Decree of the Rector n. 1188 of 17/11/2023
Competition for awarding 1 research grant at the University of Udine

DISCLAIMER:
The official and legally binding call for applications is in Italian only.
This document cannot be used for legal purposes and is only meant to provide information in English on the call for applications (Decree of the Rector n. 1188 of 17/11/2023). Please refer to the official call published on: https://www.uniud.it/it/albo-ufficiale

Any change and integration will be made available on the above mentioned web page. Therefore, no personal written communication regarding the examination date and/or competition results shall be provided to applicants.

Annex 1

Competition announcement for the assignment of 1 research grant at the University of Udine, entitled "SINCRO: Spatiotemporal entrainment as Innovative Neuromodulation targeting Cerebello-cerebral circuits for enhancing Rehabilitation Outcomes of cognitive and social skills in progressive and acquired cerebellar diseases" SSD: M-PSI/04 (principal investigator, Cosimo Urgesi)

Art. 1

A selection procedure is hereby launched for the award of 1 research grant at the University of Udine, as identified in Attachment A which constitutes an integral part of the present announcement.
The research grant is linked to the research project and is subject and conditioned upon the relative funding.
The fellowship may be renewed, in compliance with Art. 22, Law No. 240 of 30 December 2010 (as in the text in force before the implementation of the Conversion Law of the D.L. 36/2022, L. 79/2022), Law No. 11 of 27 February 2015, and the current regulations of the University of Udine for awarding research grants, issued with the Rector's Decree No. 182 of 31 March 2021. The renewal is subject to the scientific coordinator's positive assessment of the researcher's activities, an adequate scientific rationale, and a corresponding financial covering.

The research fellowship does not give rise to any right with regards to accessing University posts.

Any personal communication to candidates related to this selection will be sent exclusively to the email address indicated when registering for the selection, as mentioned in Art. 5.

Art. 2

The research grant described in this competition announcement and the required qualifications to apply for the position are identified in Attachment A. The lack of the admission requirements leads to the automatic exclusion from the competition procedure.

Possession of a PhD or equivalent degree obtained abroad or, only for the interested areas, of a medical specialization accompanied by an adequate scientific production, constitutes a preferential qualification for awarding the research fellowship of this selection, if it has not been provided as a mandatory requirement.

For the only purpose of the admission to the competition, the Examining Board (Art. 7) shall assess the equivalence of the qualification obtained abroad, except for the evaluation of the medical specialization qualification to which Article 38 of the Legislative Decree 165/2001 and subsequent modifications and additions, and EU regulations on the matter, shall be applied.

The Examining Board will proceed to the evaluation of the qualification obtained abroad according to the documentation attached to the application form. The Examining Board may exclude the candidate if the submitted documentation does not provide sufficient information for the assessment.
Therefore, applicants must enclose all the documentation in their possession relating to their qualification in order to provide the Examining Board with sufficient information for assessment.

Candidates holding a qualification issued by a **European Research Area country**, if successful, must submit, if not already attached to the application form one of the following options:

- Supplement Diploma in English issued by the competent University.
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplo*me*" service at https://cimea.diplome.eu/udine/#/auth/login

Candidates holding a qualification issued by a **non-European Research Area country**, if successful, must submit, if not already attached to the application form one of the following options:

- Declaration of the on-site value of the qualification and the certificate relating to the degree with examinations and grades. A certificate in a language other than Italian or English must be accompanied by an official translation into one of these languages (certified by the competent diplomatic-consular authority or certified by a court in Italy).
- CIMEA Certificate of comparability of the foreign qualification, issued by CIMEA (Information Centre on Academic Mobility and Equivalence) via the "diplo*me*" service at https://cimea.diplome.eu/udine/#/auth/login

If the Supplement Diploma or the statement/attestation of comparability are not available when signing the contract, the applicant must demonstrate that he/she has requested the documentation and submit it as soon as possible.

Any exclusion from the selection procedure due to lack of eligibility requirements, absence of required documents, failure to sign the selection application or submission of the selection application in a manner different from what is provided for in this call for applications will be communicated to applicants exclusively at the email address indicated in the application form.

Art. 3

The research grant referred to in this call for applications cannot be awarded:

a. to employees of Universities and the entities referred to in Article 22, section 1, of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022);
b. to those who have already been awarded research grants pursuant to Italian Law no. 240 of 30 December 2010 (prior to the reform introduced by Law no. 79 of 29 June 2022) for the maximum period provided by law, even if not continuously, excluding the period in which the grant was used in conjunction with the doctorate, up to the legal term of the relative course;
c. to those who have already benefited from research grants and fixed-term researcher contracts provided for, respectively, in Articles 22 and 24 of Italian Law no. 240 of 30 December 2010 (in the text prior to the reform introduced by Law no. 79 of 29 June 2022), for a total of 12 years, even if not consecutive;
d. to anyone who has a degree of kinship or affinity, up to and including the fourth degree, with:

- the Rector, the Director General or a member of the Board of Directors of the University of Udine;
- the scientific supervisor or a professor/researcher belonging to the department or organisation hosting the research grant in question.

The research grant provided for in this call for applications cannot be combined:

a) with scholarships of any kind, except for those granted by Italian or foreign institutions to supplement, by means of stays abroad, the fellow's training or research activities;
b) with other research grants;
c) with an employment relationship, even if part-time, without prejudice to the relevant provisions for employees of public administrations.

The grant awarded under this call for applications is also incompatible with simultaneous attendance at university degree courses, either Bachelor's degree or Master's degree courses, research Doctorates with scholarships and medical specializations, in Italy or abroad.

Art. 4

Applicants must enclose with their application, under penalty of exclusion, the following documents:

a) their professional scientific CV, highlighting the candidate's aptitude for carrying out and implementing the research project (Attachment A);
b) their identity card, their passport or any other identification document[1];
c) (for candidates with a foreign qualification only) certification or self-certification of both the academic qualification required for the admission to the selection, and of the exams (with evaluation) took during the period of study abroad, and of any other document that can be useful to the evaluation of the degree by the Examining Board.

Applicants can attach to the application, publications and any other certification considered useful to demonstrate the qualification based on the research program (Attachment A) and to certify any research activity accomplished at public or private institutes (indicating the starting and ending date and the duration).

The documents and qualifications mentioned above must be submitted in Italian or English. Those that are not as requested will not be evaluated. Documents originally written in a language other than Italian or English must come with a translation in Italian or English, that the candidate will do on its own responsibility. The translation can be an abstract concerning the thesis.

Italian and Community candidates wishing to submit qualifications referring to conditions and facts attested by Public Administrations must proceed exclusively with self-certification.
Non-EU citizens legally residing in Italy may self-certify only data that can be verified or certified by Italian public bodies. They may also use declarations in lieu when provided for by an international convention between Italy and the declarant's country of origin.
Non-EU citizens not residing in Italy cannot self-certify.

Only the qualifications possessed by the candidate on the date the application form is submitted and submitted in accordance with the procedures set out in Article 5 will be assessed.

Failure to submit mandatory documents provided for in this article will constitute grounds for exclusion from the selection.

[1] Please be aware that the residence permit is not an identification document.

Art. 5

The submission of the applications for the present call starts on November 30, 2023 at 2:00 pm (Italian time) and ends on February 8, 2024 at 2:00 pm (Italian time).

The application to take part in the selection must be completed, under penalty of exclusion, using the appropriate online procedure, available at the link https://pica.cineca.it/
The procedure involves an applicant registration step, for those who do not already have an account, and then an application completion step.

Once completed, the online application must be signed in the manner described in the online procedure (manual signature with attached identity document or digital signature), under penalty of exclusion from selection. The application does not have to be signed if you access the above-mentioned online procedure using your SPID ID.

The qualifications referred to in Article 4 must be attached to the application in .pdf format. Individual .pdf files may not exceed 30MB.

The application for participation in the selection is automatically sent to the University of Udine with the definitive closing of the online procedure.

The University Administration:
- is not responsible if it is impossible to read the submitted documentation in electronic format due to damaged files;
- shall not accept or take into consideration qualifications or documents received in paper form or by any means other than what is specified in this article.

Reference to documents or publications already submitted in connection with other competitions is not allowed.

The Administration is not responsible for any missing document or communication because of inaccurate indication of residence and/or address submitted by the candidate during the application. Also, the Administration is not responsible if the candidate has not communicated changes in this information, or has communicated them too late. The Administration is also not responsible for any postal or telegraphic problems not attributable to the Administration itself.

Applicants are advised not to wait until the last few days before the closing date to submit their application. The University accepts no responsibility for any malfunctions due to technical problems and/or overloading of the communication line and/or application systems.

Art. 6

The selection procedure is held in accordance with the modality indicated in Attachment A.

The test will aim to assess the general preparation, experience and aptitude for research of the candidate. It will consist in the evaluation of the professional scientific curriculum, of the publications and qualifications presented, and of the interview, where foreseen.

Art. 7

The Examining board for the competition is identified in Attachment A of the present competition announcement, of which it is an integral part.

At its first meeting, the Examining board shall appoint its President and Secretary, and establish the criteria and methods for evaluating the qualifications and the interview, where foreseen.

The results of the qualifications assessment must be disclosed to applicants during the interview, where foreseen.

The Examining board can award a maximum of 100 points (one hundred out of one hundred) to the selection.

At the end of the evaluation procedure, the Examining board shall formulate the general merit list based on the overall score of each candidate, and draw up the minutes of the whole competition procedure.

Based on the ranking list, the assignment is awarded to candidates who have obtained a minimum overall score of 70/100 (seventy out of one hundred).

The Examining board's judgement is final.

The ranking list will be made public exclusively through publication on the University's official website.

Applicants will not be notified of the outcome of the evaluation.

Those who do not declare their acceptance of the research grant and do not present themselves at the research centre within the deadline communicated by the latter, even if not formally, shall lose the right to receive it. Exceptions to this term will only be granted in cases of documented force majeure.

Art. 8

The research activity cannot be started before signing the contract defining the terms and conditions of the collaboration.

The activity covered by the research grant must have the following characteristics:

a) it must be carried out as part of the research programme covered by the grant and not be a merely technical support to it;
b) it must have a close connection with the realization of the research program for which the winner of the grant has been awarded the contract;
c) it must be continuous and, in any case, temporally defined, not merely occasional, and in coordination with the overall activity of the University;
d) it must be carried out autonomously, solely within the limits of the programme prepared by the programme supervisor, without predetermined working hours.

The researcher is required to submit a detailed written report on the work carried out and the results achieved, accompanied by the opinion of the scientific supervisor, to the reference organisation at the intervals set out in the contract. The researcher must also submit interim reports and timesheets, if requested by the reference organisation.

Either the fellow or the reference organisation may withdraw from the contract.
The reference organisation may terminate the contract not only in the cases referred to in Article 9, sections 2 and 3, of the "Internal rules for awarding research grants pursuant to law 240 of 30 December 2010" of the University of Udine, but also in the event the research project and therefore the financial coverage on which the research grant is based cease to exist.

Art. 9

The following legal dispositions shall apply to the grant referred to in this call for applications:
- for tax matters, the provisions of Article 4 of Italian Law no. 476 of 13 August 1984, as subsequently amended and supplemented;
- for social security matters, the provisions of Article 2(26) *et seq*. of Italian Law no. 335 of 8 August 1995, as subsequently amended and supplemented;
- for mandatory maternity leave, the provisions of the Italian Ministerial Decree of 12 July 2007;
- with regard to sick leave, the provisions of Article 1(788) of Italian Law no. 296 of 27 December 2006 and subsequent amendments.

During the period of mandatory maternity leave, the allowance paid by INPS according to Art. 5 of the Italian Ministerial Decree of 12 July 2007 is supplemented by the University up to the full amount of the research grant.

The grant will be paid in monthly instalments.

Art. 10

The data collected as part of the procedure referred to in Art. 5 are necessary to properly manage the selection procedure, for any subsequent management of the research grant and for purposes related to managing services provided by the University. The University of Udine is the Data Controller. At any time, the data subject may request access, rectification and, depending on the University's institutional purposes, cancellation and restriction of processing or oppose the processing of their data. The data subject can always lodge a complaint with the Italian Data Protection Authority. The complete disclosure is available on the University of Udine website in the "Privacy" section, accessible from the home page www.uniud.it Direct Link: https://www.uniud.it/it/it/pagine-speciali/guida/privacy

Art. 11

For all matters not expressly mentioned in this call for applications, refer to the regulations in force on the subject cited in the introduction and to the "Internal rules for awarding research grants pursuant to Italian Law no. 240 of 30 December 2010" of the University of Udine, issued by Rector's Decree no. 182 of 31 March 2021.

Art. 12

The procedure supervisor is Dr Sandra Salvador, Head of the Research Services Area of the University of Udine.

The Responsible office at the University of Udine is “Area Servizi per la Ricerca - Ufficio Formazione per la Ricerca”, via Mantica n. 31 - 33100 Udine, Italia.

To request information about the call for applications, please complete the following form available on the University of Udine website:
https://helpdesk.uniud.it/SubmitSR.jsp?type=req&accountId=universityofudine&populateSR_id=42105

Attachment A

Responsabile scientifico della ricerca / Principal investigator:

Nome e cognome / Name and surname: Cosimo Urgesi
Qualifica / Position: Professore Associato / Associate Professor
Dipartimento / Department: Lingue e Letterature Comunicazione Formazione e Società / Languages and Literature, Communication, Education and Society
Area MUR / Research field: 11 - Scienze storiche, filosofiche, pedagogiche, psicologiche
Settore concorsuale e Settore scientifico disciplinare / Scientific sector: 11/E2; M-PSI/04 - Psicologia dello sviluppo e psicologia dell'educazione

Titolo dell'assegno di ricerca / Topic of the research fellowship "assegno di ricerca":
I bandi sono consultabili dal sito dell'Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

Testo in italiano:

Sincronizzazione spazio-temporale dei circuiti cerebello-cerebrali come neuromodulazione innovativa per coadiuvare la riabilitazione delle abilità cognitive e sociali nelle malattie cerebellari progressive e acquisite.

Text in English:

SINCRO: Spatiotemporal entrainment as Innovative Neuromodulation targeting Cerebello-cerebral circuits for enhancing Rehabilitation Outcomes of cognitive and social skills in progressive and acquired cerebellar diseases.

Obiettivi previsti e risultati attesi del programma di ricerca in cui si colloca l'attività dell'assegnista di ricerca / Foreseen objectives and results of the research programme performed by the research fellow "assegnista di ricerca":
I bandi sono consultabili dal sito dell'Ateneo, del MUR e di Euraxess / The calls are available on the University, MUR and Euraxess websites

Testo in italiano:

Abstract del progetto	Le alterazioni cerebellari sono state collegate non solo a deficit sensomotori, ma anche a una costellazione di disfunzioni cognitive, sociali e affettive, note come Sindrome cognitivo-affettiva cerebellare (CCAS) [1, 2], che colpisce bambini e adulti con atassia congenita o acquisita [3, 4]. Mentre sono state raccolte diverse informazioni sui circuiti cerebello-cerebrali che mediano le funzioni cognitive e sociali [5-7], pochi studi hanno affrontato la riabilitazione della CCAS [8-11]. In questo progetto capitalizzeremo su tali conoscenze per implementare e testare un nuovo intervento di neuromodulazione cerebellare. Applicheremo una stimolazione transcranica a corrente alternata (tACS) cerebellare sincronizzata con le oscillazioni cerebrali individuali durante un sul cervelletto durante un training di realtà virtuale (VR) delle abilità cognitive e sociali in pazienti con CCAS. Ci aspettiamo che la tACS cerebellare aumenti gli effetti del training in VR sul funzionamento cognitivo e sociale promuovendo la plasticità cerebellare e facilitando la connettività cerebello-cerebrale.
Obiettivi del progetto	L'obiettivo generale di questo progetto è quello di mettere a punto un protocollo di neuromodulazione per facilitare la neuroplasticità cerebello-cerebrale durante un training VR volto a potenziare la formazione di

	modelli interni di eventi fisici e sociali in pazienti con malformazioni cerebellari congenite e disordini cerebellari neurodegenerativi. Ci aspettiamo che la stimolazione delle connessioni cerebello-cerebrali con la tACS, combinata con il training assistito da VR delle abilità di percezione sociale, migliori l'apprendimento implicito delle regolarità comportamentali di altri individui in pazienti con atassia progressiva. Questo potrebbe essere attivato anche in situazioni di vita quotidiana, con un reale miglioramento della vita sociale e affettiva dei pazienti e delle loro famiglie. Obiettivi specifici dello studio: O1. Mettere a punto un sistema immersivo di VR per valutare lo sviluppo di modelli predittivi nella percezione sociale e valutarne la fattibilità ed efficacia in (pre)-adolescenti, giovani adulti e adulti sani. O2. Testare l'efficacia di una stimolazione cerebellare non invasiva a corrente alternata (tACS) in individui adulti sani attraverso la misurazione di parametri comportamentali ed elettroencefalografici (EEG).
Stato dell'arte	Le alterazioni cerebellari risultano essere correlate non solo a deficit sensomotori, ma anche a una costellazione di disfunzioni cognitive, sociali e affettive, conosciute con il nome di sindrome cerebellare cognitivo-affettiva (CCAS) [1, 2], che colpisce bambini e adulti con atassia congenita o acquisita [3, 4]. Il cervelletto è visto come un nodo centrale nei circuiti neurali distribuiti responsabili delle funzioni sensomotorie, cognitive e affettive [5-7], dove opera principalmente generando simulazioni di eventi sotto forma di modelli interni [4, 8, 9]. Queste simulazioni si estendono a tutti i domini motori, cognitivi e sociali attraverso varie reti cerebello-cerebrali [5, 10, 11], giustificando il complesso quadro dei sintomi della CCAS [1-4, 12, 13]. Nonostante queste conoscenze neuroscientifiche, esiste un bisogno insoddisfatto di riabilitazione della CCAS nei pazienti con alterazioni cerebellari. Prove preliminari provenienti dai nostri gruppi di ricerca hanno sostenuto l'efficacia di un allenamento basato sulla realtà virtuale (VR) per la cognizione sociale nei pazienti con atassia [14, 15]. Permettendo un'esperienza sensomotoria corporea di scenari complessi (sociali) in un ambiente altamente motivante e interattivo, la VR è uno strumento promettente per la riabilitazione [16]. La neuromodulazione della connettività cerebello-cerebrale può potenziare ulteriormente gli effetti del trattamento. La stimolazione cerebellare ha ricevuto un interesse crescente al fine di promuovere le funzioni motorie e non motorie e alleviare i sintomi della CCAS [17-23]. A questo scopo sembra particolarmente promettente la possibilità di personalizzare la neurostimolazione sulle dimensioni spaziale e temporale in funzione del modello individuale di dinamica dell'attività cerebrale mediante la stimolazione transcranica a corrente alternata (tACS) [24]. È stato dimostrato che la tACS sul cervelletto promuove la plasticità cerebellare e migliora le prestazioni motorie [25, 26]. La tACS è un metodo di neuromodulazione non invasivo che consente di modulare le oscillazioni cerebrali spontanee tramite correnti alternate a bassa intensità applicate sulla superficie del cuoio capelluto. La frequenza della stimolazione può essere sintonizzata sulla frequenza naturale delle oscillazioni cerebellari sottostanti, inducendo miglioramenti online e post-effetto delle prestazioni motorie [26, 27]. In effetti, varie frequenze sono state registrate in strati distinti del cervelletto: un ritmo oscillatorio di 50 Hz

	corrisponde alla frequenza di scarica basale delle cellule del Purkinje, mentre un ritmo di 6 Hz rientra nell'intervallo di oscillazioni coperto dalle cellule granulari [28, 29]. La tACS cerebellare a 50 Hz, tuttavia, si è dimostrata efficace nell'influenzare sia i potenziali evocati motori che le prestazioni motorie, mentre una stimolazione a 10 Hz è risultata non efficace [30]. Inoltre, l'utilizzo di un montaggio modificato ad anello centrale (noto come tACS ad alta definizione (HD) [31]) consente di guidare selettivamente le oscillazioni neurali nel circuito cerebellare. Nessuno studio, tuttavia, ha affrontato gli effetti della tACS sulla riabilitazione cognitiva e socio-emotiva nell'atassia.
Descrizione del progetto	*Partecipanti* Per l'O1 si prevede di arruolare tre gruppi di individui senza patologie neurologiche o psichiatriche per la creazione degli scenari di VR adatti per le diverse fasce d'età: N= 24 preadolescenti tra i 12 e i 17 anni, N= 24 giovani adulti tra i 18 e i 35 anni e N=24 adulti tra i 36 e i 60 anni. Il gruppo di volontari sani (n=30) per l'O2 sarà arruolato sulla base dei seguenti criteri di inclusione: età compresa tra i 18 e i 35 anni. I criteri di esclusione saranno: condizioni psichiatriche e neurologiche attuali o pregresse, assunzione di farmaci che influenzano il sistema nervoso centrale e controindicazioni alla stimolazione tACS (presenza di impianti metallici o elettronici nel cervello/cranio; presenza di dispositivi metallici o elettronici in altre parti del corpo; disturbi epilettici o episodi di perdita di coscienza o un grave trauma cranico; grave malattia cerebrale). *Procedura sperimentale e strumenti* Lo studio consta di tre livelli sperimentali: • Sviluppo degli scenari di realtà virtuale validati in individui sani di varie fasce di età. • Stimolazione mediante tACS, registrazioni EEG e compiti comportamentali in individui adulti sani. *Protocollo VR* L'allenamento in VR prevede che ogni partecipante effettui inizialmente 80 trial. In ogni trial il partecipante dovrà anticipare le mosse di un avatar virtuale facendo una scelta tra tre possibili. Ci saranno quattro possibili avatar, tre dei quali per l'80% delle volte faranno la stessa scelta, rendendo il loro comportamento prevedibile, mentre il quarto avatar farà scelte sempre diverse. Nel training con i pazienti le preferenze di ciascun avatar cambiano in ogni sessione giornaliera e, giorno dopo giorno, si prevede che i pazienti comprendano le preferenze degli avatar in quella sessione e ne anticipino il comportamento, aumentando così le capacità predittive. I contesti ambientali saranno due per ogni fascia di età. Per i (pre)-adolescenti e i giovani adulti i contesti virtuali faranno riferimento ad un'ambientazione all'interno di una scuola e un parco giochi, mentre per gli adulti ad un ristorante e supermercato. L'interazione con il mondo virtuale avverrà attraverso un joystick. Alcuni avatar sceglieranno la stessa opzione nell'80% dei trial, altri agiranno in modo pseudo-random. Il partecipante per predire il comportamento dell'avatar dovrà capire quale sia la sua strategia. La registrazione delle risposte del partecipante aiuterà a comprendere se questi ha sviluppato un modello del comportamento altrui.

	Il sistema VR verrà generato in un ambiente compatibile con i visori a caschetto Oculus, già usati in altri protocolli approvati da questo comitato etico. *Stimolazione tACS* La stimolazione cerebellare non invasiva a corrente alternata (tACS) sarà applicata attraverso un montaggio ad alta definizione (HD-tACS 4x1), composto da cinque elettrodi circolari (circa 3 cm2). Le regioni target saranno gli emisferi cerebellari posteriori destro e sinistro, in linea con le evidenze che dimostrano che il contributo cerebellare alla cognizione sociale è sostenuto soprattutto dai settori cerebellari postero-laterali coinvolti nella rete di mentalizzazione dedicata alla comprensione degli stati mentali altrui, attraverso connessioni funzionali con le regioni di mentalizzazione corticali [5]. L'elettrodo attivo sarà posizionato sopra la regione cerebellare target, mentre quattro elettrodi di riferimento saranno posizionati in cerchio ed equidistanti dal centro (3 cm). La tACS verrà applicata alla frequenza gamma individuale (range: 40-60 Hz, rilevata tramite EEG), e consisterà in correnti sinusoidali (2 mA) applicate per 20 min, con una fase di salita/discesa di 30 secondi. Nella condizione di controllo (sham), saranno presenti solo le fasi di salita e discesa, ma per tutto il resto del tempo non sarà applicata corrente. *Registrazione EEG* l'EEG sarà registrato attraverso 64 elettrodi attivi montati sullo scalpo secondo il Sistema Internazionale 10-10 e con referenza agli elettrodi mastoidei. La frequenza di campionamento sarà di 250 Hz (filtro 0,01-80 Hz). I movimenti oculari saranno monitorati mediante elettro-oculogramma. Gli elettrodi saranno disinfettati prima di ogni utilizzo e il partecipante sarà disaccoppiato dalla rete elettrica grazie all'utilizzo di cavi a fibra ottica e degli amplificatori che funzionano con batterie da 3,6 V. Le registrazioni EEG saranno utilizzate a tre scopi: 1. Per individualizzare il trattamento prima di somministrare la tACS. A questo scopo si registrando cinque minuti di EEG spontaneo a occhi aperti e in stato di riposo. Questa registrazione permetterà di rilevare il picco di frequenza gamma individuale (IGF). L'IGF (intervallo: 40-60 Hz) è stato selezionato come frequenza target per la tACS in quanto particolarmente efficace per l'attività del cervelletto. 2. Per verificare l'effetto del trattamento (tACS) sui processi cerebrali sensoriali e cognitivi di base dei partecipanti. A questo scopo, prima e subito dopo il trattamento verranno acquisite ulteriori registrazioni EEG durante l'esecuzione di un compito visuo-motorio che permetterà anche di valutare funzioni comportamentali come il tempo di risposta e accuratezza. A livello EEG, saranno invece valutati i processi cerebrali sensoriali e cognitivi attraverso l'utilizzo della tecnica dei potenziali evento correlati (ERP) associati all'apparizione dallo stimolo nel compito visuo-motorio in entrambe le fasi sia pre e post-stimolo associate a funzioni cognitive bottom-up e top-down come l'attenzione e l'anticipazione del compito [32]. 3. Eseguire analisi di coerenza parziale diretta (PDC) per studiare i cambiamenti della connettività funzionale cerebrale indotti dalla tACs e training VR durante lo stato di riposo e il compito visuo-motorio.

	Disegno sperimentale Fase 1: Sviluppo di compiti virtuali e test su soggetti sani Nella prima fase del protocollo verranno predisposti gli scenari e i task virtuali che verranno testati su individui sani di diverse fasce d'età: (pre)-adolescenti (12-17 anni, n=24), giovani adulti (18-35 anni, n=24) e adulti di mezza età (36-60 anni, n=24). L'usabilità del sistema verrà valutata somministrando ai soggetti le scale validate USEQ e NASA-TLX. L'efficacia preliminare degli scenari sarà testata somministrando prima e dopo la sessione di realtà virtuale un compito di previsione degli stati mentali degli altri (intenzioni, emozioni o tratti di personalità) e un compito di controllo di previsione non sociale. Tutti i compiti hanno una struttura simile, con informazioni preliminari contestuali (sociali) offerte come stimoli priming, seguite da target ambigui, prevedibili o non prevedibili in base al contesto sociale. Anche se la decisione sul compito dipende dalle informazioni fornite dal target, dovrebbe essere influenzata dalla congruenza/incongruenza del prime contestuale (cioè, in linea con la previsione o in violazione della previsione). Fase 2: Stimolazione tACS su soggetti sani Verranno condotti quattro esperimenti, ognuno dei quali valuterà gli effetti della tACS sull'emisfero cerebellare destro e sinistro rispetto ad una condizione di controllo (sham). In ogni esperimento, durante la tACS, i partecipanti eseguiranno i compiti di priming contestuale nella previsione di stati mentali altrui e il compito di controllo di previsione non sociale come implementati nella fase 1. Verrà applicato un disegno sperimentale a misure ripetute, considerando la congruenza tra prime e target (congruenza vs. incongruenza), il tipo di stimolazione (tACS attiva a sinistra vs. tACS attiva a destra vs. sham) e la tempistica delle misurazioni EEG/ERP (prima vs. dopo la tACS) come fattori interni ai soggetti.
Possibili potenzialità applicative	Per quanto riguarda la fase 1, ci aspettiamo che il training di realtà virtuale VR sia fattibile, coinvolgente e ben tollerato, come dimostrato dalle scale di usabilità e dai bassi tassi di abbandono. Il programma di training, infatti, comprenderà attività e scenari adattati all'età e al livello funzionale dei partecipanti. Ancora più importante, ci aspettiamo che la valutazione preliminare dell'efficacia del training di realtà virtuale si tradurrà in un miglioramento della capacità di anticipare le preferenze degli avatar. In particolare, ci aspettiamo che i partecipanti mostrino un apprendimento più rapido e accurato dell'associazione tra le alternative di scelte comportamentali e le intenzioni degli avatar, suggerendo una maggiore capacità nella costruzione di modelli interni delle preferenze comportamentali altrui. Questi effetti dovrebbero generalizzarsi ai compiti di priming contestuale nella previsione di stati mentali altrui, in cui i partecipanti dovrebbero fare più affidamento sul prime contestuale per fornire le loro risposte. Analogamente, alla luce dei dati riportati in letteratura scientifica, ci aspettiamo che l'utilizzo della tACS cerebellare nella fase 2, rispetto alla stimolazione fittizia (sham), possa migliorare le prestazioni nei compiti di previsione sociale in adulti sani, in particolare migliorando l'uso delle aspettative sociali per prevedere l'intenzione, le emozioni e i tratti di personalità degli altri. Si ipotizza che la tACS così strutturata, agendo su specifici bersagli cerebellari ed essendo

	personalizzata sulla specifica frequenza gamma, possa facilitare la capacità di formare modelli interni delle intenzioni altrui e potenziare gli effetti del training VR incentrato sulle abilità di percezione sociale in pazienti con disturbi cerebrali complessi che comportano alterazioni cerebellari. Si prevede che gli effetti si trasferiscano anche in compiti sensori-motori generici migliorando le capacità di anticipazione/preparazione al compito e attenzionali e alle attività della vita quotidiana e all'interazione sociale. Il risultato finale di SINCRO sarà la proposta di un protocollo riabilitativo che combini il training VR e la stimolazione cerebrale non invasiva per alleviare i deficit di abilità sociali nei pazienti con disturbi legati alle funzioni cerebellari. La portabilità sia del training VR sia del dispositivo di stimolazione faciliterà la diffusione di questo protocollo nelle cliniche ospedaliere e in quelle ambulatoriali. Mentre i risultati forniranno prove specifiche di efficacia nei pazienti con alterazioni cerebellari, l'ampia fascia di età della popolazione testata in collaborazione con gli altri gruppi di ricerca favorirà lo sfruttamento dei risultati per estendere lo stesso protocollo in altri disturbi della cognizione sociale.
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Text in English:

Abstract	Cerebellar alterations have been linked to not only sensorimotor deficits, but also a constellation of cognitive, social and affective dysfunctions, known as Cerebellar Cognitive Affective Syndrome (CCAS) [1, 2], which affects children and adults with congenital or acquired ataxia [3, 4]. While large knowledge about the cerebello-cerebral circuitry mediating cognitive and social functions has been gathered [5-7], few studies have addressed the rehabilitation of CCAS [8-11]. Here, we capitalize on this knowledge to implement and trial a new cerebellar neuromodulation intervention. We apply cerebellar transcranial alternating current stimulation (tACS) synchronized with individual brain oscillations during a Virtual Reality (VR)-training of cognitive and social skills in CCAS. We expect that cerebellar tACS will boost the effects of the VR-training on cognitive and social functioning by promoting cerebellar plasticity and facilitating cerebello-cerebral connectivity.
Objectives of the project	The general aim of SINCRO is to set up a neuromodulation protocol to facilitate cerebello-cerebral neuroplasticity during a VR-training aimed at boosting the formation of internal models of physical and social events in (pre)-adolescents and adults with congenital non-progressive ataxia and patients with neurodegenerative cerebellar disorder. We expect that stimulating cerebello-cerebral connections with tACS combined with VR-assisted training of social perception abilities will improve the implicit learning of behavioral regularities of other individuals in patients with either congenital or progressive ataxia. This might be activated also in everyday life situations, with real improvements of the social and affective lives of patients and their families. Aim 1. The first aim of SINCRO is to set up an immersive VR system [10], aimed at supporting the creation and/or use of forward models during social perception in (pre)-adolescents and adults diagnosed with congenital or progressive ataxia. Aim 2. The second aim of SINCRO is to test the effectiveness of cerebellar tACS protocol to enhance social skills in healthy adults combining behavioral and electroencephalographic (EEG) outcomes.
State of the art	Our lives are characterized not only by synchronized activities of different brain areas and by synchronized muscular activations that are orchestrated in gestures, but also by behaviors synchronized with those of other people that favor social interactions. When people walk together, they tend to synchronize their steps, when they talk, they naturally alternate speaking and listening phases. These spontaneous behaviors are based on the prediction of actions and intentions of other people. In individuals with CCAS this social ability is often impaired. The cerebellum is viewed as a central node in the distributed neural circuits subserving sensorimotor, cognitive, and affective functions [5-7], where it mainly operates by generating simulations of events in the form of internal models [4, 12, 13]. These computations generalize across motor, cognitive and social domains through different cerebello-cerebral networks [5, 14, 15], explaining the complex pattern of CCAS symptoms [1-4, 16, 17]. Despite this neuroscientific knowledge, there is an unmet need for the rehabilitation of CCAS in patients with cerebellar alterations. Preliminary evidence from our consortium has supported the efficacy of a VR-training to social cognition in ataxia patients [10, 11]. Allowing for embodied sensorimotor experience of complex (social) scenarios in a highly motivating and interactive setting, VR is a promising tool for rehabilitation [18].

	Neuromodulation of cerebello-cerebral connectivity may further boost treatment effects. Cerebellar stimulation has received growing attention to promote motor and non-motor functions and alleviate CCAS symptoms [19-25]. Tailoring stimulation in the spatial and temporal dimension to the individual pattern of brain activity dynamics using tACS seems particularly effective [26]. tACS over the cerebellum has been proved to promote cerebellar plasticity and improve motor performance [27, 28]. No study, however, has addressed the effects of tACS on cognitive and socio-emotional rehabilitation in ataxia.
Project description	*Phase 1.* The VR training program is adapted from a scenario developed under a NET-project funded by the Italian Ministry of Health (NET-2013-02356160-4, to RB) for the rehabilitation of children and adolescents with congenital cerebellar ataxia and further extended to other neurodevelopmental disorders (Williams Syndrome) under a Young Researcher Grant by the Italian Ministry of Health (GR-2016-02363640, to CU). The training was developed basing on the specific computation exerted by the cerebellum in predicting the behavior of others. Participants are immersed into a realistic scenario that favors their sense of presence, their sense of body ownership, and their sense of action, idest their capacity to interact with the virtual environment [18]. They are engaged in a competition with one of four avatars representing other people in social scenarios designed to force them to anticipate the movements of the avatars, thus predicting their preference. Indeed, the behavioral preference of each avatar changes day by day and patients are expected to understand the actual preference of the avatars and to anticipate their behavior, thus likely boosting predictive abilities. Preliminary results [11] showed that, compared to a control VR-training focused on motor and visual-spatial abilities, the above-mentioned social rehabilitation VR-training improved the abilities of patients to rely on contextual expectancies to predict the behavioral preferences of the avatars. The effects were generalized to different testing scenarios, in which patients had to learn regularities in the behaviors of others on the basis of arbitrary contextual cues and use these expectations to predict the outcome of ambiguous actions. The training had also generalization effects on social perception skills, e.g., Emotion recognition and Theory of Mind abilities as evaluated with standard neuropsychological tests (i.e., NEPSY-II, [30]). Based on these promising results, two important adaptations will be implemented in SINCRO. First, the VR-scenario will be adapted for commercial VR setups to allow for a better fit with ambulatorial recruitment. This technological downscaling also provides general benefits in terms of easier multicentric data collection and cost-effective translation to wider clinical applications. Second, the scenario content will be adapted to comply with the different needs of patients of different ages and cognitive levels, considering scenarios that involve school (e.g., interactions in classroom) and playing (e.g., playground) activities for (pre)-adolescents and leisure (e.g., interaction in restaurants) and duty (e.g., market shopping) activities for adults. The advantages of using VR are the use of a completely controlled environment easy to change, an astonishing synthetic context that may favor motivation, the possibility to bring into clinical settings real life contexts, and the possibility to collect and analyze behavioral and motor data for monitoring and evaluating rehabilitation progresses [18]. We expect that tailoring the VR-scenario activities to the specific age and functional level of patients might notably increase the efficacy of treatment. These scenarios will be piloted in (pre)-adolescents and adults with typical development to evaluate the

	feasibility and efficacy in groups comparable for intellectual functioning and age to patients. In the first phase, we will implement a visor-VR-headset training aimed at supporting the creation and/or use of forward models. To adapt the VR environment to the specific needs of individuals of different ages, we will create 4 different scenes, namely a school classroom and a playground, for (pre)adolescents, and a restaurant and a market, for adults. All the scenarios will contain 3 visible options, namely seats in the classroom, pieces of recreational equipment (a swing, a circular carousel and a rocking carousel) in the playground, tables with different tablecloths in the restaurant and aisles with different products in the market. Furthermore, 4 different adolescent avatars and 4 different adult avatars will be designed (half females and the other half males), clearly identifiable by body and clothing features (i.e., hair and t-shirt colors), to be used respectively with (pre)adolescents and adults. Participants will practice in the VR environment in different 80-trial daily sessions. In each trial, participants are asked to compete with one of the avatars for reaching one of the 3 options in the scenes and activate it before the avatar. The avatar, visibly positioned next to the participant, moves towards an option, reaching it in 10 seconds. The participant interacts with the VR environment using a joystick. In each session, each avatar is associated with pre-established probabilities to one of the 3 options. Indeed, three avatars move toward a preferred object in the 80% of trials and choose each of the other 2 objects in the 10% of trials. Conversely, one avatar moves in a pseudo-random modality. When the participant anticipates the avatar in reaching the correct object, he/she receives an auditory reinforcement (clapping sound), which signals the scoring of a point in the game. The object reached by the avatar is always visible to the participant, for both successful and unsuccessful trials, in order to provide information on the avatar's preferences that can be used in the next trial. Specific features of the application forces the participants to move according to the anticipation of the avatars' preference rather than following its movements. Indeed, they are not exposed to motion cues concerning avatars' directions until a crossroad from which branches leading to the 3 objects depart. Participants are expected to implicitly learn the associations between the option and avatars' intentions in that session and anticipate their choice. Thus, the paradigm that underlies our applications should specifically enhance the building of predictive internal models of others' behavior. Once realized, the age-appropriate scenarios will be tested in (pre)adolescents (N=24; 12-17 yo), young (N=24; 18-35 yo) and middle-age (N=24; 36-60 yo) adults in a one-session training. Before and soon after the VR training session, the participants will perform the task involving the prediction of others' mental states (intentions, emotions, personality traits) and a control non-social prediction task (see methodology). This one-shot trial will allow us to test whether the scenarios are user friendly, the training session can be tolerated by all age groups and the training is effective in facilitating the use of priors to predict others' behavior. Participants will be asked to assess the usability and the perceived load demand of the VR tool by means of validated scales such as the User Satisfaction Evaluation Questionnaire (USEQ) and Nasa Task Load Index (NASA-TLX) administered to them after the execution of the VR session. This will provide a proof of concept for the extension of a multi-session VR training in cerebellar patients. The data from these participants with typical development will also serve as a comparison for

	the baseline performance of the age-matched groups of patients. *Phase 2.* By modulating cortical excitability and oscillatory activity through the delivering of low-intensity electric current flow over the scalp, NIBS tools have been observed to influence long-range functional connections between the human neocortex and the cerebellum [20, 25]. In particular, previous studies have shown that cerebellar NIBS, by activating cerebello-cerebral connectivity, may facilitate the computational primitives generated by the cerebellum, i.e., sequence learning and error/deviant detection, and lead to improvements in social perception tasks that are strictly associated to the functionality of signal transmission and processing between the cerebellum and the cerebral cortex [20-22]. TACS is a noninvasive neuromodulation method that allows spontaneous brain oscillations to be modulated via low-intensity alternating currents applied on the scalp surface. Frequency of stimulation can be tuned (i.e., entrainment) to the natural frequency of the underlying cerebellar oscillations, inducing online and after-effect improvements of motor performance [28, 31]. Indeed, various frequencies have been recorded in distinct layers of the cerebellum: an oscillatory rhythm of 50 Hz corresponds to the basal firing frequency of the Purkinje cells, whereas a rhythm of 6 Hz falls into the oscillations range covered by the granule cells [32, 33]. Only a 50 Hz cerebellar tACS, however, was proven effective in affecting both motor evoked potentials and motor performance, whereas a 10 Hz stimulation resulted to be non-effective [34]. Furthermore, using a modified centre-ring montage (known as high-definition (HD) tACS [35]) will allow selectively driving neural oscillations in the cerebellar circuit. The specific tACS frequency will be tailored to the individualized peak of the gamma frequency band of each patient as detected with EEG recording during resting state. The opportunity to customize intervention parameters allows facing interindividual variability in the pattern of brain oscillations. Before and following the tACS, further EEG measurements will be carried out, as Event-related potentials (ERP) associated with sensorimotor tasks to assess changes in basic sensory and cognitive functions including sensory and motor anticipation [36], and partial directed coherence (PDC) analyses to investigate functional connectivity changes during resting-state and the visuomotor task. Cerebellar tACS will be administered during the execution of a battery of experimental tasks, developed by the consortium under a grant funded by the Italian Ministry of University (PRIN 20203LT7H3PRIN), to specifically test social predictive abilities at different levels of complexity: a) prediction of motor intentions; b) prediction of emotional states; 3) prediction of personality traits. A control task aimed to test prediction abilities in a non-social context will be also used. Testing the behavioral and electrophysiological effects of tACS in young adults with typical development will allow for more refined expectations about the effects of tACS in patients with cerebellar alterations and will provide a proof of concept for the feasibility and efficacy of this NIBS treatment for the rehabilitation of social perception skills. We expect to find that active, as compared to sham, cerebellar tACS will improve performance at the social prediction tasks, particularly enhancing the use of social expectancies to predict the intention, emotion and personality traits of others, transferring the acquired skills into daily life. In phase 2, we will run a series of experiments in young healthy adults (N = 30; 18-35 yo) to estimate the effects of tACS delivered to different cerebellar targets vs. sham tACS on social prediction and associated cognitive functions.

	Target regions will be the left and right posterior cerebellar hemispheres in line with evidence showing that the cerebellar contribution to social cognition is mostly supported by bilateral Crus I and II in the hemispheres [5]. Indeed, while more medial regions (i.e., vermis) are typically associated with low-level processing of emotional signals via connections with cerebral limbic structures [42], postero-lateral cerebellar sectors have been found to participate to the mentalizing resting-state network devoted to the understanding of others' mental states, through functional closed-loop connections with cortical mentalizing regions (e.g., TPJ) [5]. Exclusion criteria are psychiatric and neurological conditions, medication influencing the central nervous system as well as standard tACS exclusion criteria. Following the results of the simulation of the E-field described in the preliminary data, tACS will be applied through a 4x1 HD-tACS montage, composed of five ring electrodes (3.14 cm2). More specifically, the active electrode will be placed over the target cerebellar region, while the other four electrodes, serving as references, will be positioned in a circle and equidistant from the center (3 cm). Active tACS consists of sinusoidal currents (2 mA), with a ramp-up/down phase of 30-s. In the sham control condition, the currents are ramp-up/down for 10-s. To individualize the treatment, before delivering tACS, we detect the individual gamma frequency (IGF) peak (usually prominent on prefrontal lobes) recording 5 min eyes-open resting-state EEG. The IGF (range: 40-60 Hz) is selected as target frequency for tACS as particularly effective for cerebellum activity. During tACS, participants perform one of the tasks involving the prediction of others' mental states (intentions, emotions, personality traits) and a control non-social prediction task. All tasks have a similar structure, with (social) contextual prior information offered as priming stimuli, followed by ambiguous targets, either predictable or not predictable based on the social contexts. Even if the task decision depends on the information provided by the target, it should be affected by the congruence/incongruence of the contextual prior (i.e., in line with the prediction vs. violation of the prediction). Considering the ambiguity of the target, contextual effects are thus evident as "priming" effects, with participants being usually better in discrimination when the target can be predicted based on the contextual information. See Methodology for further details To evaluate offline effect of tACS, before and just after the treatment furter EEG recordings are acquired during execution of a visuomotor task (25 min duration) to evaluate both behavioral (response time and accuracy) and cortical functions (Stimulus-locked ERP components in both pre- and post-stimulus phases) associated with bottom-up and top-down cognitive functions as attention and task anticipation [36]. PDC analyses are also employed to investigate functional connectivity changes during resting-state and the visuomotor task. Four experiments will be conducted, each one testing, within-subjects, the effects of tACS over left vs. right cerebellar hemisphere vs. sham tACS on one of the 4 tasks. In each experiment, we will apply a repeated measure experimental design, considering the congruence between prime and target (congruence vs incongruence), the type of stimulation (active left vs. right cerebellar tACS vs. sham tACS) and the timing of EEG measurements (before vs after tACS) as within-subjects factors.

Possible application potentialities	The qualifying aspect of SINCRO is the integration of state-of-the-art rehabilitation programs based on neuroscientific knowledge of the basic computational properties of the cerebellum with innovative noninvasive brain stimulation techniques to modulate spontaneous brain oscillations and promote brain plasticity. This is expected to boost the effects of the training and will ultimately provide a short-term, effective training that may improve the quality of life of patients, decreasing medicalization and promoting socialization and participation. Addressing different etiologies of cerebellar alterations across the life span, SINCRO will personalize the rehabilitation procedures at both functional (i.e., adapting the ecological VR scenarios to the specific age and interests of patients) and physiological level (i.e., tailoring the tACS frequency to the individual pattern of brain oscillations), finally contributing to forster personalized medicine approaches in neurorehabilitation. As regards Aim1, we expect that the VR-training will be feasible, engaging and well tolerated, as demonstrated by perception scales and low dropout rates among participants, since the rehabilitation program comprises activities and scenarios tailored to the specific age and functional level of participants. More importantly, we expect that the pilot testing of the efficacy of the VR-training will result in participants being more efficient in anticipating avatars' preferences. In particular, we expect that both (pre)adolescents and young and middle-aged adults will show faster and more accurate learning of the association between options and avatars' intentions after the training compared to their performances at baseline, suggesting enhanced abilities in building predictive internal models of others' behaviors. These effects are expected to generalize to the context-based predictions task, where participants are expected to rely more on the contextual prime to provide their responses. As for Aim2, we expect to observe cerebellar tACS at the IGF to enhance participants' social prediction abilities. More specifically, we expect improved use of contextual priors to predict others' intentions, emotions and personality traits during active cerebellar tACS, compared to sham stimulation. Conversely, no effect is expected for the non-social control task, thus demonstrating the specificity of the cerebellar stimulation on social prediction abilities. Furthermore, we expect to observe changes in brain oscillations patterns following the stimulation, as shown by functional connectivity changes as measured by means of EEG recordings during resting-state and the visuomotor task, which may underlie the flow of neural information within the cerebro-cerebellar circuits. The ultimate aim of SINCRO is to test the effects of a restorative rehabilitation intervention coupling VR-training tasks and the delivering of tACS over the cerebellum in (pre)-adolescents and adults with congenital non-progressive ataxia and patients with neurodegenerative cerebellar disorder. Nowadays, NIBS is routinely used in adults to integrate motor and cognitive rehabilitation programs, as boosting endogenous neural activation underlying ongoing brain mechanisms engaged in a training-task is suggested to produce cumulative improvement effects [37]. However, only recently the feasibility and efficacy of applying transcranial electrical stimulation to pediatric neurological and neuropsychiatric disorders have been explored [38], also targeting cerebellar structures [39]. The stimulation will be targeted on the cerebellar nodes of the cerebello-cerebral circuitry involved in social cognition (mentalizing network)

	[40, 41]. We hypothesize that tACS over specific cerebellar targets and personalized on the specific gamma peak frequency may facilitate the ability to form internal models of the actions and emotions of others and boost the effects of a VR-training focusing on social perception skills in patients with complex brain disorders that involve cerebellar alterations. The effects are also expected to transfer into daily life activities and social interaction. The project is highly innovative in investigating the effects of spatiotemporal tuning Non-invasive Brain Stimulation (NIBS) to the anatomo-functional organization of cerebello-cerebral networks. The project contributes to ongoing research suggesting that combining NIBS with functional training may potentiate the effects of treatment by promoting brain plasticity and boosting cognitive learning. This integrative approach to rehabilitation might increase the efficacy of the intervention, with maximal capitalization on the efforts of clinicians and patients, reducing the costs for the National Health System. Ultimately, showing the safety and efficacy of using tACS with (pre)-adolescents will speed up the application of NIBS to cognitive rehabilitation of neuropsychiatric disorders across the life span. This can provide new impetus for the development of integrative interventions able to translate into rehabilitation procedures cutting-edge findings in experimental and clinical neuroscience, to offer long-lasting benefits in everyday life. Testing congenital and progressive cerebellar patients allows evaluating different models of cerebellar alterations. Congenital alterations impact since the earliest stages of embryonic life, likely leading to different functional organizations of cerebello-cerebral circuits as compared to typical development due to the extreme plasticity characterizing early stages of life. Conversely, neurodegenerative disorders occur after the cerebello-cerebral circuits are typically established. These two different models of cerebellar alterations are likely to lead to different patterns or severity of behavioral deficits, thus allowing to shed light onto plasticity of cerebello-cerebral circuits involved in social perception, highlighting not only the specificity of the anatomo-functional associations, but also the possibilities of recovery. The transdiagnostic and cross sectional approach of SINCRO, addressing different etiologies of cerebellar alterations across the life span may also provide a breeding ground for the development of potential therapeutic target to improve cognitive and social skills in other neurodevelopmental (e.g. Autism), neurological (e.g., neurodegenerative disorders/dementia) and psychiatric (e.g., mood disorders) diseases in which cerebellar alterations have been linked with cognitive and social deficits [2, 5, 16, 29].
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- Risorse d'Ateneo: bando interno finanziamento assegni 2023 (D.R. n. 406/2023) - CUP: G23C23000780005;
- Progetto "SINCRO: Spatiotemporal entrainment as Innovative Neuromodulation targeting Cerebello-cerebral circuits for enhancing Rehabilitation Outcomes of cognitive and social skills in progressive and acquired cerebellar diseases" - Bando Ordinario della ricerca finalizzata (RF) - "Change promoting" Ministero della Salute, RF-2021-12374279 (convenzione stipulata tra Ministero della Salute e il Capofila - Fondazione Santa Lucia IRCCS Roma). Codice U-GOV: CR_2023_IRCCS_SLUCIA_SINCRO_URGESI. CUP G23C22002980001.

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- possesso di un curriculum scientifico professionale idoneo allo svolgimento dell'attività di ricerca contemplata.

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I risultati della valutazione dei titoli saranno resi noti agli interessati nel corso del colloquio / The evaluation of the qualifications will be disclosed to candidates during the interview

Calendario del colloquio / Calendar of the oral exam	Modalità / Modality	Videoconferenza / Videoconference
	Data / Date	15 febbraio / February 2024
	Ora / Time	14:00 / 2:00 pm (Italian time)
	Luogo / Place	-

Per sostenere il colloquio i candidati devono esibire un valido documento di riconoscimento. / Candidates must come to the interview with a valid identity document.

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