Visual and tactile scanning training in patients with neglect after stroke

Roger Hilfiker

11h30 - 12h20

HES-SO Valais-Wallis

Kalter Kaffee (It's old news)

Your best teacher is your last mistake.

Content

→Short introduction of research team

→Short presentation of the project

→Difficulties and pitfalls encountered during the implementation and what we have undertaken to complete the project

→Interactions with the Scientific Commission

→Conclusion

~20 min. talk + discussion

Discussion: How can we foster clinical Research?

Short introduction of research team

Prof. Martin Sattelmayer, PhD → https://martinsatt.rbind.io

Lina Nilsson Balfe

Lara Allet

Roger Hilfiker

Mélanie Sautaux

Marie Jolivet

Michaela Zeiter

Marielle van Oirschot

Nina Forkel

Karin Bayard

Dr. Claude Vaney

Biography

Martin Sattelmayer
Associate professor UAS
HES-SO Valais-Wallis

I am a researcher and lecturer at the University of Applied Sciences Valais-Wallis (HES-SO Valais-Wallis). I am involved in teaching undergraduate physiotherapy students. My research interests inlcude the application of motor learning principles to the field of health professions education, the evaluation of complex health professions interventions and design and evaluation of assessments for procedural skills in educational and clinical settings. I have work experience as physiotherapist in various clinical settings with the main focus on neurological rehabilitation.

Interests
- Neurological rehabilitation
- Motor control and learning
- Health professions education
- Meta-analysis
- Item response theory
- R

Education
- Doctor of Rehabilitation Sciences, 2019
  Queen Margaret University, UK
- MA in Adult Education, 2010
  Technische Universität Kaiserslautern, GER
- MSc in Neurological rehabilitation, 2005
  Vrije Universiteit Brussel, B
- Bachelor in Physiotherapy, 2003
  Zuyd University, NL

Short presentation of the project

1) Marie Jolivet and Katia Giacomino (directed by Martin Sattelmayer). *Effets des traitements utilisés en physiothérapie sur la négligence unilatérale: revue systématique et méta-analyse*. Bachelor Thesis. Haute Ecole de Santé Valais, 2012.

2) SNF submission RCT

3) Internal project for a pilot trial

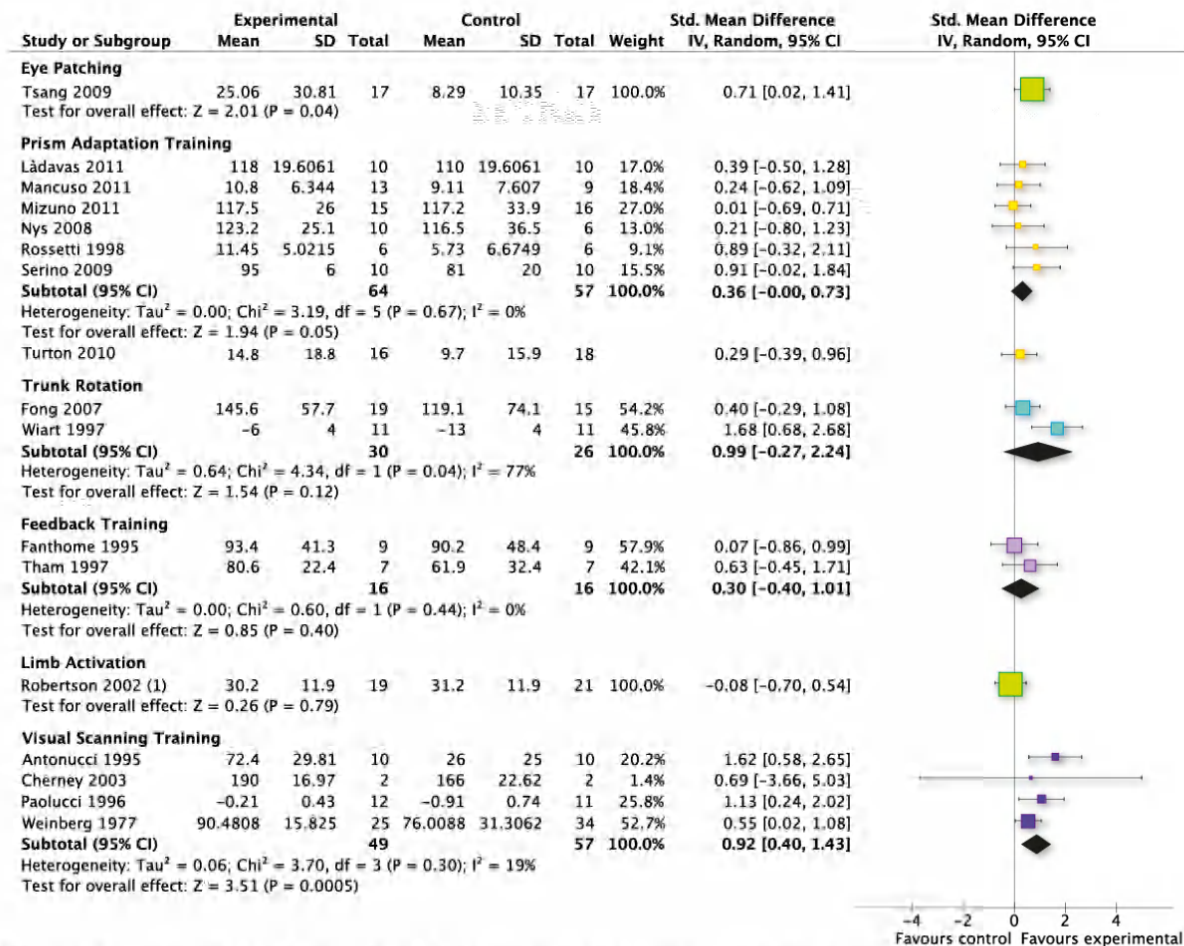| Study or Subgroup	Experimental			Control			Weight	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Eye Patching									
Tsang 2009	25.06	30.81	17	8.29	10.35	17	100.0%	0.71 [0.02, 1.41]	
Test for overall effect: Z = 2.01 (P = 0.04)									
Prism Adaptation Training									
Làdavas 2011	118	19.6061	10	110	19.6061	10	17.0%	0.39 [−0.50, 1.28]	
Mancuso 2011	10.8	6.344	13	9.11	7.607	9	18.4%	0.24 [−0.62, 1.09]	
Mizuno 2011	117.5	26	15	117.2	33.9	16	27.0%	0.01 [−0.69, 0.71]	
Nys 2008	123.2	25.1	10	116.5	36.5	6	13.0%	0.21 [−0.80, 1.23]	
Rossetti 1998	11.45	5.0215	6	5.73	6.6749	6	9.1%	0.89 [−0.32, 2.11]	
Serino 2009	95	6	10	81	20	10	15.5%	0.91 [−0.02, 1.84]	
Subtotal (95% CI)			64			57	100.0%	0.36 [−0.00, 0.73]	
Heterogeneity: Tau² = 0.00; Chi² = 3.19, df = 5 (P = 0.67); I² = 0%									
Test for overall effect: Z = 1.94 (P = 0.05)									
Turton 2010	14.8	18.8	16	9.7	15.9	18		0.29 [−0.39, 0.96]	
Trunk Rotation									
Fong 2007	145.6	57.7	19	119.1	74.1	15	54.2%	0.40 [−0.29, 1.08]	
Wiart 1997	−6	4	11	−13	4	11	45.8%	1.68 [0.68, 2.68]	
Subtotal (95% CI)			30			26	100.0%	0.99 [−0.27, 2.24]	
Heterogeneity: Tau² = 0.64; Chi² = 4.34, df = 1 (P = 0.04); I² = 77%									
Test for overall effect: Z = 1.54 (P = 0.12)									
Feedback Training									
Fanthome 1995	93.4	41.3	9	90.2	48.4	9	57.9%	0.07 [−0.86, 0.99]	
Tham 1997	80.6	22.4	7	61.9	32.4	7	42.1%	0.63 [−0.45, 1.71]	
Subtotal (95% CI)			16			16	100.0%	0.30 [−0.40, 1.01]	
Heterogeneity: Tau² = 0.00; Chi² = 0.60, df = 1 (P = 0.44); I² = 0%									
Test for overall effect: Z = 0.85 (P = 0.40)									
Limb Activation									
Robertson 2002 (1)	30.2	11.9	19	31.2	11.9	21	100.0%	−0.08 [−0.70, 0.54]	
Test for overall effect: Z = 0.26 (P = 0.79)									
Visual Scanning Training									
Antonucci 1995	72.4	29.81	10	26	25	10	20.2%	1.62 [0.58, 2.65]	
Cherney 2003	190	16.97	2	166	22.62	2	1.4%	0.69 [−3.66, 5.03]	
Paolucci 1996	−0.21	0.43	12	−0.91	0.74	11	25.8%	1.13 [0.24, 2.02]	
Weinberg 1977	90.4808	15.825	25	76.0088	31.3062	34	52.7%	0.55 [0.02, 1.08]	
Subtotal (95% CI)			49			57	100.0%	0.92 [0.40, 1.43]	
Heterogeneity: Tau² = 0.06; Chi² = 3.70, df = 3 (P = 0.30); I² = 19%									
Test for overall effect: Z = 3.51 (P = 0.0005)									

Figure 1. Outcome neglect. Forest plot of 6 trials comparing different type of treatments against control interventions. Values on x-axis indicate standardized mean differences (SMDs). The plot is stratified according to the different treatments. The size of the squares indicates the weight of the studies. I² indicates heterogeneity and values can be interpreted as follows: 25% low, 50% moderate and 75% as high between-trial heterogeneity, although for the interpretation, the size and number of trials included must be considered.

Visual or tactile scanning in the personal space

Visual or tactile scanning in the personal space: The patients will receive this intervention when neglect related deficits are recognized on the Vest Test or on the Catherine Bergego Scale (on the items that assess neglect in the personal space). Only patients with body representational neglect will receive this intervention. The tactile or visual scanning intervention consists of different search and selection tasks. The patients are wearing a custom made vest (Figure 4). The vest is firmly attached to the patients' body to assure that the training is conducted in the personal space. A thick red line is visible and sensible (5 cm diameter) on the left lateral border of the vest. Velcro straps are placed horizontally on the vest with a distance of 5 cm to each other. Stimuli (different objects) are arranged in an orderly or random fashion on the vest. We adapted different levels of exercise intensity accordingly to methods described for visually scanning training in the peripersonal space (Cherney, Halper et al. 2003).

- Level 1a: identification of objects with the same shape
- Level 1b: identification of objects with the same texture
- Level 1c: blindfolded identification of objects with the same shape
- Level 1d: blindfolded identification of objects with the same texture
- Level 2a & 2b: identification of combinations of objects with the same shape (2a) or texture (2b) arranged in an orderly fashion
- Level 2c & 2d: blindfolded identification of combinations of objects with the same shape (2c) or texture (2d) arranged in an orderly fashion
- Level 3a & 3b: identification of combinations of objects with the same shape (3a) or texture (3b) arranged in an randomly fashion
- Level 3c & 3d: blindfolded identification of combinations of objects with the same shape (3c) or texture (3d) arranged in an randomly fashion

The red line on the left side of the vest should help the patient to scan the left side of his body and is used as an anchor point. At the start of each practice trial the patient has to explore with his ipsilesional hand the red line. If that is not possible the therapist might help with manual or verbal assistance. The training starts at the top horizontal row. After reaching the right side of the body the training continuous by searching the red line and the start of the second horizontal line. Again, the therapist might help with verbal or manual assistance. The intervention trial is finished when all horizontal lines are explored. After the intervention trial the therapist provides feedback about the patients' performance (when possible with the help of a mirror). At the start the objects are colour coded to help the patient to solve the task by using either visual or tactile scanning methods. At the level 1c and 1d the patients are blindfolded and have to use only tactile scanning methods to find objects with different textures or shapes. The aim of the last two levels is to find combinations of objects (e.g. two blue fluffs next to each other). This might be in situations where objects are arranged in an orderly fashion (Level 2) or where objects are arranged randomly (Level 3). Exercise progression will be set with the following guidelines. At the beginning four objects are placed on every horizontal line (level 1a- 1d). In an array with five

Visual or tactile scanning and trunk rotation in the peripersonal space

Visual or tactile scanning and trunk rotation in the peripersonal space: Patients will receive this intervention when neglect related deficits are recognized on the Behavioural Inattention Test or on the Catherine Bergego Scale (on the items that assess neglect in the peripersonal space). Only patients with neglect in the peripersonal space will receive this intervention.

The tactile or visual scanning intervention consists of different search and selection tasks. Patients are sitting or standing (depending on the decision of the therapist) in front of a custom-made training table (Figure 5). The table is designed to place all necessary objects within reaching distance. We designed two tables in different sizes to provide an optimal training situation for all included patients. A thick red line is visible and sensible (5 cm diameter) on the left lateral border of the table. Five lines are running over the table from the left to right side. Each line consists of 10 positions for stimuli. Similar to the training in the personal space, stimuli (different objects) are arranged in an or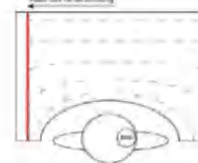derly or random fashion on the table. For exercise progression we use similar parameters described earlier for the training in the personal space (Level 1 – 3). Briefly, the patients have to identify objects with different shapes and textures. This is done in situations with visual control and in blindfolded situations. Further progression is introduced by identification of combinations of objects (either in orderly or random sequence). The red line on the right side of the table is used as anchor point. Before the patients start the intervention trial, the red line has to be found with the ipsilesional hand.

Trunk rotation: In addition to the scanning training the patients are encourage to use trunk rotation to the left side to find the anchor point. To control the trunk rotation we use the parameters Fong et al. (2007) described in their study. The trunk rotation should be between 15-35 degrees from the midline towards the neglected right side. When this is not possible the therapist might assist. The training starts at the top row and the patients have to explore this line first. After reaching the right side the patients return to the anchor line and continue with the second line (and so on). Exercise progression will be set with the guidelines described for the training in the personal space with slight modifications. In the beginning 5 Objects are placed on every line (1 target and 4 distractors). This is progressed until 10 items are placed on every line (1 targets and 9 distractors). The criterion to move to the next level is an accuracy of 90% in three consecutive trials.

Visual scanning training in the extrapersonal space

Visual scanning training in the extrapersonal space: Patients will receive this intervention when neglect related deficits are recognized on the Catherine Bergego Scale (on the items that assess neglect in the extrapersonal space). Only patients with neglect in the extrapersonal space will receive this intervention. The visual scanning intervention consists of different cancellation tasks. Patients are sitting or standing (depending on the decision of the therapist) in front of a 2 x 3 m screen as described by Antonucci et al. (1995) and Paolucci et al. (1996). The distance between the screen and the patients is far enough to ensure training in the extrapersonal 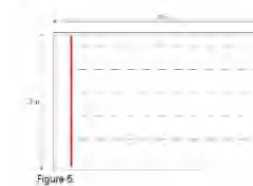space. The patients' position is on the right hand side of the screen (Figure 6). On the left side of the screen is a clearly visible red line. On the screen there are six horizontal lines with each 10 different positions for objects. A projector placed behind the patients will project different templates on the screen. Attached to the patients' chest is a laser pointer. At the start the patients have to move the pointer to the anchor line on the left side. This is accomplished by a **trunk rotation** between 15 and 35° using the guidelines of Fong et al. (2007). After reaching the red line the patients visually scan each line for objects. After finding the potential target the patients have to point on it and describe it verbally. Similar to the training in the personal and peripersonal space we adapted different levels of exercise difficulty from Cherney et al. (2003).

- Level 1: identification of objects with the same shape or colour
- Level 2: identification of combinations of objects with the same shape or colour arranged in an orderly fashion
- Level 3: identification of combinations of objects with the same shape or colour arranged in an randomly fashion

Exercise progression will be set similar to the above-mentioned methods. In the beginning 5 Objects are placed on every line (1 target and 4 distractors). This is progressed until 10 items are placed on every line (1 targets and 9 distractors). The criterion to move to the next level is an accuracy of 90% in three consecutive trials.
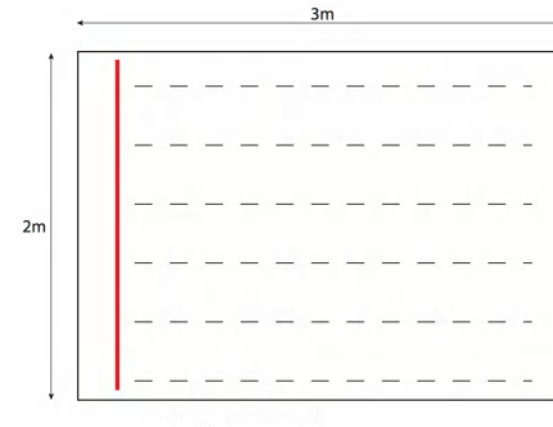
Visual and tactile scanning training in patients with neglect
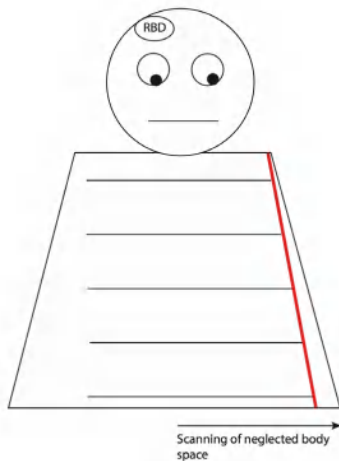
Neglect in personal space
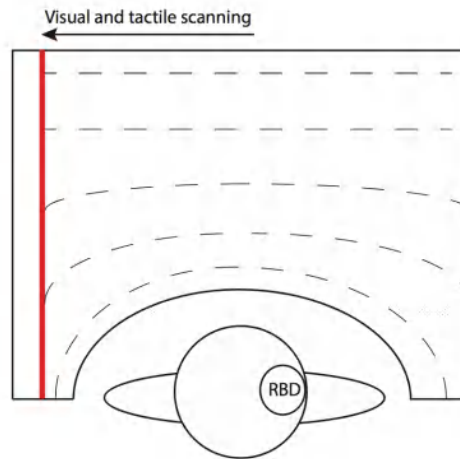
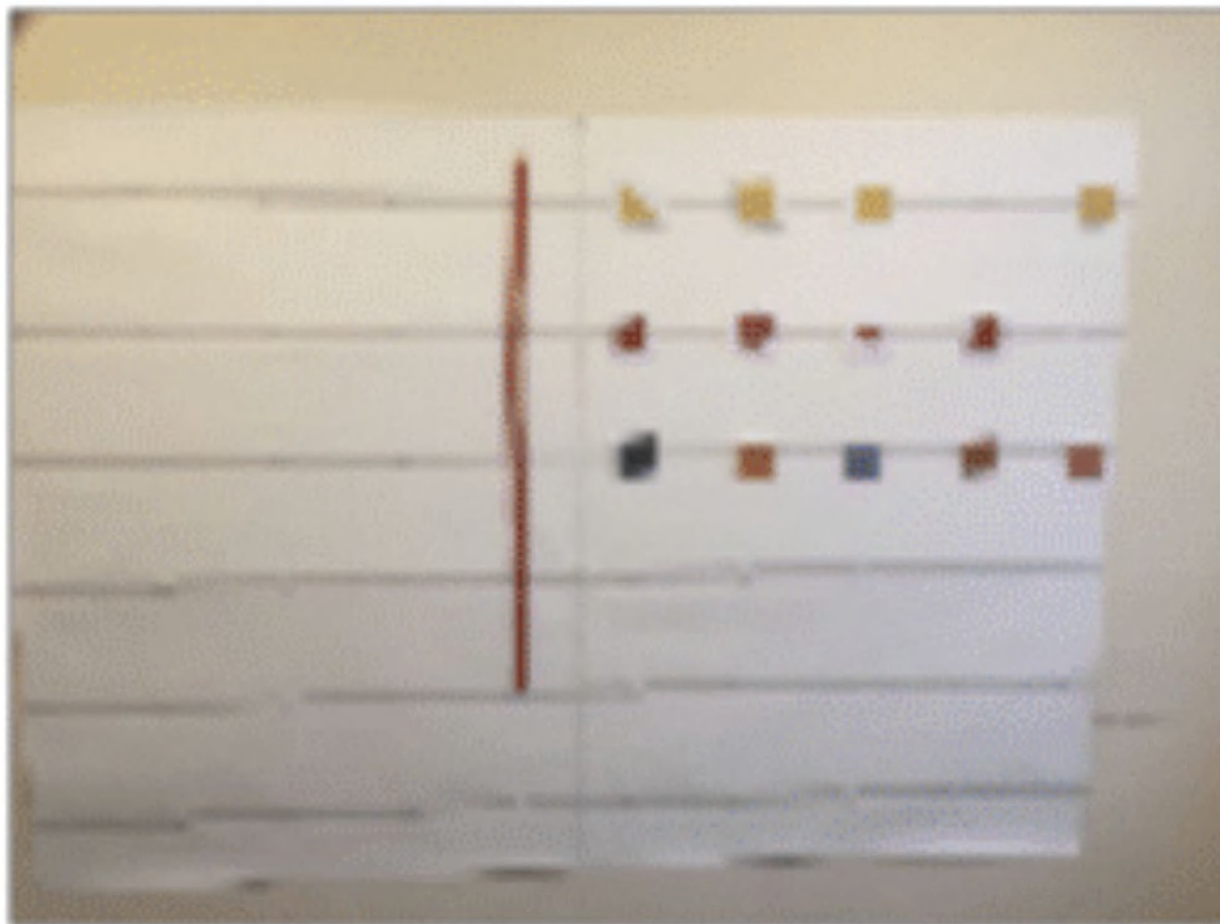Neglect in peripersonal space

Neglect in Extrapersonal space

swissuniversities

EQUAL SALARY

Valais excellence

Personal Space
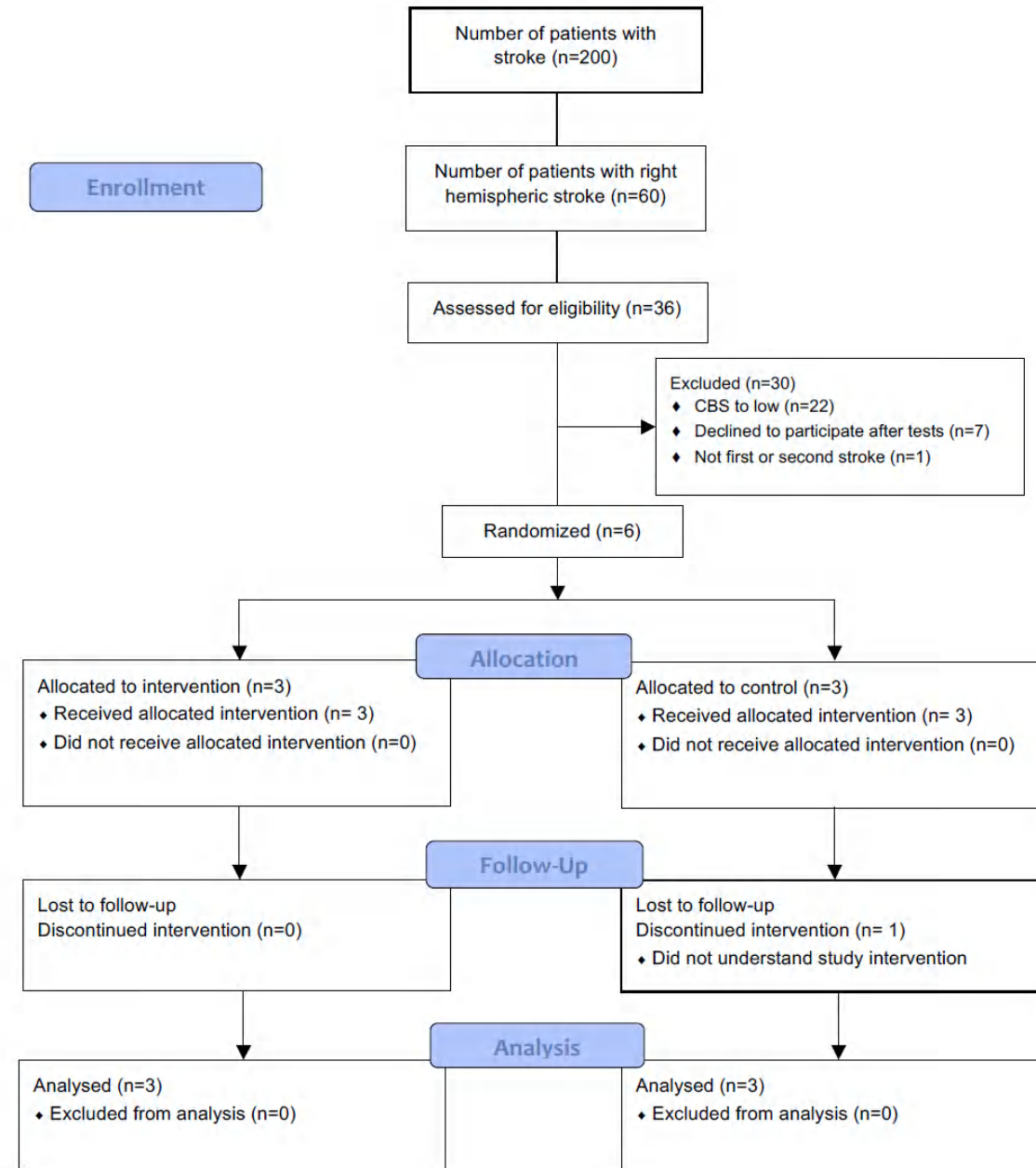
Peripersonal Space

Extrapersonal space

Results and Problems

Aim: 16 patient with hemineglect

Included: 6

After a prolongation of one year...

Difficulties and pitfalls encountered during the implementation and what we have undertaken to complete the project

1) **Negotiation of contracts with clinical partners**

   1) → They can't allocate personal to research "on an hour" basis if they are already fully "booked" → we needed to provide a fixed number of percentages, so that the FTE (EPT) could be increased for the duration of the study

      1) But what if recruitment slower???? → we had to take the risk

2) **Recruitment of Patients**

   1) If you want make disappear a disease, run a study…

   2) Daily business of a non-university clinic….

swissuniversities   EQUAL SALARY

Difficulties and pitfalls encountered during the implementation and what we have undertaken to complete the project

➢ The main mission of a clinic always comes first ...

  ➢ ...and research always second...

➢ Neglect quite high prevalence (~30% in early rehabilitation), but comorbidities limit inclusions (e.g., cognitive impairments).

swissuniversities

EQUAL SALARY

Was the money badly invested?

Definitively not

→ We learned a lot on the intervention

→ We learned a lot on the outcome measurement tools

Could we have done better

Definitively yes

→ We need to support clinicians more

→ Interest of clinicians important (e.g. we had the impression that the clinicians would have be more interested in a technological intervention instead of our "paper and cotton" intervention (we later tried to search money to implement our intervention as an augmented reality intervention).

Difficulties and pitfalls encountered during the implementation and what we have undertaken to complete the project

Interactions with the Scientific Commission

→ Excellent comments regarding our protocol

→ When problems were detected, we contacted the scientific commission to late

  → However, recruitment depends on third parties…

  → It would have been too expensive to add a new clinical partner

  → Budgets for these project are always calculated too low

Interactions with the Scientific Commission

The Proposal

ComSci
→support more proactive

→ Use expertise of ComSci to make interesting projects methodologicaly better
→ Foster research in clinical settings

Make Interesting Projects Great

Make Interesting Projects Great

Make Clinicians Great Research Partners

Conclusion

→ We need to foster a research culture in clinical settings

→ A lot of clinical work is done in non-teaching clinics (i.e. non-universitary clinics). → How can we do research with them.

→ We need robust financing models to remunerate clinicians who help in clinical research. This is expensiv.

→ I would love to discuss the implication of clinicians / clinics in our research. For me, this is a very high priority.

Thank you very much for your attention

I think we have time for a discussion....