. Transitive imitation was associated with self-efficacy for managing global and social interaction symptoms. Intransitive imitation, non-symbolic pantomime, and praxis deficits in activities of daily living performance were related to self-efficacy for cognitive symptoms.

8. CONCLUSIONES

El TULIA Apraxia test y la ADL Observations scale son dos instrumentos válidos y fiables para detectar y evaluar la apraxia de los miembros superiores en pacientes hispanohablantes que han sufrido un ictus. La traducción y adaptación transcultural garantiza que ambos mantienen la equivalencia semántica, conceptual y operativa con las versiones originales. Los resultados de la validez de constructo muestran que el TULIA Apraxia test se organiza en seis factores: i) imitación no simbólica, ii) imitación intransitiva, iii) imitación transitiva, iv) pantomima no simbólica, v) pantomima intransitiva y vi) pantomima transitiva; y la ADL Observations scale en cuatro factores: i) independencia, ii) iniciación, iii) ejecución, y iv) control. Los dos instrumentos son fiables para su uso en esta población y los puntos de corte ajustados por edad y para cada subtest aumentan la precisión de ambas herramientas. Los resultados de los análisis de sensibilidad y especificidad y los valores predictivos muestran que tanto el TULIA Apraxia test y como la ADL Observations scale presentan una alta precisión diagnóstica al identificar pacientes con y sin apraxia de los miembros superiores. Hasta donde conocemos, esta investigación es la primera que traduce, adapta transculturalmente y evalúa las propiedades psicométricas del TULIA Apraxia test y de la ADL Observations scale para su uso en pacientes post-ictus hispanohablantes, lo que supone una contribución esencial a la comprensión de la apraxia de los miembros superiores en diversos contextos idiomáticos y culturales.

En cuanto a la relación de la apraxia de los miembros superiores con la ocupación humana, los resultados indican que la pantomima transitiva se relacionó con la participación actual en roles. La imitación no simbólica y la imitación transitiva se asociaron a los cambios en la participación de roles tras un ictus. La pantomima intransitiva mostró una asociación con las expectativas de participación en el futuro.

Además, la imitación no simbólica y la pantomima intransitiva se asociaron con el valor o nivel de importancia asignado a los roles. Con relación a la apraxia de los miembros superiores y los factores de salud, la imitación intransitiva se relacionó con la autoeficacia general y la autoeficacia para el control de los síntomas emocionales. La imitación transitiva se relacionó con la autoeficacia para el manejo de los síntomas globales y de interacción social. Por último, la imitación intransitiva, la pantomima no simbólica y los déficits prácticos en las actividades de la vida diaria se vincularon a la autoeficacia para el manejo de síntomas cognitivos.

V

Clinical messages



9. CLINICAL MESSAGES

- The TULIA Apraxia test and the ADL Observations scale are two valid and reliable instruments to use in clinical settings for assessing upper limb apraxia in Spanish-speaking post-stroke patients.
- These instruments are valid and reliable instruments to use also in the research areas, in systematic reviews, meta-analyses, longitudinal, multicentric, or clinical trial studies, as well as studies that investigate possible relationships between upper limb apraxia and other health conditions, biomarkers, or population groups.
- Both scales can be used in diagnostic approaches to identify upper limb apraxia among Spanish-speaking post-stroke patients.
- The relation between upper limb apraxia and human occupation and health factors emphasises the importance of early assessing ULA in post-stroke patients to identify specific needs and tailor interventions accordingly.
- These relationships underscore the need to develop strategies to guide the design of personalised rehabilitation plans, which not only focus on improving physical functions, but also enhance cognitive functions, ensuring a more exhaustive approach to post-stroke recovery.

VI

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Annexes



10. REFERENCES

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11. ANNEXES

Annexe I. Reasoning process for the translation and cross-cultural adaptation of the TULIA Apraxia test

Original version:

The examiner demonstrated the movements in a mirrored fashion. Subjects were instructed to reproduce the movement after the examiners completed their demonstration. On pantomime, subjects were asked to carefully listen to the task and to execute it as precisely as possible. Subjects were informed whether the movements had a meaning or not before each subtest. For transitive gestures, subjects were explicitly instructed to imagine holding a tool/object in their hand.

Translator 1:

El examinador demostró los movimientos como en un espejo. Se pidió a los sujetos que reprodujeran el movimiento una vez que los examinadores hubieran finalizado su demostración. En pantomima, se pidió a los sujetos que escucharan atentamente la tarea y los ejecutaran con la máxima precisión posible. Antes de cada parte del test se informó a los sujetos sobre si los movimientos tenían o no significado. En el caso de los gestos transitivos, se ordenó explícitamente a los sujetos que imaginaran que sujetaban en la mano una herramienta/objeto.

Translator 2:

El examinador demostró los movimientos como si fueran un reflejo en un espejo. Se pidió a los sujetos que reprodujeran el movimiento después de que el examinador hubiera completado su demostración. En pantomima, se pidió a los sujetos que escucharan atentamente la tarea y que la ejecutaran lo más precisamente posible. Se informó a los sujetos cuales de los movimientos tenían significado y cuales no, antes de cada subtest. Para los gestos transitivos, se pidió explícitamente que se imaginaran que sostenían una herramienta/objeto en su mano.

Reconciled version:

El examinador realiza diferentes movimientos en espejo. Al paciente se le pide que realice el mismo gesto una vez que el examinador ha terminado.

Al paciente se le pide que escuche atentamente la instrucción. Antes de la implementación de cada subescala, se le informa sobre si los movimientos tienen o no significado. El paciente debe realizar una pantomima para cada gesto con la máxima

precisión posible. En el caso de los gestos transitivos, se pide explícitamente que imagine que sujeta con la/s mano/s la herramienta u objeto.

Instrucción para el paciente: voy a realizar una serie de gestos con las manos. Cuando termine cada uno, usted debe imitarlos. Imítelo como si estuviera frente a un espejo.

Estos gestos (tienen/no tienen) significado.

Last version:

Instrucciones preliminares:

El/La evaluador/a y la persona evaluada se encuentran sentados uno en frente del otro, con una mesa separando a ambos.

Tienen las manos encima de la mesa.

El/La evaluador/a recibirá a la persona evaluada y, de forma clara y sencilla, le explicará en qué consiste el TULIA Apraxia test, cuánto tiempo va a emplear y que es lo que van a realizar.

Antes de la implementación de cada sub-test, el/la evaluador/a informará sobre si los siguientes movimientos tienen o no significado. En el caso de los gestos transitivos, se le pedirá, explícitamente, que imagine que sujeta con la mano la herramienta u objeto. En el caso de la imitación, los gestos deberán imitarse como si fueran el reflejo de un espejo, de la forma más precisa posible e inmediatamente después de la demostración. En el caso de la pantomima, la persona evaluada deberá hacer el gesto de la forma más precisa posible inmediatamente después de la petición verbal.

Changes applied:

The instructions were adapted from the original study and added to the Spanish version of the TULIA Apraxia test as an initial preparation.

The verb tense was changed to the present to make it consistent

The exact phrase the evaluator must read to the evaluated person was added to ensure the most accurate replication of the test

Inclusive language has been added

Instrucción literal para dar a la persona evaluada antes de comenzar los sub-tests de imitación: voy a realizar una serie de gestos con las manos. Cuando termine cada uno, usted debe imitarlos. Imítelos como si estuviera frente a un espejo y de la manera más precisa posible. Los primeros gestos que vamos a hacer no tienen significado.	
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Non-symbolic imitation subtest

Original version:

Imitation, non-symbolic

<u>Translator 1:</u> Imitación, no simbólico	<u>Translator 2:</u> Imitación, no simbólica
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Reconciled version:

Imitación no simbólica

<u>Last version:</u> Imitación no simbólica	<u>Changes applied:</u> –
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Original version:

Put index finger on top of nose

<u>Translator 1:</u> Poner el dedo índice sobre la punta de la nariz	<u>Translator 2:</u> Poner el dedo índice en la punta de la nariz
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Reconciled version:

Poner el dedo índice sobre la punta de la nariz

<u>Last version:</u> Poner el dedo índice sobre la punta de la nariz	<u>Changes applied:</u> –
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Original version:

Bring thumb extended on forehead, other fingers point upwards

<u>Translator 1:</u>	<u>Translator 2:</u>
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Colocar el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba	Poner el dedo pulgar extendido sobre la frente, los demás dedos apuntando hacia arriba
<u>Reconciled version:</u>	
Colocar el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba	
<u>Last version:</u>	<u>Changes applied:</u>
Colocar el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba	–
<u>Original version:</u>	
Bring back of the hand under chin, shoulder 90° abducted	
<u>Translator 1:</u>	<u>Translator 2:</u>
Colocar el dorso de la mano bajo la barbilla, separando el brazo en ángulo de 90°	Llevar el dorso de la mano bajo la barbilla, con el hombro abducido 90°
<u>Reconciled version:</u>	
Colocar el dorso de la mano bajo la barbilla, separando el brazo en ángulo de 90°	
<u>Last version:</u>	<u>Changes applied:</u>
Colocar el dorso de la mano bajo la barbilla, con el hombro en abducción a 90°	–
<u>Original version:</u>	
Place the hand flat on top of the head	
<u>Translator 1:</u>	<u>Translator 2:</u>
Colocar la mano plana sobre la cabeza	Poner la mano plana sobre la cabeza
<u>Reconciled version:</u>	
Colocar la mano plana sobre la cabeza	
<u>Last version:</u>	<u>Changes applied:</u>
Colocar la mano plana sobre la cabeza	–
<u>Original version:</u>	
Lift only the hand from the table (forearm stays on the table)	
<u>Translator 1:</u>	<u>Translator 2:</u>

Levantar solo la mano de la mesa (dejando el antebrazo sobre la mesa)	Levantar solo la mano de la mesa (el antebrazo se mantiene sobre la mesa)
<u>Reconciled version:</u>	
Levantar solo la mano de la mesa (dejando el antebrazo sobre la mesa)	
<u>Last version:</u>	<u>Changes applied:</u>
Con la mano y el antebrazo apoyados sobre la mesa, levantar solo la mano de la mesa (dejando el antebrazo apoyado)	Se ha añadido la posición desde la que debe comenzar el movimiento Se ha incorporado la palabra “apoyado” para añadir especificidad
<u>Original version:</u>	
Spread little finger outwards	
<u>Translator 1:</u>	<u>Translator 2:</u>
Extender hacia fuera el dedo meñique	Extender el dedo pequeño hacia afuera
<u>Reconciled version:</u>	
Extender hacia fuera el dedo meñique	
<u>Last version:</u>	<u>Changes applied:</u>
Con la mano y el antebrazo apoyados sobre la mesa, extender hacia fuera el dedo meñique	The starting position for the movement has been added
<u>Original version:</u>	
Extend the arm sideward up to shoulder height	
<u>Translator 1:</u>	<u>Translator 2:</u>
Extender el brazo lateralmente hasta la altura del hombro	Extender el brazo lateralmente hasta la altura del hombro
<u>Reconciled version:</u>	
Extender el brazo lateralmente hasta la altura del hombro	
<u>Last version:</u>	<u>Changes applied:</u>
Extender el brazo lateralmente hasta la altura del hombro	–
<u>Original version:</u>	
Lift middle finger	
<u>Translator 1:</u>	<u>Translator 2:</u>
Levantar el dedo corazón	Levantar el dedo del medio

<u>Reconciled version:</u> Levantarse el dedo corazón	
<u>Last version:</u> Con la mano y el antebrazo apoyados sobre la mesa, levantar el dedo corazón (el resto de la mano y el antebrazo deben quedar apoyados)	<u>Changes applied:</u> The starting position for the movement has been added

Intransitive imitation subtest

<u>Original version:</u> Imitation, intransitive	
<u>Translator 1:</u> Imitación, transitivo	<u>Translator 2:</u> Imitación, transitiva
<u>Reconciled version:</u> Imitación, transitiva	
<u>Last version:</u> Imitación transitiva	<u>Changes applied:</u> –
<u>Original version:</u> Make a catholic cross sign	
<u>Translator 1:</u> Hacer la señal católica de la cruz	<u>Translator 2:</u> Hacer el gesto de la cruz católica
<u>Reconciled version:</u> Hacer el gesto de la cruz católica	
<u>Last version:</u> Hacer el gesto de la cruz católica	<u>Changes applied:</u> –
<u>Original version:</u> Show as if someone is crazy	
<u>Translator 1:</u> Indicar que alguien está loco	<u>Translator 2:</u> Hacer el gesto como si alguien estuviera loco
<u>Reconciled version:</u> <u>Indicar que alguien está loco</u>	

<u>Last version:</u> Hacer el gesto de indicar que alguien está loco. Alternativas: Cómo le diría a alguien que está loco, con las manos.	<u>Changes applied:</u> An additional explanation was added
<u>Original version:</u> Wipe dust from shoulder	
<u>Translator 1:</u> Sacudirse el polvo del hombro	<u>Translator 2:</u> Limpiar el polvo del hombro
<u>Reconciled version:</u> Sacudirse el polvo del hombro	
<u>Last version:</u> Hacer el gesto de sacudirse el polvo del hombro	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Salute like a soldier	
<u>Translator 1:</u> Saludar militarmente	<u>Translator 2:</u> Saluda como un soldado
<u>Reconciled version:</u> Saludar como un soldado	
<u>Last version:</u> Hacer el gesto de saludar como un soldado	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Hitch for a car	
<u>Translator 1:</u> Hacer la señal de autostop	<u>Translator 2:</u> Hacer autostop
<u>Reconciled version:</u> Hacer la señal de autostop	
<u>Last version:</u> Hacer el gesto de autostop	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Make a stop sign	
<u>Translator 1:</u> Hacer la indicación de stop	<u>Translator 2:</u> Hacer la señal de stop

<u>Reconciled version:</u>	
Hacer la señal de stop	
<u>Last version:</u>	<u>Changes applied:</u>
Hacer la señal de stop	–
<u>Original version:</u>	
Clasp fingers	
<u>Translator 1:</u>	<u>Translator 2:</u>
Agarrarse los dedos	Entrecruzar los dedos
<u>Reconciled version:</u>	
Entrecruzar los dedos de ambas manos	
<u>Last version:</u>	<u>Changes applied:</u>
Entrecruzar los dedos de ambas manos	“Both hands” has been specified for clarity
<u>Original version:</u>	
Point to a bird in the sky	
<u>Translator 1:</u>	<u>Translator 2:</u>
Señalar a un pájaro en el cielo	Señalar un pájaro en el cielo
<u>Reconciled version:</u>	
Señalar un pájaro en el cielo	
<u>Last version:</u>	<u>Changes applied:</u>
Hacer el gesto de señalar un pájaro en el cielo	“Make the gesture of” has been added
Imitation transitive subtest	
<u>Original version:</u>	
Imitation, transitive	
<u>Translator 1:</u>	<u>Translator 2:</u>
Imitación, transitivo	Imitación, transitiva
<u>Reconciled version:</u>	
Imitación, transitiva	
<u>Last version:</u>	<u>Changes applied:</u>
Imitación transitiva	–
<u>Original version:</u>	

Drink for a glass	
<u>Translator 1:</u> Beber de un vaso	<u>Translator 2:</u> Beber de un vaso
<u>Reconciled version:</u> Beber de un vaso	
<u>Last version:</u> Hacer el gesto de beber de un vaso	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u>	
Comb hair	
<u>Translator 1:</u> Peinarse el cabello	<u>Translator 2:</u> Peinarse el pelo
<u>Reconciled version:</u> Peinarse el cabello	
<u>Last version:</u> Hacer el gesto de cepillarse el pelo con un cepillo	<u>Changes applied:</u> “Make the gesture of” has been added “With a brush” has been added to avoid interpretations such as combing hair with the hand
<u>Original version:</u>	
Pick up telephone	
<u>Translator 1:</u> Descolgar el teléfono	<u>Translator 2:</u> Descolgar el teléfono
<u>Reconciled version:</u> Descolgar el teléfono	
<u>Last version:</u> Hacer el gesto de llevarse un teléfono móvil al oído	<u>Changes applied:</u> “Make the gesture of” has been added “Pick up” has been removed because modern phones no longer require picking up “Mobile phone” has been specified to ensure uniformity in the hand-held object
<u>Original version:</u>	
Smoke a cigarette	

<u>Translator 1:</u> Fumar un cigarrillo	<u>Translator 2:</u> Fumar un cigarro
<u>Reconciled version:</u> Fumar un cigarrillo	
<u>Last version:</u> Hacer el gesto de fumar un cigarro	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a hammer	
<u>Translator 1:</u> Utilizar un martillo	<u>Translator 2:</u> Utilizar un martillo
<u>Reconciled version:</u> Utilizar un martillo	
<u>Last version:</u> Hacer el gesto de utilizar un martillo	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a key	
<u>Translator 1:</u> Utilizar una llave	<u>Translator 2:</u> Utilizar una llave
<u>Reconciled version:</u> Utilizar una llave	
<u>Last version:</u> Hacer el gesto de utilizar la llave para abrir la puerta de casa	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a scissors	
<u>Translator 1:</u> Utilizar unas tijeras	<u>Translator 2:</u> Utilizar unas tijeras
<u>Reconciled version:</u> Utilizar unas tijeras	
<u>Last version:</u> Hacer el gesto de utilizar unas tijeras	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a stamp to post-mark	

<u>Translator 1:</u> Utilizar un sello para marcar	<u>Translator 2:</u> Utilizar un sello para marcar
<u>Reconciled version:</u> Utilizar un matasellos sobre una carta	
<u>Last version:</u> Hacer el gesto de utilizar un matasellos de tinta sobre un papel	<u>Changes applied:</u> “Make the gesture of” has been added It has been specified that it is an ink stamp It has been specified that the stamp should be placed on a piece of paper, adding context to the gesture

Pantomime non-symbolic subtest

Original version:

Pantomime, non-symbolic

<u>Translator 1:</u> Pantomima, no simbólico	<u>Translator 2:</u> Pantomima, no simbólica
<u>Reconciled version:</u> Pantomima, no simbólica	
<u>Last version:</u> Pantomima no simbólica	<u>Changes applied:</u> –

Original version:

Place your hand flat on your head

<u>Translator 1:</u> Coloque su mano plana sobre su cabeza	<u>Translator 2:</u> Ponga su mano plana sobre su cabeza
<u>Reconciled version:</u> Coloque su mano plana sobre su cabeza	
<u>Last version:</u> Coloque su mano plana sobre su cabeza	<u>Changes applied:</u> –

Original version:

Put your hand on your right (or left) shoulder

<u>Translator 1:</u> Coloque su mano sobre su hombro derecho (o izquierdo)	<u>Translator 2:</u> Ponga su mano sobre su hombro derecho (o izquierdo)
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<u>Reconciled version:</u>	
Coloque su mano sobre el hombro derecho (o izquierdo)	
<u>Last version:</u>	<u>Changes applied:</u>
Coloque su mano sobre el hombro derecho (o izquierdo)	–
<u>Original version:</u>	
Take your left (or right) ear between thumb and index finger	
<u>Translator 1:</u>	<u>Translator 2:</u>
Sujete su oreja izquierda (o derecha) con sus dedos pulgar e índice	Tome su oreja izquierda (o derecha) entre los dedos pulgar e índice
<u>Reconciled version:</u>	
Sujete su oreja izquierda (o derecha) con sus dedos pulgar e índice	
<u>Last version:</u>	<u>Changes applied:</u>
Tome su izquierda (o derecha) entre los dedos pulgar e índice	–
<u>Original version:</u>	
Put your extended thumb on your forehead, other fingers point upwards	
<u>Translator 1:</u>	<u>Translator 2:</u>
Coloque su pulgar extendido sobre su frente, con los demás dedos apuntando hacia arriba.	Ponga su dedo pulgar extendido sobre tu frente, con los demás dedos apuntando hacia arriba
<u>Reconciled version:</u>	
Coloque el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba	
<u>Last version:</u>	<u>Changes applied:</u>
Coloque el pulgar extendido sobre la frente, con los demás dedos apuntando hacia arriba	–
<u>Original version:</u>	
Extend your arm sideward up to shoulder height	
<u>Translator 1:</u>	<u>Translator 2:</u>
Extienda el brazo lateralmente hasta la altura del hombro	Extienda su brazo lateralmente hasta la altura del hombro
<u>Reconciled version:</u>	

Extienda el brazo lateralmente hasta la altura del hombro	
<u>Last version:</u> Extienda el brazo lateralmente hasta la altura del hombro	<u>Changes applied:</u> –
<u>Original version:</u> Bend your elbow and look at the palm of your hand	
<u>Translator 1:</u> Doble el codo y mírese la palma de la mano	<u>Translator 2:</u> Doble su codo y mire la palma de su mano
<u>Reconciled version:</u> Doble el codo y mírese la palma de la mano	
<u>Last version:</u> Doble el codo y mírese la palma de la mano	<u>Changes applied:</u> –
<u>Original version:</u> Lift only your hand from the table	
<u>Translator 1:</u> Levante de la mesa solo su mano	<u>Translator 2:</u> Levante solo la mano de la mesa
<u>Reconciled version:</u> Levante solo su mano de la mesa	
<u>Last version:</u> Con la mano y el antebrazo apoyados sobre la mesa, levante solo la mano de la mesa (dejando el antebrazo apoyado)	<u>Changes applied:</u> The starting position for the movement has been added The word “supported” has been included to add specificity
<u>Original version:</u> Lift your index finger from the table	
<u>Translator 1:</u> Levante su dedo índice de la mesa	<u>Translator 2:</u> Levante su dedo índice de la mesa
<u>Reconciled version:</u> Levante su dedo índice de la mesa	
<u>Last version:</u>	<u>Changes applied:</u>

Con la mano y el antebrazo apoyados sobre la mesa, levante solo el dedo índice (dejando el resto de la mano y el antebrazo apoyados)	The starting position for the movement has been added The word “supported” has been included to add specificity
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Pantomime intransitive subtest

Original version:

Pantomime, intransitive

<u>Translator 1:</u> Pantomima, intransitivo	<u>Translator 2:</u> Pantomima, intransitiva
<u>Reconciled version:</u> Pantomima, intransitiva	
<u>Last version:</u> Pantomima intransitiva	<u>Changes applied:</u> –

Original version:

Salute like a soldier

<u>Translator 1:</u> Salude militarmente	<u>Translator 2:</u> Salude como un soldado
<u>Reconciled version:</u> Salude como un soldado	
<u>Last version:</u> Haga el gesto de saludar como un soldado	<u>Changes applied:</u> “Make the gesture of” has been added

Original version:

Throw me a kiss

<u>Translator 1:</u> Mándeme un beso	<u>Translator 2:</u> Tíreme un beso
<u>Reconciled version:</u> Mándeme un beso	
<u>Last version:</u> Haga el gesto de tirar un beso a alguien	<u>Changes applied:</u> “Make the “gesture of” has been added “Me” has been replaced with “Someone”

Original version:

Show as if someone is crazy

<u>Translator 1:</u> Indique que alguien está loco	<u>Translator 2:</u> Muestre como si alguien estuviera loco
<u>Reconciled version:</u> Muestre como si alguien estuviera loco	
<u>Last version:</u> Haga el gesto de indicar que alguien está loco. Alternativa: Cómo le diría a alguien que está loco, con las manos	<u>Changes applied:</u> An additional explanation was added
<u>Original version:</u> Scratch your head	
<u>Translator 1:</u> Rásquese la cabeza	<u>Translator 2:</u> Rásquese la cabeza
<u>Reconciled version:</u> Rásquese la cabeza	
<u>Last version:</u> Haga el gesto de rascarse la cabeza	<u>Changes applied:</u> “Make the “gesture of” has been added
<u>Original version:</u> Point to a bird in the sky	
<u>Translator 1:</u> Señale a un pájaro en el cielo	<u>Translator 2:</u> Señale un pájaro en el cielo
<u>Reconciled version:</u> Señale un pájaro en el cielo	
<u>Last version:</u> Haga el gesto de señalar un pájaro en el cielo	<u>Changes applied:</u> “Make the “gesture of” has been added
<u>Original version:</u> Wave goodbye	
<u>Translator 1:</u> Diga adiós	<u>Translator 2:</u> Despídase con la mano
<u>Reconciled version:</u> Diga adiós con la mano	
<u>Last version:</u> Haga el gesto de decir adiós con la mano	<u>Changes applied:</u> “Make the “gesture of” has been added

	“With the hand” has been added
<u>Original version:</u>	
Make a stop sign	
<u>Translator 1:</u> Haga la indicación de stop	<u>Translator 2:</u> Haz la señal de stop
<u>Reconciled version:</u> Haga la señal de stop	
<u>Last version:</u> Haga la señal de “stop”. Alternativa: Haga la señal de “alto” para que alguien se detenga	<u>Changes applied:</u> An additional explanation was added
<u>Original version:</u>	
Make a threatening sign	
<u>Translator 1:</u> Haga un gesto amenazante	<u>Translator 2:</u> Haga una señal amenazante
<u>Reconciled version:</u> Haga el gesto de amenazar a alguien	
<u>Last version:</u> Haga el gesto de reñir o regañar a alguien	<u>Changes applied:</u> “Threatening sign” has been replaced with “admonish” because “threaten” allowed for more variability in interpretation
Pantomime transitive subtest	
<u>Original version:</u>	
Pantomime, transitive	
<u>Translator 1:</u> Pantomima, transitivo	<u>Translator 2:</u> Pantomima, transitiva
<u>Reconciled version:</u> Pantomima, transitiva	
<u>Last version:</u> Pantomima transitiva	<u>Changes applied:</u> –
<u>Original version:</u>	
Brush your teeth	

<u>Translator 1:</u> Cepíllese los dientes	<u>Translator 2:</u> Cepíllese los dientes
<u>Reconciled version:</u> Cepíllese los dientes	
<u>Last version:</u> Haga el gesto de cepillarse los dientes	<u>Changes applied:</u> “Make the “gesture of” has been added
<u>Original version:</u> Comb your hair	
<u>Translator 1:</u> Péinese el cabello	<u>Translator 2:</u> Péinese el pelo
<u>Reconciled version:</u> Péinese el pelo	
<u>Last version:</u> Haga el gesto de cepillarse el pelo con un cepillo	<u>Changes applied:</u> “Make the gesture of” has been added “With a brush” has been added to avoid interpretations such as combing hair with the hand
<u>Original version:</u> Eat soup	
<u>Translator 1:</u> Beba sopa	<u>Translator 2:</u> Coma sopa
<u>Reconciled version:</u> Coma sopa	
<u>Last version:</u> Haga el gesto de tomar sopa con una cuchara	<u>Changes applied:</u> “Make the gesture of” has been added “With a spoon” has been specified to avoid holding a soup bowl in the hands
<u>Original version:</u> Smoke a cigarette	
<u>Translator 1:</u> Fume un cigarrillo	<u>Translator 2:</u> Fume un cigarro
<u>Reconciled version:</u>	

Fume un cigarrillo	
<u>Last version:</u> Haga el gesto de fumar un cigarro	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a screwdriver	
<u>Translator 1:</u> Utilice un destornillador	<u>Translator 2:</u> Use un destornillador
<u>Reconciled version:</u> Utilice un destornillador	
<u>Last version:</u> Haga el gesto de utilizar un destornillador	<u>Changes applied:</u> “Make the gesture of” has been added
<u>Original version:</u> Use a key	
<u>Translator 1:</u> Utilice una llave	<u>Translator 2:</u> Use una llave
<u>Reconciled version:</u> Utilice una llave	
<u>Last version:</u> Haga el gesto de utilizar la llave para abrir la puerta de casa	<u>Changes applied:</u> “Make the gesture of” has been added “To open the front door” has been added to standardise the gesture, as it could lead to reinterpretations (car key, wrench...)
<u>Original version:</u> Use a stamp to post-mark	
<u>Translator 1:</u> Utilice un sello para matasellar	<u>Translator 2:</u> Use un sello para matasellar
<u>Reconciled version:</u> Utilice un matasellos	
<u>Last version:</u> Haga el gesto de utilizar un matasellos de tinta sobre un papel	<u>Changes applied:</u> “Make the gesture of” has been added It has been specified that it is an ink stamp

	It has been specified that the stamp should be placed on a piece of paper, adding context to the gesture
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Original version:

Cut bread that is put on the table

<u>Translator 1:</u> Corte el pan que está sobre la mesa	<u>Translator 2:</u> Corte pan que está encima de la mesa
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Reconciled version:

Corte el pan que está sobre la mesa

<u>Last version:</u> Haga el gesto de utilizar un cuchillo para cortar una barra de pan que está sobre la mesa	<u>Changes applied:</u> “Make the gesture of” has been added “Use a knife” has been added
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Scoring method

Original version:

5 points: normal movement or identical to the demonstrated movement

<u>Translator 1:</u> 5 puntos: movimiento normal o idéntico al demostrado	<u>Translator 2:</u> 5 puntos: movimiento normal o idéntico al demostrado
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Reconciled version:

5 puntos: movimiento normal o idéntico al demostrado

<u>Last version:</u> 5 puntos: Imitación: la persona realiza un movimiento idéntico al mostrado por el/la evaluador/a Pantomima: la persona realiza el gesto de forma precisa (en términos de espacio, tiempo y contenido de la acción) y cumple con el objetivo de la petición verbal	<u>Changes applied:</u> Imitation and pantomime were distinguished to clarify the criteria for evaluating correct movement execution
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Original version:

4 points: goal of the movement is achieved, but errors occur not affecting trajectory (normal movement plane relative to goal object [tool or own body], normal joint coordination and movement shape). Movement is too slow, hesitating, robot-like, sloppy with minor spatial errors such as reduced amplitudes

Translator 1:

4 puntos: se alcanza el objetivo del movimiento, pero se producen errores que no afectan a la trayectoria (plano del movimiento normal en relación con el objeto objetivo [herramienta o cuerpo propio], coordinación articular y forma del movimiento normales). El movimiento es demasiado lento, vacilante, robótico, descuidado, con pequeños errores espaciales como amplitudes reducidas

Translator 2:

4 puntos: se alcanza el objetivo del movimiento, pero se producen errores que no afectan a la trayectoria (plano de movimiento normal respecto al objeto objetivo [herramienta o cuerpo propio], coordinación articular y forma del movimiento normales). El movimiento es demasiado lento, vacilante, robótico, descuidado con errores espaciales menores como amplitudes reducidas

Reconciled version:

4 puntos: se alcanza el objetivo del movimiento, pero con pequeños errores que no afectan a la trayectoria: errores en la temporalidad (movimiento demasiado lento, vacilante o robótico) o errores espaciales (amplitud ligeramente reducida). No hay errores de contenido, la coordinación articular está mantenida y el movimiento refleja la acción que se está realizando

Last version:

4 puntos: se alcanza el objetivo del movimiento, pero con pequeños errores que no afectan a la trayectoria (el movimiento se realiza en el plano adecuado en relación con el objetivo [objeto o propio cuerpo], la coordinación articular es correcta y también la forma del movimiento). Los pequeños errores pueden ser en la temporalidad (movimiento demasiado lento, vacilante o

Changes applied:

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robótico) o errores espaciales (amplitud ligeramente reducida)	
<p><u>Original version:</u></p> <p>3 points: goal of the movement is achieved, errors subtly affecting trajectory occur, but are corrected. Extra movements and omissions are present (mainly distal), even brief content errors (substitutions, perseverations) may occur; however, corrections are made in the ongoing movement</p>	
<p><u>Translator 1:</u></p> <p>3 puntos: se alcanza el objetivo del movimiento, se producen errores que afectan sutilmente a la trayectoria, pero se corrigen. Se producen movimientos extra y omisiones (principalmente distales), incluso pueden producirse breves errores de contenido (sustituciones, perseveraciones); sin embargo, las correcciones se realizan en el movimiento en curso</p>	<p><u>Translator 2:</u></p> <p>3 puntos: se alcanza el objetivo del movimiento, se producen errores que afectan sutilmente a la trayectoria, pero se corrigen. Se producen movimientos adicionales y/u omisiones (principalmente a nivel distal), incluso pueden producirse pequeños errores de contenido (sustituciones, perseveraciones); sin embargo, las correcciones se realizan en el movimiento en curso</p>
<p><u>Reconciled version:</u></p> <p>3 puntos: se alcanza el objetivo del movimiento, con pequeños errores durante la trayectoria del movimiento pero que la persona corrige durante el curso de la acción. Se pueden producir errores temporales (ocurrencia) o de contenido (sustituciones, movimientos adicionales o perseveraciones)</p>	
<p><u>Last version:</u></p> <p>3 puntos: se alcanza el objetivo del movimiento, pero ocurren errores que afectan sutilmente a la trayectoria y son corregidos durante el curso de la acción. Estos errores pueden incluir movimientos adicionales u omisiones (principalmente en partes distales del cuerpo) o errores de contenido, como sustituciones o perseveraciones</p>	<p><u>Changes applied:</u></p> <p>–</p>

Original version:

2 points: goal of the movement is achieved, errors subtly affecting trajectory occur, but are not corrected. Body-part-as-object errors, extra movements and omissions (mainly distal) occur without correction

Translator 1:

2 puntos: se alcanza el objetivo del movimiento, se producen errores que afectan sutilmente a la trayectoria, pero no se corrigen. Se producen errores de cuerpo como objeto, movimientos adicionales y omisiones (principalmente distales) sin corrección

Translator 2:

2 puntos: se alcanza el objetivo del movimiento, pero se producen errores que afectan sutilmente a la trayectoria y no se corrigen. Se producen errores de uso de cuerpo como objeto, movimientos extra y omisiones (principalmente distales) que tampoco se corrigen

Reconciled version:

2 puntos: se alcanza el objetivo del movimiento, pero se presentan errores sutiles durante la trayectoria que no son corregidos. Se observan errores temporales (ocurrencia) y/o de contenido (uso de cuerpo como objeto y/o movimientos adicionales)

Last version:

2 puntos: se alcanza el objetivo del movimiento, pero ocurren errores que afectan sutilmente a la trayectoria y no son corregidos. Estos errores pueden incluir movimientos adicionales y omisiones (principalmente en partes distales del cuerpo) o el uso del cuerpo como objeto

Changes applied:

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Original version:

1 point: goal of the movement is not achieved, errors grossly affecting trajectory occur or semantic content is incorrect.

Final position is false, major errors in spatial orientation, overshoot and extra movements (particularly proximal), however, overall movement pattern remains recognisable. Persisting substitutions (related or unrelated) and perseverations occur

Translator 1:

Translator 2:

<p>1 punto: no se alcanza el objetivo del movimiento, se producen errores que afectan gravemente a la trayectoria o el contenido semántico es incorrecto. La posición final es falsa, hay errores importantes en la orientación espacial, rebasamientos y movimientos extra (especialmente proximales), aunque el patrón de movimiento general sigue siendo reconocible. Se producen sustituciones persistentes (relacionadas o no) y perseveraciones</p>	<p>1 punto: no se alcanza el objetivo del movimiento, se producen errores graves que afectan a la trayectoria o el contenido semántico es incorrecto. La posición final es falsa, se producen errores importantes en la orientación espacial, rebasamiento y movimientos adicionales (especialmente proximales), sin embargo, el patrón de movimiento general sigue siendo reconocible. Se producen sustituciones persistentes (relacionadas o no) y perseveraciones</p>
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Reconciled version:

1 punto: no se alcanza el objetivo del movimiento porque se producen errores significativos en la trayectoria del movimiento. Se producen errores espaciales (como errores en la configuración externa o en la amplitud), errores de contenido (como sustituciones, relacionadas o no, movimientos adicionales). Sin embargo, el patrón del movimiento sigue siendo reconocible

Last version:

1 punto: el objetivo del movimiento no se alcanza. Pueden ocurrir errores que afecten gravemente a la trayectoria, resultando en una posición final incorrecta, como movimientos adicionales (principalmente en las partes proximales del cuerpo) o errores graves en la orientación espacial. También puede ocurrir que el contenido semántico del gesto sea incorrecto, que haya sustituciones persistentes (relacionadas o no) o perseveraciones. A pesar de ello, el patrón general del movimiento sigue siendo reconocible.

Changes applied:

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Original version:

0 points: no movement, unrecognisable movement. Seeking and amorphous movements, no temporal or spatial relationship to the requested gesture

Translator 1:

0 puntos: no hay movimiento, movimiento irreconocible. Búsqueda y movimientos amorfos, sin relación temporal ni espacial con el gesto solicitado

Translator 2:

0 puntos: no hay movimiento, movimiento irreconocible. Movimientos de búsqueda y amorfos, sin relación temporal o espacial con el gesto solicitado

Reconciled version:

0 puntos: no se ejecuta ningún movimiento o este es irreconocible. La persona puede intentar hacer el gesto, pero el movimiento es impreciso y desorganizado, sin relación clara en cuanto a tiempo o espacio con el gesto solicitado

Last version:

0 puntos: no se ejecuta ningún movimiento o si la persona lo intenta, este es irreconocible. Se observan movimientos erráticos, desorganizados, sin relación temporal o espacial con el gesto solicitado.

Changes applied:

“Amorphous has been replaced with “erratic, disorganised movements”

Annexe II. Reasoning process for the translation and cross-cultural adaptation of the ADL Observations scale

Original version:

The therapist observes the following activities and scores the findings for each activity and each aspect

Translator 1:

El terapeuta observa las siguientes actividades y puntúa los resultados de cada actividad y cada aspecto

Translator 2:

El terapeuta observa las siguientes actividades y puntúa los hallazgos de cada actividad y cada aspecto

Reconciled version:

El terapeuta observa las siguientes actividades y puntúa los hallazgos para cada actividad y cada aspecto

Last version:

Instrucciones preliminares: El/la evaluador/a recibirá a la persona evaluada y le explicará, de forma clara y sencilla, en qué consiste la ADL Observations scale, cuanto tiempo va a emplear y qué es lo que va a realizar.

Instrucción para dar a la persona evaluada: a continuación, le voy a pedir que realice cuatro actividades. En la mesa encontrará varios objetos. Por favor, para cada actividad elija el/los objetos necesarios y utilícelos como lo haría en su vida diaria. Tiene que realizar la actividad de la forma más precisa posible.

Changes applied:

The instructions have been expanded by adding preliminary information

The exact phrases the evaluator must read to the evaluated person were added to ensure the most accurate replication of the test

Inclusive language has been added

Activities

Original version:

Personal hygiene: washing the face and upper body

Translator 1:

Translator 2:

Higiene personal: lavarse la cara y la parte superior del cuerpo	Higiene personal: lavarse la cara y la parte superior del cuerpo
<u>Reconciled version:</u>	
Higiene personal: lavarse la cara y la parte superior del cuerpo	
<u>Last version:</u>	<u>Changes applied:</u>
Actividad: higiene personal: lavarse la cara y la parte superior del cuerpo. Instrucciones para dar a la persona evaluada: haz como si se lavara la cara y la parte superior del cuerpo (hasta la cadera), incluyendo los brazos, tal como lo haría en su rutina diaria de ducha. Recuerde que debe utilizar uno de los objetos que están en la mesa. Objeto: esponja	The activity has been described in more detail, as recommended by the original authors It has been divided into three parts: “activity name”, “instructions for the person”, and “object”
<u>Original version:</u>	
Dressing: putting on a shirt or blouse	
<u>Translator 1:</u>	<u>Translator 2:</u>
Vestirse: ponerse una camiseta o una blusa	Vestirse: ponerse una camisa o una blusa
<u>Reconciled version:</u>	
Vestirse: ponerse una camiseta o una blusa	
<u>Last version:</u>	<u>Changes applied:</u>
Actividad: ponerse una bata de sanitario. Instrucciones para la persona evaluada: póngase la bata que está sobre la mesa acomódesela y abroche los botones. Objeto: bata de sanitario	The activity has been described in more detail, as recommended by the original authors It has been divided into three parts: “activity name”, “instructions for the person”, and “object”
<u>Original version:</u>	
Feeding: preparing and eating a sandwich	
<u>Translator 1:</u>	<u>Translator 2:</u>
Comer: prepararse y comer un sandwich	Alimentación: preparar y comer un bocadillo

Reconciled version:

Alimentación: preparar y comer un sándwich

Last version:

Actividad: preparar y comer un sándwich.
Instrucciones para la persona evaluada: prepare un sándwich utilizando los ingredientes que están encima de la mesa. Después, coma un trozo de sándwich utilizando los cubiertos.
Objetos: pan de molde, queso y jamón cocido; alternativa: lechuga, tomate; tenedor y cuchillo

Changes applied:

The activity has been described in more detail, as recommended by the original authors
The object to be used has been specified

Original version:

An activity is chosen by the therapist, which is relevant for the patient or standard at the department

Translator 1:

Una actividad escogida por el terapeuta que sea relevante para el paciente o estándar en el departamento

Translator 2:

Se elige una actividad por el terapeuta, que sea relevante para el paciente o estándar en el departamento

Reconciled version:

Una actividad escogida por el terapeuta, que sea relevante para el paciente o estándar en el departamento

Last version:

la cuarta actividad es escogida por el/la evaluador/a, ya sea una actividad relevante para la persona evaluada o una actividad estándar

Changes applied:

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Performance parameters: independence

Original version:

Independence

Translator 1:

Independencia

Translator 2:

Independencia

Reconciled version:

Independencia	
<u>Last version:</u> Independencia: capacidad para realizar la actividad sin ayuda externa	<u>Changes applied:</u> The definition of the parameter has been included
<u>Original version:</u> 0 points: the patient is totally independent, can function without any help in any situation	
<u>Translator 1:</u> 0 puntos: el paciente es totalmente independiente	<u>Translator 2:</u> 0 puntos: el paciente es totalmente independiente y puede desenvolverse sin ninguna ayuda en cualquier situación
<u>Reconciled version:</u> 0 puntos: el paciente es totalmente independiente y puede desenvolverse sin ninguna ayuda en cualquier situación	
<u>Last version:</u> 0 puntos: la actividad se realiza sin necesidad de ayuda	<u>Changes applied:</u> The scoring has been simplified to make it easier to understand, clarifying that independence refers to the lack of need for assistance
<u>Original version:</u> 1 point: the patient is able to perform the activity but needs some supervision; The patient needs minimal verbal assistance to perform adequately; The patient needs maximal verbal assistance to perform adequately	
<u>Translator 1:</u> 1 punto: el paciente puede realizar la actividad pero necesita cierta supervisión. Necesita asistencia verbal mínima para desempeñarse adecuadamente. Necesita la máxima asistencia verbal para desempeñarse adecuadamente	<u>Translator 2:</u> 1 punto: el paciente es capaz de realizar la actividad, pero necesita algo de supervisión; El paciente necesita asistencia verbal mínima para realizar la actividad adecuadamente; El paciente necesita asistencia verbal máxima para realizar la actividad adecuadamente
<u>Reconciled version:</u>	

1 punto: el paciente es capaz de realizar la actividad, pero necesita cierta supervisión;
El paciente necesita asistencia verbal mínima para realizar la actividad adecuadamente;
El paciente necesita asistencia verbal máxima para realizar la actividad adecuadamente

Last version:

1 punto: la persona evaluada es capaz de realizar la actividad, pero necesita asistencia verbal, ya sean indicaciones generales o instrucciones detalladas

Changes applied:

Requirements have been unified to provide a more concise description
Inclusive language has been added

Original version:

**2 points: the patient needs minimal physical assistance to perform adequately;
The patient needs maximal physical assistance to perform adequately**

Translator 1:

2 puntos: el paciente necesita ayuda física mínima para un desempeño adecuado. Necesita la máxima ayuda física para un desempeño adecuado

Translator 2:

2 puntos: el paciente necesita asistencia física mínima para realizar la actividad adecuadamente; el paciente necesita asistencia física máxima para realizar la actividad adecuadamente

Reconciled version:

2 puntos: el paciente necesita ayuda física mínima para un desempeño adecuado; el paciente necesita la máxima ayuda física para un desempeño adecuado

Last version:

2 puntos: la persona necesita cualquier tipo de ayuda física para realizar la actividad

Changes applied:

Requirements have been unified to provide a more concise description
Inclusive language has been added

Original version:

3 points: the patient cannot perform the task despite full assistance

Translator 1:

3 puntos: el paciente no puede realizar la tarea a pesar de una ayuda completa

Translator 2:

3 puntos: el paciente no puede realizar la actividad incluso con asistencia completa

Reconciled version:

3 puntos: el paciente no puede realizar la actividad, a pesar de recibir una ayuda completa

Last version:

Changes applied:

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3 puntos: la persona no puede realizar la actividad, incluso recibiendo una asistencia completa	
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Performance parameter: initiation

Original version:

Initiation

<u>Translator 1:</u> Iniciación	<u>Translator 2:</u> Iniciación
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Reconciled version:

Iniciación

<u>Last version:</u> Iniciación: la capacidad para comprender las instrucciones y comenzar la actividad	<u>Changes applied:</u> The definition of the parameter has been included
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Original version:

0 points: there are no observable problems: the patient understands the instructions and initiates the activity

<u>Translator 1:</u> 0 puntos: no hay problemas observables: el paciente comprende la instrucción e inicia la actividad	<u>Translator 2:</u> 0 puntos: no hay problemas observables: el paciente entiende las instrucciones e inicia la actividad
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Reconciled version:

0 puntos: no hay problemas observables: el paciente entiende las instrucciones e inicia la actividad

<u>Last version:</u> 0 puntos: no se observan problemas, la persona entiende las instrucciones e inicia la actividad	<u>Changes applied:</u> Inclusive language has been added
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Original version:

**1 point: the verbal instruction has to be adapted/extended;
The therapist has to demonstrate the activity;
It is necessary to show pictures or write down the instruction;
The objects needed to perform the task have to be given to the patient**

<u>Translator 1:</u>	<u>Translator 2:</u>
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<p>1 punto: la instrucción verbal debe adaptarse/ampliarse. El terapeuta tiene que demostrar la actividad. Es necesario mostrar imágenes o anotar las instrucciones. Los objetos necesarios para realizar la tarea deben ser entregados al paciente</p>	<p>1 punto: la instrucción verbal debe ser adaptada/ampliada; el terapeuta debe demostrar la actividad; es necesario mostrar imágenes o escribir las instrucciones; los objetos necesarios para realizar la actividad deben ser entregados al paciente</p>
<p><u>Reconciled version:</u></p> <p>1 punto: la instrucción verbal debe ser adaptada/ampliada; el terapeuta debe demostrar la actividad; es necesario mostrar imágenes o escribir las instrucciones; los objetos necesarios para realizar la actividad deben ser entregados al paciente</p>	
<p><u>Last version:</u></p> <p>1 punto: se da al menos uno de los siguientes supuestos: 1) la instrucción verbal debe adaptarse o ampliarse para facilitar el inicio de la actividad; 2) el/la evaluador/a debe realizar la actividad primero o mostrar cómo se inicia; 3) el/la evaluador/a debe mostrar imágenes o proporcionar las instrucciones escritas para ayudar a la persona a comenzar; 4) los objetos deben ser entregados a la persona evaluada para poder iniciar la actividad.</p>	<p><u>Changes applied:</u></p> <p>The information has been restructured The requirements have been clarified and listed The language has been simplified Inclusive language has been added</p>
<p><u>Original version:</u></p> <p>2 points: the therapist has to initiate the activity together with the patient; The activity has to be modified in order to be performed adequately</p>	
<p><u>Translator 1:</u></p> <p>2 puntos: el terapeuta debe iniciar la actividad junto con el paciente. La actividad debe modificarse para que se realice de manera adecuada</p>	<p><u>Translator 2:</u></p> <p>2 puntos: el terapeuta debe iniciar la actividad junto con el paciente; La actividad debe ser modificada para realizarse correctamente</p>
<p><u>Reconciled version:</u></p> <p>2 puntos: el terapeuta debe iniciar la actividad junto con el paciente; la actividad debe modificarse para que sea realizada de forma adecuada</p>	

<u>Last version:</u> 2 puntos: se da al menos uno de estos dos supuestos: 1) el/la evaluador/a debe comenzar la actividad junto con el paciente; 2) la actividad debe adaptarse para que la persona pueda comenzarla de manera adecuada	<u>Changes applied:</u> The requirements have been clarified and listed Inclusive language has been added
<u>Original version:</u> 3 points: the therapist has to take over	
<u>Translator 1:</u> 3 puntos: el terapeuta tiene que hacerse cargo	<u>Translator 2:</u> 3 puntos: el terapeuta debe hacerse cargo
<u>Reconciled version:</u> 3 puntos: el terapeuta debe hacerse cargo	
<u>Last version:</u> 3 puntos: la persona no puede iniciar la actividad y es el/la evaluador/a quién tiene que hacerse cargo	<u>Changes applied:</u> The information has been clarified Inclusive language has been added
Performance parameter: execution	
<u>Original version:</u> Execution	
<u>Translator 1:</u> Ejecución	<u>Translator 2:</u> Ejecución
<u>Reconciled version:</u> Ejecución	
<u>Last version:</u> Ejecución: capacidad para realizar las actividades en el orden correcto y utilizando los objetos adecuados	<u>Changes applied:</u> The definition of the parameter has been included
<u>Original version:</u> 0 points: there are no observable problems: the activity is performed correctly	
<u>Translator 1:</u>	<u>Translator 2:</u>

0 puntos: no hay problemas observables: la actividad se realiza correctamente	0 puntos: no hay problemas observables; la actividad se realiza correctamente
<u>Reconciled version:</u>	
0 puntos: no hay problemas observables; la actividad se realiza correctamente	
<u>Last version:</u>	<u>Changes applied:</u>
0 puntos: no se observan dificultades realizando la actividad	–
<u>Original version:</u>	
1 point: the patient needs verbal guidance;	
Verbal guidance has to be combined with gestures, pantomime, and intonation	
Pictures of the proper sequence of action have to be shown	
<u>Translator 1:</u>	<u>Translator 2:</u>
1 punto: el paciente necesita orientación verbal. La guía verbal debe combinarse con gestos, pantomima y entonación. Se deben mostrar imágenes de la secuencia de acción adecuada	1 punto: el paciente necesita guía verbal. La guía verbal debe combinarse con gestos, pantomima y entonación; se deben mostrar imágenes de la secuencia correcta de la acción
<u>Reconciled version:</u>	
1 punto: el paciente necesita orientación verbal. La orientación verbal debe combinarse con gestos, pantomima y entonación; se deben mostrar imágenes de la secuencia correcta de la acción	
<u>Last version:</u>	<u>Changes applied:</u>
1 punto: se da al menos uno de estos supuestos: 1) la persona necesita orientación verbal para realizar la actividad; 2) la orientación verbal debe combinarse con gestos, mímica o entonación para realizar la actividad	The requirements have been clarified and listed Inclusive language has been added
<u>Original version:</u>	
2 points: the patient needs physical guidance	
<u>Translator 1:</u>	<u>Translator 2:</u>
2 puntos: el paciente necesita ayuda física	2 puntos: el paciente necesita guía física
<u>Reconciled version:</u>	

2 puntos: el paciente necesita ayuda física	
<u>Last version:</u> 2 puntos: la persona requiere una orientación física para realizar la actividad	<u>Changes applied:</u> Inclusive language has been added
<u>Original version:</u> 3 points: the therapist has to take over	
<u>Translator 1:</u> 3 puntos: el terapeuta tiene que hacerse cargo	<u>Translator 2:</u> 3 puntos: el terapeuta tiene que hacerse cargo
<u>Reconciled version:</u> 3 puntos: el terapeuta tiene que hacerse cargo	
<u>Last version:</u> 3 puntos: el/la persona evaluadora debe hacerse cargo de la actividad	<u>Changes applied:</u> Inclusive language has been added
Performance parameter: control	
<u>Original version:</u> Control	
<u>Translator 1:</u> Control	<u>Translator 2:</u> Control
<u>Reconciled version:</u> Control	
<u>Last version:</u> Control: capacidad de supervisar, ajustar y corregir el desempeño durante la actividad	<u>Changes applied:</u> The definition of the parameter has been included
<u>Original version:</u> 0 points: there are no observable problems: the patient does not need feedback	
<u>Translator 1:</u> 0 puntos: no hay problemas observables: el paciente no necesita feedback	<u>Translator 2:</u> 0 puntos: no hay problemas observables: el paciente no necesita retroalimentación
<u>Reconciled version:</u> 0 puntos: no hay problemas observables: el paciente no necesita retroalimentación	
<u>Last version:</u>	<u>Changes applied:</u> Inclusive language has been added

0 puntos: no se observan problemas, la persona no requiere retroalimentación	
<u>Original version:</u>	
1 point: the patient needs verbal feedback about the result of the performance;	
The patient needs physical feedback about the result of the performance	
<u>Translator 1:</u>	<u>Translator 2:</u>
1 punto: el paciente necesita feedback verbal sobre el resultado de la actividad. El paciente necesita feedback físico sobre el resultado de la actividad	1 punto: el paciente necesita retroalimentación verbal sobre el resultado de la ejecución; el paciente necesita retroalimentación física sobre el resultado de la ejecución
<u>Reconciled version:</u>	
1 punto: el paciente necesita retroalimentación verbal sobre el resultado de la actividad; el paciente necesita retroalimentación física sobre el resultado de la actividad	
<u>Last version:</u>	<u>Changes applied:</u>
1 punto: se da al menos uno de estos dos supuestos: 1) la persona necesita retroalimentación verbal sobre el resultado de la actividad; 2) la persona necesita retroalimentación física sobre el resultado de la actividad	The requirements have been clarified and listed Inclusive language has been added
<u>Original version:</u>	
2 points: the patient needs verbal feedback about the execution;	
The patient needs physical feedback about the execution;	
It is necessary to use mirrors or video recordings	
<u>Translator 1:</u>	<u>Translator 2:</u>
2 puntos: el paciente necesita feedback verbal sobre la ejecución. El paciente necesita feedback físico sobre la ejecución. Es necesario utilizar espejos o grabaciones de video	2 puntos: el paciente necesita retroalimentación verbal sobre la ejecución; el paciente necesita retroalimentación física sobre la ejecución; Es necesario el uso de espejos o videos
<u>Reconciled version:</u>	

2 puntos: el paciente necesita retroalimentación verbal sobre la ejecución; el paciente necesita retroalimentación física sobre la ejecución; es necesario utilizar espejos o grabaciones en video

Last version:

2 puntos: se da al menos uno de los siguientes supuestos: 1) la persona necesita retroalimentación verbal sobre la ejecución de la actividad; 2) la persona necesita retroalimentación física sobre la ejecución de la actividad; 3) la persona requiere el uso de espejos o grabaciones en video que permitan a la persona observar su ejecución

Changes applied:

The requirements have been clarified and listed

Inclusive language has been added

Original version:

3 points: the therapist has to take over

Translator 1:

3 puntos: el terapeuta tiene que hacerse cargo

Translator 2:

3 puntos: el terapeuta tiene que hacerse cargo

Reconciled version:

3 puntos: el terapeuta tiene que hacerse cargo

Last version:

3 puntos: el/la evaluador/a debe corregir la actividad en su totalidad

Changes applied:

The information has been clarified

Inclusive language has been added

Annexe III. Reasoning process for the translation and cross-cultural adaptation of the Role Checklist

Original version:

The purpose of this checklist is to identify the major roles in your life. The checklist, which is divided into two parts, presents 10 roles and defines each one.

Part I: Beside each role, indicate, by checking the appropriate column, if you performed the role in the past, if you presently perform the role, and if you plan to perform the role in the future. You may check more than one column for each role.

Part II: The same roles are listed below. Next to each role, check the column which best indicates how valuable or important the role is to you. Answer for each role, even if you have never performed or do not plan to perform the role.

Translator 1:

El propósito de este listado es identificar los diferentes roles que usted lleva a cabo. El listado está dividido en dos partes, presenta 10 roles y define cada uno de ellos.

Parte I: al lado de cada rol, indica con una marca de cotejo si ha desempeñado ese rol en el pasado, si tienes ese rol en el presente y si planeas ese rol en el futuro. Puede marcar más de una columna para cada rol.

Parte II: en esta parte están listados los mismos roles. Al lado de cada rol, marque la columna que mejor indique cuan valioso o importante es ese rol para ti. Marque una respuesta para cada rol, aunque no lo haya tenido ni pienses tenerlo.

Translator 2:

El propósito de este listado es identificar los diferentes roles que puede adoptar en su vida. El listado, que está dividido en dos partes, presenta 10 roles y define cada uno de ellos.

Parte I: junto a cada rol, coloque una marca en la columna correspondiente si ha desempeñado ese rol en el pasado, si lo está desempeñando en el presente o si piensa desempeñarlo en el futuro. Puede marcar más de una columna en cada rol.

Parte II: en esta parte se enumeran los mismos roles que en la anterior. Junto a cada rol, marque la columna que mejor indique lo importante que es ese rol para usted. Marque una respuesta para cada rol, aunque no lo haya desempeñado nunca ni tenga previsto hacerlo.

Reconciled version:

El propósito de este listado es identificar los diferentes roles que usted puede llevar a cabo a lo largo de su vida. El listado, que está dividido en dos partes, presenta 10 roles y define cada uno de ellos.

Instrucciones para leer a la persona evaluada: El propósito de este cuestionario es conocer su participación en diez roles que se pueden realizar en la vida diaria. Primero, yo le voy a leer la definición de cada rol y después le voy a preguntar si participaba en ese rol antes del ictus, si lo hace actualmente y si cree que participará en el futuro. Por último, le pediré que valore la importancia que tiene para usted cada rol, independientemente de que haya participado, participe o espere participar.

Proposed changes by the independent experts:

Include a brief and simple definition of what roles are to ensure that everyone understands the Role Checklist is assessing.

Last version:

Instrucciones preliminares: El/La evaluador/a recibirá a la persona evaluada y le explicará de forma clara y sencilla en qué consiste el Role Checklist, cuánto tiempo va a tomar la prueba y en qué van a consistir las preguntas. Para la evaluación, el/la evaluador/a y la persona evaluada deberán estar sentados/as uno/a en frente del otro/a, con una mesa separando a ambos/as.

Instrucción para dar a la persona evaluada: este cuestionario tiene como propósito conocer su participación en diez roles, que son las diferentes funciones que las personas desempeñan en su vida diaria, como ser amigo/a o trabajador/a. Para ello, primero le leeré la definición de cada rol. Después le preguntaré si ha participado en ese rol en el pasado, si participa en él actualmente y si cree que

Changes applied:

Preliminary instructions have been detailed.

Gender-inclusive language has been added.

Literal instructions for the participant have been included to standardise the administration of the Role Checklist.

Definition of the term “role” has been included in a very simple manner.

participará en el futuro. Por último, le pediré que valore la importancia de cada rol para usted, independientemente de si ha participado, participa o espera participar.

Es importante tener en cuenta que este cuestionario se centra en la participación con una frecuencia de al menos una vez por semana. Por ejemplo, usted puede verse a sí mismo como miembro de una familia, pero si su familia reside fuera y comparte poco tiempo con ellos, es posible que no cumpla con el criterio de participación que registran estas preguntas.

Role definitions

Original version:

STUDENT. Attending school on a part-time or full-time basis.

Translator 1:

Estudiante: asistir a la escuela a tiempo completo o a tiempo parcial.

Translator 2:

Estudiante: asistir al colegio a tiempo completo o parcial.

Reconciled version:

Rol de estudiante: asistir a la escuela, instituto y/o universidad, hacer algún curso o recibir alguna formación de adulto ya sea a tiempo completo o a tiempo parcial. Por ejemplo, algún curso de idiomas, de informática, universidad para mayores, etc.

Proposed changes by the independent experts:

Change “formación de adulto” to “formación en la edad adulta” to avoid confusion.

Add “ESO/Bachillerato”.

Add “diplomados y capacitaciones”.

Include online training.

Last version:

Changes applied:

<p>Rol de estudiante: asistir a la escuela, instituto o universidad, o realizar algún curso o formación en la edad adulta, ya sea a tiempo completo, a tiempo parcial u online. Por ejemplo, algún curso de idiomas, de informática, ESO/Bachillerato, diplomados, capacitaciones, universidad para mayores, etc.</p>	<p>A more extensive and clear definition has been added.</p>
<p><u>Original version:</u> WORKER. Part-time or full-time paid employment.</p>	
<p><u>Translator 1:</u> Trabajador: empleado a tiempo completo o a tiempo parcial.</p>	<p><u>Translator 2:</u> Trabajador: tener un empleo a tiempo completo o parcial.</p>
<p><u>Reconciled version:</u> Rol de trabajador/a: tener un empleo remunerado a tiempo completo o tiempo parcial. Se incluye también amo/a de casa a tiempo completo.</p>	
<p><u>Proposed changes by the independent experts:</u> None</p>	
<p><u>Last version:</u> Rol de trabajador/a: tener un empleo remunerado, ya sea a tiempo completo o tiempo parcial o bien dedicarse a tiempo completo al cuidado del hogar.</p>	<p><u>Changes applied:</u> The term “paid” has been added. Dedicating full-time to household care has been added. Gender-inclusive language has been added.</p>
<p><u>Original version:</u> VOLUNTEER. Donating services, at least once a week, to a hospital, school, community, political campaign, and so forth.</p>	
<p><u>Translator 1:</u> Voluntario: Ofrecer servicios sin recibir ninguna paga alguna a algún hospital, escuela, comunidad, grupo político, etc. Por lo menos una vez a la semana.</p>	<p><u>Translator 2:</u> Voluntario: prestar servicios, al menos una vez a la semana, en un hospital, escuela, comunidad, campaña política, etc., sin recibir ninguna remuneración.</p>

Reconciled version:

Rol de voluntario/a: prestar algún tipo de servicio o ayuda en un hospital, escuela, vecindario, comunidad, asociación, de manera desinteresada y sin recibir ninguna remuneración económica, al menos una vez a la semana.

Proposed changes by the independent experts:

Specify that the remuneration would be financial.

Add a more specific example of tasks performed by a volunteer.

Add virtual volunteering.

Indicate that the role of a volunteer involves a commitment to the organisation.

Last version:

Rol de voluntario/a: prestar algún tipo de servicio o ayuda, como acompañar a personas mayores, en hospitales, vecindarios, comunidades, asociaciones, etc., o a través de plataformas de voluntariado virtual. Esta ayuda es de manera desinteresada y sin recibir ninguna remuneración económica, y con una periodicidad de al menos una vez a la semana.

Changes applied:

A more extensive and clear definition has been added.

Gender-inclusive language has been added.

Original version:

CAREGIVER. Responsibility, at least once a week, for the care of someone such as a child, spouse, relative, or friend.

Translator 1:

Proveedor de cuidados: tener responsabilidad de cuidar niños, esposa/esposo, familiar o amigo, por lo menos una vez por semana.

Translator 2:

Cuidador/a: responsabilizarse del cuidado de niños, cónyuge, familiares o amigos al menos una vez a la semana.

Reconciled version:

Rol de cuidador/a: responsabilizarse al menos una vez a la semana, del cuidado de hijos/as, nietos/as, pareja, familiares, amigos/as, etc.

Proposed changes by the independent experts:

Add pet care.

Specify that the caregiver role could be paid.
 Clarify what types of care are involved: hygiene, feeding, mobility, assistance with medication, etc.
 Add examples of caregiver activities.
 Add that it is unpaid.
 Include the parental role.
 Further delimit the definition.

<p><u>Last version:</u> Rol de cuidador/a: responsabilizarse del cuidado de hijos/as, nietos/as, pareja, padres, madres, familiares, amigos/as, mascotas, etc., Esto incluye asistencia en la alimentación, desplazamientos, cuidados médicos, etc. sin ánimo de lucro y al menos una vez a la semana.</p>	<p><u>Changes applied:</u> A more extensive and clear definition has been added. Gender-inclusive language has been added.</p>
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Original version:
HOME MAINTAINER. Responsibility, at least once a week, for the upkeep of the home such as housecleaning or yard work.

<p><u>Translator 1:</u> Ama o amo de casa: tener responsabilidad, al menos una vez a la semana, de las tareas de limpieza de hogar o de jardinería.</p>	<p><u>Translator 2:</u> Amo/a de casa: responsabilizarse, al menos una vez a la semana, de las tareas de limpieza del hogar o de jardinería.</p>
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Reconciled version:
 Amo/a de casa: Responsabilizarse, al menos una vez a la semana, de tareas de mantenimiento del hogar, como limpiar, cocinar, cuidar el jardín si se tiene, ir al supermercado, poner lavadoras, etc.

Proposed changes by the independent experts:
 Specify that this role involves domestic tasks, partial or total management of the family budget, supervision of household work and tasks, childcare, etc., and without remuneration.
 Include the mental load associated with domestic tasks.

Encompass not only cleaning and maintenance tasks but also the organisation and management of the household, the care of the home and its belongings, the provisioning of the household, and family wellbeing.

Last version:

Rol de responsable del hogar: responsabilizarse de tareas de mantenimiento del hogar, como organización y gestión del hogar, aprovisionamiento, cuidado del bienestar familiar, responsabilidad de la limpieza, cocina, cuidado de la ropa, etc., sin remuneración económica y al menos una vez a la semana.

Changes applied:

A more extensive and clear definition has been added.
Gender-inclusive language has been added.

Original version:

FRIEND. Spending time or doing something, at least once a week, with a friend.

Translator 1:

Amigo: pasar tiempo o realizar alguna actividad con un amigo, por lo menos una vez por semana.

Translator 2:

Amigo: pasar tiempo o hacer alguna actividad con amigos al menos una vez a la semana.

Reconciled version:

Rol de amigo/a es: pasar tiempo o hacer alguna actividad con algún amigo/a al menos una vez a la semana, como tomar café, pasear, tener una conversación, ir al cine, etc.

Proposed changes by the independent experts:

Add being in contact through mobile (calls, messages, video calls, etc.)

Last version:

Rol de amigo/a: dedicar tiempo o realizar alguna actividad con amigos/as como tomar café, pasear, tener una conversación, ir al cine, llamar por teléfono, etc., al menos una vez a la semana.

Changes applied:

A more extensive and clear definition has been added.
Gender-inclusive language has been added.

Original version:

FAMILY MEMBER. Spending time or doing something, at least once a week, with a family member, such as a child, spouse, or other relative.

<p><u>Translator 1:</u></p> <p>Miembro de familia: pasar algún tiempo y/o realizar alguna actividad con algún miembro de la familia, tales como hijos, esposa/esposo, padres u otro familiar, por lo menos una vez por semana.</p>	<p><u>Translator 2:</u></p> <p>Miembro de familia: pasar tiempo o hacer alguna actividad con algún miembro de familia, como hijos, cónyuge, padres u otro familiar, al menos una vez a la semana.</p>
<p><u>Reconciled version:</u></p> <p>Rol de miembro de familia: pasar tiempo o hacer alguna actividad con algún miembro de la familia, hijos/as, nietos/as, pareja, padres, etc., como comidas familiares, excursiones, paseos, etc., al menos una vez a la semana.</p>	
<p><u>Proposed changes by the independent experts:</u></p> <p>Include relationship with grandparents, and cousins.</p> <p>Add “to converse”</p>	
<p><u>Last version:</u></p> <p>Rol de miembro de familia: dedicar tiempo o realizar alguna actividad con algún miembro de la familia, como hijos/as, nietos/as, pareja, padres, madres, abuelos/as primos/as, entre otros. Esto puede incluir eventos como comidas familiares, excursiones, paseos, o simplemente conversar, al menos una vez a la semana.</p>	<p><u>Changes applied:</u></p> <p>A more extensive and clear definition has been added.</p> <p>Gender-inclusive language has been added.</p>
<p><u>Original version:</u></p> <p>RELIGIOUS PARTICIPANT. Involvement, at least once a week, in groups or activities affiliated with one’s religion.</p>	
<p><u>Translator 1:</u></p> <p>Participante religioso: participar e involucrarse en grupos o actividades afiliadas a alguna religión, por lo menos una vez por semana.</p>	<p><u>Translator 2:</u></p> <p>Participante religioso: participar en actividades o grupos relacionados con alguna religión, por lo menos una vez a la semana.</p>
<p><u>Reconciled version:</u></p>	

Rol de miembro activo de un grupo religioso o grupo espiritual es: Participar, al menos una vez a la semana, en actividades o grupos relacionados con alguna religión o con la espiritualidad.

Proposed changes by the independent experts:

None

Last version:

Rol de miembro activo de un grupo religioso o grupo espiritual: participar en actividades o reuniones relacionadas con alguna religión o con la espiritualidad, al menos una vez a la semana.

Changes applied:

Participant in spiritual group has been added.

Original version:

HOBBYIST/AMATEUR. Involvement, at least once a week, in a hobby or amateur activity such as sewing, playing a musical instrument, woodworking, sports, the theatre, or participating in a club or team.

Translator 1:

Aficionado: participar y/o involucrarse en algún pasatiempo o afición, como coser, tocar algún instrumento, trabajar la madera, practicar deportes, hacer teatro, o formar parte de algún club o equipo, al menos una vez por semana.

Translator 2:

Aficionado: participar en algún pasatiempo, como coser, tocar un instrumento musical, trabajar la madera, practicar deportes, hacer teatro, o participar en algún club o equipo, al menos una vez por semana.

Reconciled version:

Rol de aficionado/a es: Participar, al menos una vez a la semana, en alguna afición o actividad de ocio durante el tiempo libre, como coser, tocar algún instrumento, cuidar del huerto, bailar, practicar deporte, hacer teatro, etc.

Proposed changes by the independent experts:

Add driving vehicles.

Attend workshops.

Indicate that hobbies can be done alone or with company.

Last version:

Rol de aficionado/a: participar en alguna afición o actividad de ocio durante el

Changes applied:

“Participating in a club or team” has been removed.

<p>tiempo libre, ya sea de forma autodidacta o en clases, solo/a o acompañado/a, como coser, tocar algún instrumento, conducir vehículos, cuidar del huerto, bailar, practicar deporte, hacer teatro, etc., al menos una vez a la semana.</p>	<p>More examples of activities have been added.</p> <p>It has been specified that hobbies are done in leisure time.</p> <p>A more extensive and clear definition has been added.</p> <p>Gender-inclusive language has been added.</p>
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Original version:

PARTICIPANT IN ORGANISATIONS. Involvement, at least once a week, in organisations.

<p><u>Translator 1:</u></p> <p>Participante de organizaciones: participar en organizaciones por lo menos una vez por semana.</p>	<p><u>Translator 2:</u></p> <p>Participante en organizaciones: participar en organizaciones al menos una vez a la semana.</p>
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Reconciled version:

Rol de participante en organizaciones es: Participar, al menos una vez a la semana, en organizaciones o asociaciones, como la asociación de padres, algún club, por ejemplo, de montaña, peña de fútbol, equipos, etc.

Proposed changes by the independent experts:

None

<p><u>Last version:</u></p> <p>Participante en organizaciones: participar en organizaciones o asociaciones, como la asociación de padres, algún club, por ejemplo, de montaña, peña de fútbol, equipos, etc., al menos una vez a la semana.</p>	<p><u>Changes applied:</u></p> <p>A more extensive and clear definition has been added.</p>
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Original version:

OTHER. A role not listed which you have performed, are presently performing, and/or plan to perform.

<p><u>Translator 1:</u></p>	<p><u>Translator 2:</u></p>
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Otros roles: algún otro rol el cual haya realizado anteriormente, el cual realiza ahora o el cual planea realizar.	Otros: otro rol que no figure en la lista y que haya desempeñado en el pasado, lo esté desempeñando actualmente o tenga previsto desempeñarlo en el futuro.
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Reconciled version:

Otros roles: algún otro rol que no figure en el listado y que usted haya desempeñado en el pasado, lo esté desempeñando actualmente o tenga previsto desempeñar.

Proposed changes by the independent experts:

None

<u>Last version:</u> Otros roles: cualquier otro rol no incluido en la lista que haya desempeñado en el pasado, esté desempeñando actualmente o espere participar en el futuro.	<u>Changes applied:</u> —
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Part I. Role participation

Original version:

Past

Present

Future

<u>Translator 1:</u> Pasado Presente Futuro	<u>Translator 2:</u> Pasado Presente Futuro
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Reconciled version:

Pasado

Presente

Expectativas de participación en el futuro

Proposed changes by the independent experts:

None

<u>Last version:</u> Participación en el pasado. Participación en el presente.	<u>Changes applied:</u> <ul style="list-style-type: none"> The word “participation” has been specified for each time frame.
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Expectativas de participación en el futuro.	<ul style="list-style-type: none"> The “future” has been clarified as “expectations of future participation”. <p>In the Spanish version of the Role Checklist, a specific question for each time frame has been added for each role.</p>
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Part II. Assigned value or importance to role participation

Original version:

Not all valuable

Some-what valuable

Very valuable

<u>Translator 1:</u> No muy valioso Con algún valor Muy valioso	<u>Translator 2:</u> No muy importante Con alguna importancia Muy importante
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Reconciled version:

No muy valioso o importante.

Con algún valor o importancia.

Muy valioso o importante.

Proposed changes by the independent experts:

None

<u>Last version:</u> Nada de valor, no es importante para mí. Algo de valor, una importancia media para mí. Mucho valor, es muy importante para mí.	<u>Changes applied:</u> <ul style="list-style-type: none"> The information has been clarified. In the Spanish version of the Role Checklist, a specific question for each role has been added.
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Annexe IV. Content validation questionnaire to evaluate the Role Checklist

FORMULARIO SOBRE EL “ROLE CHECKLIST”

Como investigadores e investigadoras de la Universidad de Granada estamos realizando una validación de contenido y adaptación cultural del cuestionario Role Checklist para personas con ictus en países hispanohablantes. Este cuestionario es una de las principales herramientas de evaluación de Terapia Ocupacional porque permite estimar la participación en roles en diferentes etapas.

Los roles son un conjunto de comportamientos, responsabilidades y principios que organizan la participación de las personas en la vida diaria y en la comunidad. Estos roles se determinan por aspiraciones personales, necesidades y/o circunstancias y suponen un equilibrio entre la vida personal y social. La participación en roles otorga un sentido único a las actividades de la vida diaria, conforma las rutinas y hábitos y contribuye a formar la identidad de cada persona. Esta participación se caracteriza por el valor o grado de importancia que individualmente se atribuye a los roles. Este valor, permite a las personas sentirse representadas por sus acciones y actividades y permite definir que responsabilidades se están dispuestas a asumir en la vida diaria.

A pesar de la importancia del Role Checklist para evaluar la participación en roles, no es una herramienta validada aún para poblaciones de lengua hispana y por eso, la validación es nuestro objetivo de estudio. La calidad del cuestionario en castellano no solo requiere una traducción, sino también una adaptación cultural y un análisis en profundidad de cada sección o parte que forma el Role Checklist. Por eso, contactamos contigo como experto/a en el área temática y/o metodológica, con el objetivo de conocer tu opinión sobre el contenido del Role Checklist y así ayudarnos a mejorar su validez de contenido.

A continuación, le mostraremos el Role Checklist estructurado en diferentes partes: 1) instrucciones generales, 2) definición de cada uno de los roles incluidos en el Role Checklist y 3) secciones del Role Checklist. Al finalizar cada parte, encontrará algunas afirmaciones y/o preguntas que deberá evaluar siguiendo las instrucciones que se le presentan. El contenido que se presenta en cursiva es la información que se lee literal a las personas evaluadas. Ante cualquier duda, quedamos a su disposición.

1) **Instrucciones generales del Role Checklist:** *El propósito de este cuestionario es conocer su participación en diez roles que se pueden realizar en la vida diaria. Primero, yo le voy a leer la definición de cada rol y después le voy a preguntar si participaba en ese rol antes del ictus, si lo hace actualmente y si cree que participará en el futuro. Por último, le pediré que valore la importancia que tiene para usted cada rol, independientemente de que haya participado, participe o espere participar.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre las instrucciones generales del Role Checklist:

Las instrucciones generales del Role Checklist proporcionan suficiente información sobre cómo responder al cuestionario.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Las instrucciones se comprenden con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Las instrucciones son precisas y no dejan lugar a ambigüedades.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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¿Hay alguna parte de las instrucciones que encuentre confusa o ambigua? Indique cuál.

Respuesta libre:

¿Hay alguna parte de las instrucciones que se pueda mejorar? Indique cuál.

Respuesta libre:

1) Definición de cada uno de los roles incluidos en el Role Checklist:

La definición del rol de estudiante es: *Asistir a la escuela o recibir formación a tiempo completo o parcial.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de estudiante:

La definición del rol de estudiante se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de estudiante proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de estudiante, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de estudiante es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de estudiante que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de estudiante? Indique cuál.

Respuesta libre:

La definición del rol de trabajador/a es: *Tener un empleo a tiempo completo o tiempo parcial.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de trabajador/a:

La definición del rol de trabajador/a se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de trabajador/a proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de trabajador/a, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de trabajador/a es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de trabajador/a que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de trabajador/a? Indique cuál.

Respuesta libre:

La definición del rol de voluntario/a es: *Prestar servicios, al menos una vez a la semana, en un hospital, escuela, comunidad, asociación, campaña política, etc., sin recibir ninguna remuneración.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de voluntario/a:

La definición del rol de voluntario/a se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de voluntario/a proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de voluntario/a, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de voluntario/a es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de voluntario/a que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de voluntario/a? Indique cuál.

Respuesta libre:

La definición del rol de cuidador/a es: *Responsabilizarse del cuidado de niños/as, cónyuge, familiares o amigos/as al menos una vez a la semana.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de cuidador/a:

La definición del rol de cuidador/a se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de cuidador/a proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de cuidador/a, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de cuidador/a es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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¿Cree que hay alguna actividad relacionada con el rol de cuidador/a que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de cuidador/a? Indique cuál.

Respuesta libre:

La definición del rol de amo/a de casa es: *Responsabilizarse, al menos una vez a la semana, de las tareas de limpieza, cocina, jardinería o mantenimiento del hogar.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de amo/a de casa:

La definición del rol de amo/a de casa se comprende con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de amo/a de casa proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo
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0

4

Con la definición del rol de amo/a de casa, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de amo/a de casa es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de amo/a de casa que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de amo/a de casa? Indique cuál.

Respuesta libre:

La definición del rol de amigo/a es: *Pasar tiempo o hacer alguna actividad con un amigo o amiga al menos una vez a la semana.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de amigo/a:

La definición del rol de amigo/a se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de amigo/a proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de amigo/a, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de amigo/a es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de amigo/a que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de amigo/a? Indique cuál.

Respuesta libre:

La definición del rol de miembro de familia es: *Pasar tiempo o hacer alguna actividad con algún miembro de la familia, como hijos/as, cónyuge, padres u otro familiar, al menos una vez a la semana.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de miembro de familia:

La definición del rol de miembro de familia se comprende con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de miembro de familia proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Con la definición del rol de miembro de familia, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de miembro de familia es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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¿Cree que hay alguna actividad relacionada con el rol de miembro de familia que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de miembro de familia? Indique cuál.

Respuesta libre:

La definición del rol de miembro activo de un grupo religioso es: *Participar en actividades o grupos relacionados con alguna religión por lo menos una vez a la semana.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de miembro activo de un grupo religioso:

La definición del rol de miembro activo de un grupo religioso se comprende con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de miembro activo de un grupo religioso proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Con la definición del rol de miembro activo de un grupo religioso, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de miembro activo de un grupo religioso es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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¿Cree que hay alguna actividad relacionada con el rol de miembro activo de un grupo religioso que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de miembro activo de un grupo religioso? Indique cuál.

Respuesta libre:

La definición del rol de aficionado/a es: *Participar en alguna afición o actividad de ocio, como coser, tocar algún instrumento, practicar deporte, teatro o marquería.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la definición del rol de aficionado/a:

La definición del rol de aficionado/a se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de aficionado/a proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con la definición del rol de aficionado/a, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La definición del rol de aficionado/a es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de aficionado/a que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de aficionado/a? Indique cuál.

Respuesta libre:

La definición del rol de participante en organizaciones es: *Participar en organizaciones, clubes o equipos, al menos una vez a la semana.*

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre el rol de participante en organizaciones:

La definición del rol de participante en organizaciones se comprende con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
---------------------------	--------------------	---------------	-----------------	------------------------

La definición del rol de participante en organizaciones proporciona suficiente detalle sobre las actividades incluidas en él.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Con la definición del rol de participante en organizaciones, las personas evaluadas pueden identificar fácilmente que significa el rol.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La definición del rol de participante en organizaciones es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna actividad relacionada con el rol de participante en organizaciones que no se ha incluido en la definición? Indique cuál.

Respuesta libre:

¿Cree que alguna actividad incluida en la definición no se corresponde con el rol de participante en organizaciones? Indique cuál.

Respuesta libre:

2) Secciones del Role Checklist:

El Role Checklist se divide en dos secciones o partes: participación en roles y valores asignados a los roles.

A continuación, encontrará desglosadas cada una de ellas. Después, se le pedirá que valore como experto/a una serie de afirmaciones y/o preguntas.

Participación en roles en el pasado:

Estructura de la pregunta: *¿Antes del ictus...?*

Ejemplo: *¿Antes del ictus, fue a la escuela o realizó alguna formación?*

Opciones de respuesta: Sí / No

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre participación en roles en el pasado:

La redacción de las preguntas sobre la participación en roles en el pasado es clara y adecuada para su interpretación.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Con estas preguntas, las personas evaluadas pueden identificar fácilmente si desempeñaban estos roles antes del ictus.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Las opciones de respuesta en la participación en roles en el pasado coinciden con lo que se pregunta.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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Las opciones de respuesta de las preguntas sobre la participación en roles en el pasado se ajustan a la información que se quiere evaluar.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La participación en roles en el pasado se comprende con facilidad.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La participación en roles en el pasado permite recoger toda la información útil sobre los roles en los que la persona participaba antes del ictus.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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La participación en roles en el pasado es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo 0	En desacuerdo 1	Indeciso 2	De acuerdo 3	Muy de acuerdo 4
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¿Cree que hay alguna parte de las preguntas sobre participación en el pasado que puede ser confusa o difícil de comprender? Indique cuál.

Respuesta libre:

Participación en roles en el presente:

Estructura de la pregunta: *¿Actualmente...?*

Ejemplo: *¿Actualmente, está realizando alguna formación o estudiando algo?*

Opciones de respuesta: Sí / No

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la participación en roles en el presente:

La redacción de las preguntas sobre la participación en roles en el presente es clara y adecuada para su interpretación.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con estas preguntas, las personas evaluadas pueden identificar fácilmente si desempeñan estos roles en la actualidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta en la participación en roles en el presente coinciden con lo que se pregunta.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta de las preguntas sobre la participación en roles en el presente se ajustan a la información que se quiere evaluar.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La participación en roles en el presente se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La participación en roles en el presente permite recoger toda la información útil sobre los roles en los que la persona participa actualmente.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La participación en roles en el presente es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna parte de las preguntas sobre participación en el presente que puede ser confusa o difícil de comprender? Indique cuál.

Respuesta libre:

Proyección de participación en roles en el futuro:

Estructura de la pregunta: *¿Cree que más adelante o en el futuro...?*

Ejemplo: *¿Cree que más adelante o en el futuro, realizará alguna formación o estudiará algo?*

Opciones de respuesta: Sí / No

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre la participación en roles en el futuro:

La redacción de las preguntas sobre la proyección de participación en roles es clara y adecuada para su interpretación.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con estas preguntas, las personas evaluadas pueden identificar fácilmente si se ven desempeñando estos roles en el futuro.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta de las preguntas en la proyección de participación en roles en el futuro coinciden con lo que se pregunta.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta de las preguntas sobre la proyección de participación en roles en el futuro se ajustan a la información que se quiere evaluar.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La proyección de participación en roles en el futuro se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

La proyección de participación en roles en el futuro es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna parte de las preguntas sobre la proyección de participación en roles en el futuro que pueda ser confusa o difícil de comprender? Indique cuál.

Respuesta libre:

Valor o grado de importancia asignado a cada rol

Estructura de la pregunta: *¿Qué valor o grado de importancia le da al rol de...?*

Ejemplo: *¿Qué valor o grado de importancia le da al rol de ser estudiante?*

Opciones de respuesta: Sí / No

Por favor, como experto/a evalúe del 0 al 4 las siguientes afirmaciones y responda a las preguntas sobre el valor o grado de importancia asignado a cada rol:

La redacción de las preguntas sobre el valor o grado de importancia asignado a cada rol es clara y adecuada para su interpretación.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Con estas preguntas, las personas evaluadas pueden identificar fácilmente el valor o grado de importancia que le asignan a cada rol.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta sobre el valor o grado de importancia asignado a cada rol coinciden con lo que se pregunta.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

Las opciones de respuesta de las preguntas sobre el valor o grado de importancia asignado a cada rol se ajustan a la información que se quiere evaluar.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

El valor o grado de importancia asignado a cada rol se comprende con facilidad.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

El valor o grado de importancia asignado a cada rol es adecuada para cualquier contexto cultural y social de la población de estudio.

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que hay alguna parte de las preguntas sobre el valor o grado de importancia asignado a cada rol que puede ser confusa o difícil de comprender? Indique cuál.

Respuesta libre:

Para finalizar, le vamos a hacer unas últimas preguntas generales sobre el Role Checklist:

Por favor, como experto/a responda a las siguientes preguntas sobre la estructura general del Role Checklist:

Este es un ejemplo de secuencia de las preguntas en el Role Checklist.

Rol de estudiante es asistir a la escuela o recibir formación a tiempo completo o parcial.

¿Antes del ictus, fue a la escuela o realizó alguna formación?

¿Actualmente, está realizando alguna formación o estudiando algo?

¿Cree que más adelante o en el futuro, realizará alguna formación o estudiará algo?

¿Qué valor o grado de importancia le da al rol de ser estudiante?

Como experto/a, ¿Cree que este orden es lógico y fácil de seguir?

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Cree que el cuestionario presenta una longitud apropiada y manejable para la población de estudio?

Muy en desacuerdo	En desacuerdo	Indeciso	De acuerdo	Muy de acuerdo
0	1	2	3	4

¿Hay preguntas o partes que podrían eliminarse o acortarse para reducir la longitud del cuestionario? Indique cuáles.

Respuesta libre:

Para terminar, por favor, como experto/a responda a las siguientes preguntas generales sobre el Role Checklist:

¿Considera que el Role Checklist recoge adecuadamente la participación en roles en personas con ictus?

Respuesta libre:

¿Qué concepto fundamental sobre la participación en roles crees que falta?

Respuesta libre:

¿Tiene alguna sugerencia sobre el Role Checklist que no esté recogida en estas preguntas?

Respuesta libre:

Annexe V. Contingency table of the TULIA Apraxia subtests in relation to the AST TULIA test, used as the reference standard, for participants under 65 years old

Subtest 1. Imitation non-symbolic

Subtest 1 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	32	6	38
Negative	12	63	75
Total	44	69	113

Subtest 2. Imitation intransitive

Subtest 2 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	33	10	43
Negative	11	59	70
Total	44	69	113

Subtest 3. Imitation transitive

Subtest 3 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	34	8	42
Negative	10	61	71
Total	44	69	113

Subtest 4. Pantomime non-symbolic

Subtest 4 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	34	8	42
Negative	10	61	71
Total	44	69	113

Subtest 5. Pantomime intransitive

Subtest 5 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	30	10	40
Negative	14	59	73
Total	44	69	113

Subtest 6. Pantomime transitive

Subtest 6 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	40	20	60
Negative	4	49	53
Total	44	69	113

Note: Positive = post-stroke patients scoring below the cut-off points (indicative of upper limb apraxia); Negative = post-stroke patients scoring above the cut-off points (non-indicative of upper limb apraxia). The rows indicate how many post-stroke patients scored below or above the cut-off for the TULIA Apraxia subtests. The columns show how many patients scored above or below the cut-off for the AST TULIA test. For example, for subtest 1, 38 post-stroke patients scored below the cut-off according to this TULIA Apraxia subtest. Of these, 32 were correctly identified as having upper limb apraxia according to the AST TULIA test. 75 post-stroke patients scored above the cut-off according to this TULIA Apraxia subtest. Of these, 63 were correctly identified as not having upper limb apraxia according to the AST TULIA test.

Annexe VI. Contingency table of the TULIA Apraxia subtests in relation to the AST TULIA test, used as the reference standard, for participants over 65 years old

Subtest 1. Imitation non-symbolic

Subtest 1 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	32	15	47
Negative	7	34	41
Total	39	49	88

Subtest 2. Imitation intransitive

Subtest 2 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	32	11	43
Negative	7	38	45
Total	39	49	88

Subtest 3. Imitation transitive

Subtest 3 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	33	10	43
Negative	6	39	45
Total	39	49	88

Subtest 4. Pantomime non-symbolic

Subtest 4 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	30	13	43
Negative	9	36	45
Total	39	49	88

Subtest 5. Pantomime intransitive

Subtest 5 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	31	15	46
Negative	8	34	42
Total	39	49	88

Subtest 6. Pantomime transitive

Subtest 6 TULIA Apraxia test	AST TULIA		Total
	Positive	Negative	
Positive	25	4	29
Negative	14	45	59
Total	39	49	88

Note: Positive = post-stroke patients scoring below the cut-off points (indicative of upper limb apraxia); Negative = post-stroke patients scoring above the cut-off points (non-indicative of upper limb apraxia). The rows indicate how many post-stroke patients scored below or above the cut-off for the TULIA Apraxia subtests. The columns show how many patients scored above or below the cut-off for the AST TULIA test. For example, for subtest 1, 47 post-stroke patients scored below the cut-off according to this TULIA Apraxia subtest. Of these, 32 were correctly identified as having upper limb apraxia according to the AST TULIA test. 41 post-stroke patients scored above the cut-off according to this TULIA Apraxia subtest. Of these, 34 were correctly identified as not having upper limb apraxia according to the AST TULIA test.