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VIRTUAL REALITY EXERCISE DURING HEMODIALYSIS TO IMPROVE HEALTH-RELATED QUALITY OF LIFE: RANDOMIZED CONTROLLED TRIAL

Segura-Ortí E, Martínez-Olmos FJ, Ortega-Pérez de Villar L, Gómez-Conesa A, Amer-Cuenca JJ, Valtueña-Gimeno N, Meléndez-Oliva E, Martínez-Gramage J, Garcia- Testal A, Montañez-Aguilera FJ, Arguisuelas-Martínez MD, Benavent-Caballer V, Salvador-Coloma P, Ferrer-Sargues FJ, Biviá-Roig G, Ferrer-Salvá A, Gil-Gómez JA

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Review Article

Physical Exercise and Patients with Chronic Renal Failure: A Meta-Analysis

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Chronic renal failure is a severe clinical problem which has some significant socioeconomic impact worldwide and hemodialysis is an important way to maintain patients' health, but it seems difficult to get better in short time. Considering this, the aim of our research is to update and evaluate the effects of exercise on the health of patients with chronic renal failure. The databases were used to search for the relevant studies in English or Chinese. And the association between physical exercise and health, renal failure with chronic renal failure has been investigated. Random effect model was used to compare the physical function and capacity in exercise and control groups. Exercise is helpful in ameliorating the situation of blood pressure in patients with renal failure and significantly reduce VO₂ in patients with renal failure. The results of subgroup analysis show that, in the age 50+, physical activity can significantly reduce blood pressure in patients with renal failure. The activity program containing aerobic strength, and aerobic exercises has benefits in blood pressure among sick people and improves their maximal oxygen consumption level. These can help patients on physical function and aerobic capacity and even give them further benefits.

1. Introduction

Renal failure is characterized with the loss of its function and results in the accumulation of metabolites in blood [1–6]. As a metabolic disorder of fluids and electrolytes in the body gets disturbed, thereby causing serious health problems [7–10]. A gradual loss of kidney function over a period of several years is termed as chronic kidney disease (CKD) or chronic kidney failure [11–14]. Symptoms are usually very mild and could go unnoticed for a long time. More often than not, the symptoms are noticed when it is too late, and in a majority of cases very little can be done to reverse the situation [15–18].

In the general people, the physical activity is related to improved physical capacity and further helping in the control

of chronic diseases, including chronic kidney disease. It is reported that physical fitness level of hemodialysis patients tends to improve their function levels. Physical activity is an important nursing intervention for patients with hemodialysis in improving their physical performances [14, 15].

Several kinds of exercise interventions containing strength training and aerobic exercise were studied [8–10]. The exercise program is usually implemented twice or three times per week, and for the participation time it is about 1 hour. The period ranges from 3 months to 1 year.

Several published randomized controlled trials (RCT) studies about the effect of exercise on patients with renal failure have shown inconsistent results [14, 16]. As far as we know, the previous reviews suggest physical activity

REVIEW

Anabolic Effect of Exercise Training in People with End-Stage Renal Disease on Hemodialysis: A Systematic Review with Meta-analysis

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ABSTRACT

Purpose: The primary purpose of this systematic review was to evaluate the anabolic effect of exercise intervention in adults with end-stage renal disease on hemodialysis (ESRD). The secondary objectives were to evaluate the influence of different characteristics and exercise parameters on changes in muscle mass. **Methods:** Electronic databases (Cochrane, OVID, EMBASE, PEDr, PubMed and SCOPUS) were searched from inception to November 2012. Randomized clinical trials published in English that included adults on HD undergoing an exercise intervention where muscle mass was measured as an outcome were included in this review. Two reviewers independently selected the studies, extracted data, and assessed risk of bias within the included studies. Results were then combined by meta-analysis. The effect of exercises was determined using a standardized mean difference (SMD), expressed as a change in composition using a random effect model. **Results:** Seven SMDs extracted from 16 studies were included for this analysis. Strength training resulted in all studies, one study used aerobic and mixed strength and aerobic training with the subgroups of participants. The overall effect of exercise on muscle mass was statistically significant (SMD: 0.272, 95% CI: 0.029–0.525). **Conclusion:** Our results confirm a small but significant effect of strength/aerobic or anabolic intervention to increase muscle mass. Exercise training should be included in the management of people on maintenance HD. Although current results indicate that one in nine people on HD is likely to benefit from exercise intervention, patients' influence on hemodialysis requires further research.

Key Words: systematic review, computed tomography scan, dual energy x-ray absorptiometry, exercise, hemodialysis, magnetic resonance imaging, skeletal muscle

HELMES

Objetif: Cette critique systématique avait principalement à évaluer l'effet anabolique de l'exercice chez des adultes vivant avec une insuffisance rénale chronique en stade ultime et subissant des traitements d'hémodialyse (HD). Les objectifs secondaires consistaient à évaluer l'influence des caractéristiques des participants et des paramètres des interventions sur les changements de la masse des muscles. **Méthodes:** On a effectué des recherches dans des bases de données électroniques (Cochrane, OVID, EMBASE, PEDr, PubMed et SCOPUS) depuis leur création jusqu'en novembre 2012. On a inclus des essais cliniques randomisés publiés en anglais et qui incluaient des adultes en HD subissant une intervention d'exercice où la mesure de la masse musculaire constituait un résultat. Deux examinateurs ont sélectionné indépendamment les études, ont extrait les données et ont évalué le risque de biais dans les études incluses. Les résultats ont été combinés par méta-analyse. **Résultats:** Sept SMD ont été extraits de 16 études et ont été inclusés dans cette analyse. L'entraînement par résistance a été utilisé dans toutes les études, une étude a combiné l'entraînement par résistance et l'entraînement aérobic et mixte avec des sous-groupes de participants. L'effet global de l'exercice sur la masse musculaire a été statistiquement significatif (SMD: 0,272, IC à 95%: 0,029 à 0,525). **Conclusion:** Nos résultats confirment un effet anabolique modeste mais significatif de l'exercice de renforcement contre l'insuffisance rénale chronique en stade ultime. Bien qu'il soit probable que seulement un sur neuf patients en HD puisse bénéficier de l'exercice, l'influence des patients sur l'hémodialyse nécessite des recherches supplémentaires.

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Competing Interests: None declared.

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Exercise Training and Outcomes in Hemodialysis Patients: Systematic Review and Meta-Analysis

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Keywords

End-stage renal disease, Exercising training, Dialysis efficacy, Physical function, Meta-analysis

Abstract

Background: Inadequate dialysis, renal hypertension, and impaired exercise capacity are factors that affect the quality of life (QoL) and mortality of adults with end-stage renal disease (ESRD) undergoing hemodialysis (HD). This systematic review provided valid evidence about the effect of exercise training on single-pool Kt/V (sp Kt/V), blood pressure, and peak uptake oxygen (VO₂ peak). **Method:** A systematic review and meta-analysis of published randomized controlled trials (RCTs) that evaluated the effects of exercise training on physical fitness outcomes for adults with ESRD undergoing HD were accepted in this study. **Results:** Included 20 trials (677 participants) indicated that various exercise types improve exercise capacity, walking capacity, and health-related QoL, totally. Of note, aerobic exercise and combined exercise were the predominant exercise types. **Conclusion:** Based on our evidence, aerobic exercise or combined exercise at least for 8 weeks to 12 months, 3 times weekly, will be beneficial to physical conditions of the pa-

tients with ESRD undergoing HD. The clinical significance of the evidence above. Future studies provide more information basis for the constant exercise system by adding various exercises. © 2015

Introduction

End-stage renal disease (ESRD), the final chronic kidney disease (CKD) that exists in 8 million worldwide [1], is characterized as irreversible function and the prevalence is increasing [2]. Hemodialysis (HD) is an important and used renal replacement therapy (RRT) for ESRD [4]. According to International Society of 2.62 million people received RRT to treat ESRD. Most of them were treated with HD. Even as the HD treatment improves, there are still patients with ESRD undergoing paired to the same stage patients [5, 7], re-

REPORTS
KIDNEY
CLINICAL RESEARCH

Exercise Training in Elderly People Undergoing Hemodialysis: A Systematic Review and Meta-analysis

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Introduction: Previous reviews have indicated the effectiveness of exercise in people undergoing hemodialysis. However, these reviews did not take into account whether the subjects were elderly. We performed a systematic review of the effects of exercise training in elderly people undergoing hemodialysis and updated the evidence of exercise for people undergoing hemodialysis by adding recent research data.

Methods: We searched 8 electronic databases up to June 2016. Inclusion criteria were as follows: randomized controlled trials in English publication, subjects aged 65 and older undergoing hemodialysis, evaluation of physical function as an outcome of exercise intervention. We defined elderly as age 60 years and older. The main outcomes were exercise tolerance, peak/maximal oxygen consumption and walking ability (6-minute walk distance). Secondary outcomes were lower extremity muscle strength and quality of life.

Results: After screening of 10,323 references, 30 comparisons were entered into the analysis. However, because we found only 1 study in which elderly subjects were treated, we could not perform a meta-analysis for those people. For the general population undergoing hemodialysis, supervised exercise training was shown to significantly increase peak/maximal oxygen consumption (standard mean difference, 0.62; 95% confidence interval 0.38–0.87; P < 0.001), 6-minute walk distance (standard mean difference, 0.58; 95% confidence interval 0.24–0.92; P < 0.001), lower extremity muscle strength (standard mean difference, 0.34; 95% confidence interval 0.67–1.21; P < 0.001), and quality of life (standard mean difference, 0.53; 95% confidence interval 0.52–0.82; P < 0.001).

Conclusion: Our analysis on the effectiveness of exercise training in elderly people undergoing hemodialysis as compared with non-elderly people was somewhat inconclusive. Future studies should be carried out for elderly people to identify the most favorable exercise program for this population.

Keyword: dialysis, elderly, exercise, meta-analysis, renal replacement therapy

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An aging population and the increasing prevalence of lifestyle-related diseases, such as diabetes, hypertension, and cardiovascular disease, have led to a worldwide increase in the rate of chronic kidney disease requiring renal replacement therapy, including hemodialysis.¹ The mean age of people undergoing

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- CKD *per se* affects patients' HRQoL, association between severity of CKD and HRQoL
- Low HRQoL associated with frequent hospitalization and decreased survival.
- HRQoL, important OUTCOME in CKD

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Virtual Reality for RHB


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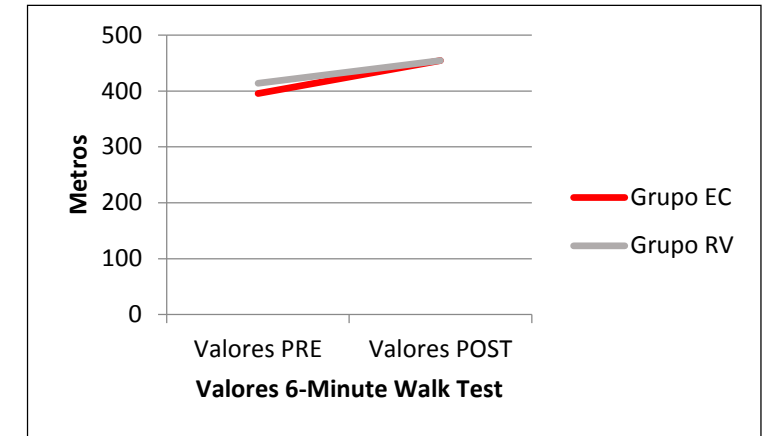
ORIGINAL ARTICLE

WILEY

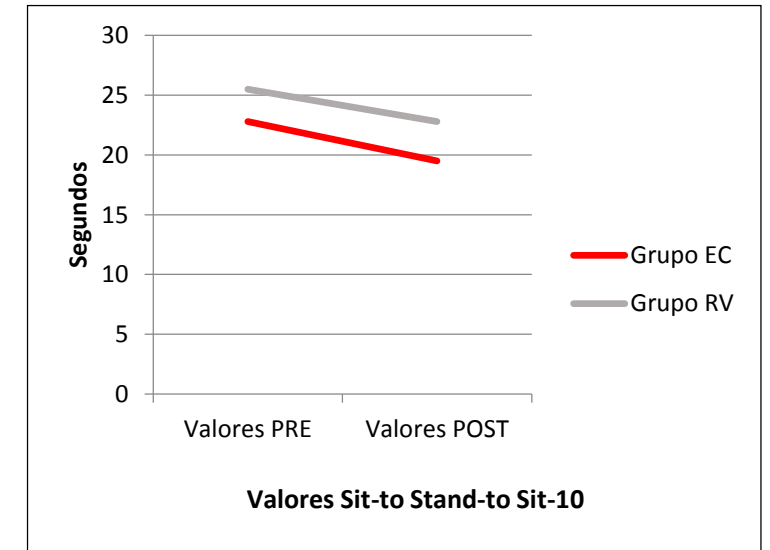
Virtual reality exercise intradialysis to improve physical function: A feasibility randomized trial

Eva Segura-Ortí¹  | Borja Pérez-Domínguez¹ | Lucía Ortega-Pérez de Villar¹ | Erika Meléndez-Oliva¹ | Javier Martínez-Gramage¹ | Rafael García-Maset² | José Antonio Gil-Gómez³

6-Minute Walk Test (6MWT)



Sit-to Stand-to Sit 10 (STS-10)

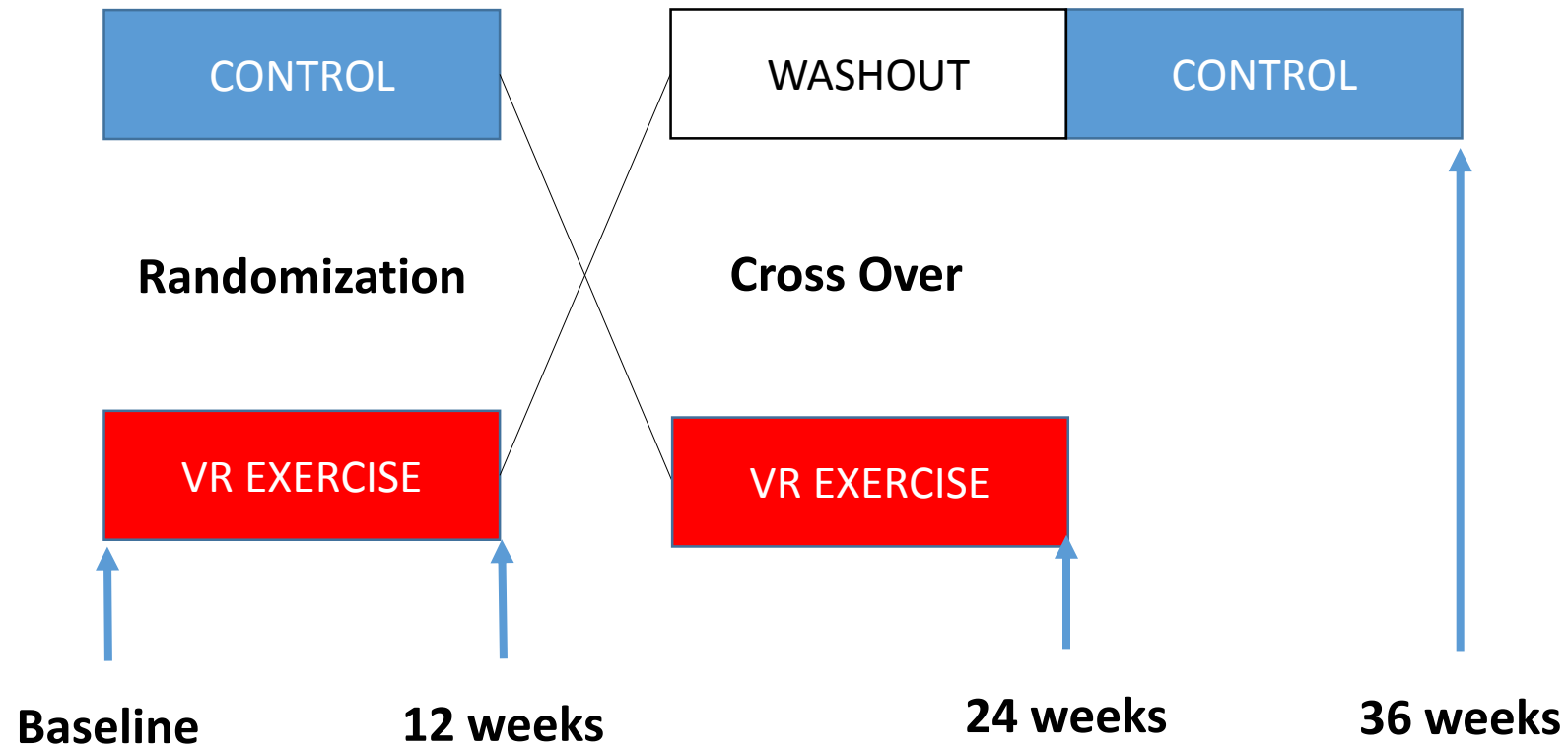


- PRIMARY AIM to investigate if a 12-weeks non-immersive Virtual Reality exercise program intradialysis improves health-related quality of life (HRQoL)

HIPOTHESIS

A Virtual reality exercise program will result in improvement in HRQoL.

Randomized crossover design



Cuestionario de Salud SF-36

Nombre _____

Fecha de registro _____

Instrucciones y normas de aplicación:

Las siguientes preguntas se refieren a lo que usted piensa sobre su salud. Sus respuestas permitirán saber cómo se encuentra usted y hasta qué punto es capaz de hacer sus actividades habituales de la vida diaria.

Conteste cada pregunta tal como se indica, ajustándose a las posibles respuestas. Si no está seguro de cómo responder a una pregunta, por favor conteste lo que le parezca más cierto.

Interpretación:

Transformar la puntuación a escala 0 a 100 (siendo lo mejor 100)

Por ejemplo, pregunta de 3 categorías se puntúa: 0 – 50 – 100; con 5 categorías se puntúa: 0 – 25 – 50 – 75 – 100; con 6 categorías se puntúa: 0 – 20 – 40 – 60 – 80 – 100.

Luego, las puntuaciones de los ítems de la misma dimensión se promedian y se crea una puntuación para cada dimensión.

Dimensiones:

-Función Física (10 ítems) 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

-Rol Físico (4 ítems) 13, 14, 15, 16.

-Dolor Corporal (2 ítems) 21, 22.

-Salud General (5 ítems) 1, 33, 34, 35, 36.

-Vitalidad (4 ítems) 23, 27, 29, 31.

-Función Social (2 ítems) 20, 32.

-Rol Emocional (3 ítems) 17, 18, 19.

-Salud Mental (5 ítems) 24, 25, 26, 28, 30.

-Transición de Salud (1) 2.

Health-related quality of life HRQoL

SF-36. *Physical Functioning*

SF-36. *Role Physical*

SF-36. *Bodily Pain*

SF-36. *General Health*

SF-36. *Vitality*

SF-36. *Social Functioning*

SF-36. *Role Emotional*

SF-36. *Mental Health*

SF-36. *Physical Component Scale*

SF-36. *Mental Component Scale*



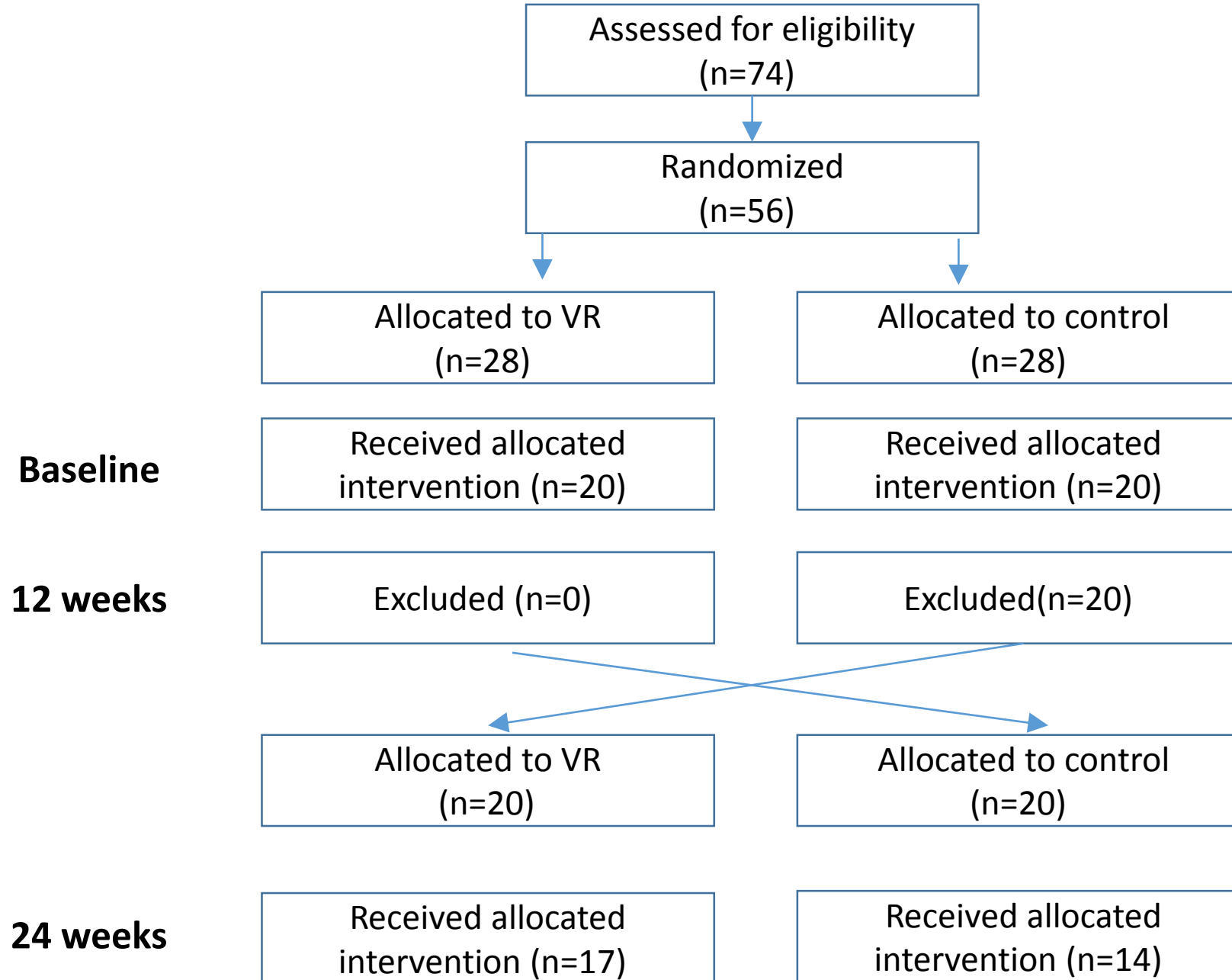
- Non-immersive VR game adapted to dialysis:
 - Treasure Hunting (TH)
 - The patient must catch some objectives avoiding obstacles by moving the lower limbs



	TESOROS	MUERTES	TOTAL
Subsesión N°1:	126	35	
Subsesión N°2:	143	36	
Subsesión N°3:	92	32	
Subsesión N°4:	122	37	592
Subsesión N°5:	109	38	178

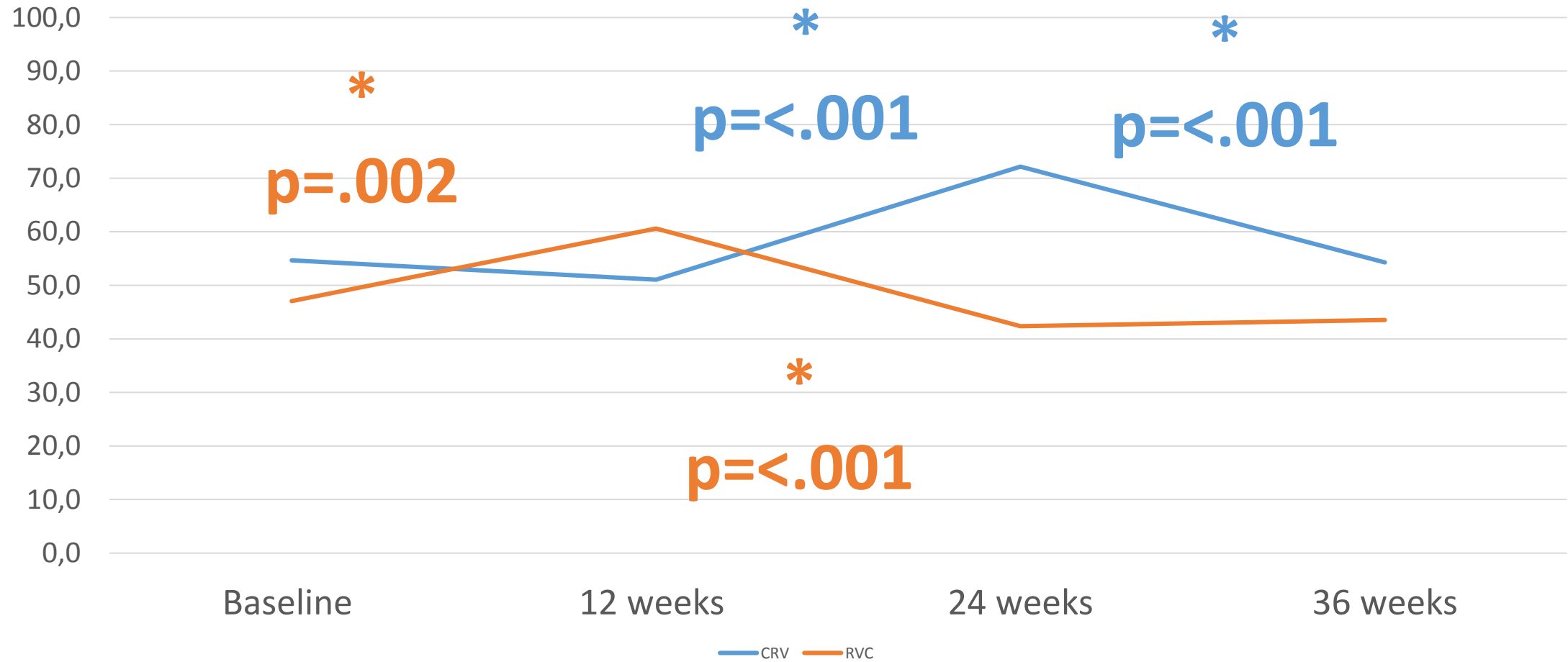
6	
7	Very, Very Light
8	
9	Very Light
10	
11	Fairly Light
12	
13	Somewhat Hard
14	
15	Hard
16	
17	Very Hard
18	
19	Very, Very Hard
20	

- Total exercise time progression
 - 3 to 42 minutes
 - Number of subsets (1 to 6)
 - Time per subset (3 to 6 min)
 - Rest between subsets (1 min)
- Rate of perceived exertion 12 to 15

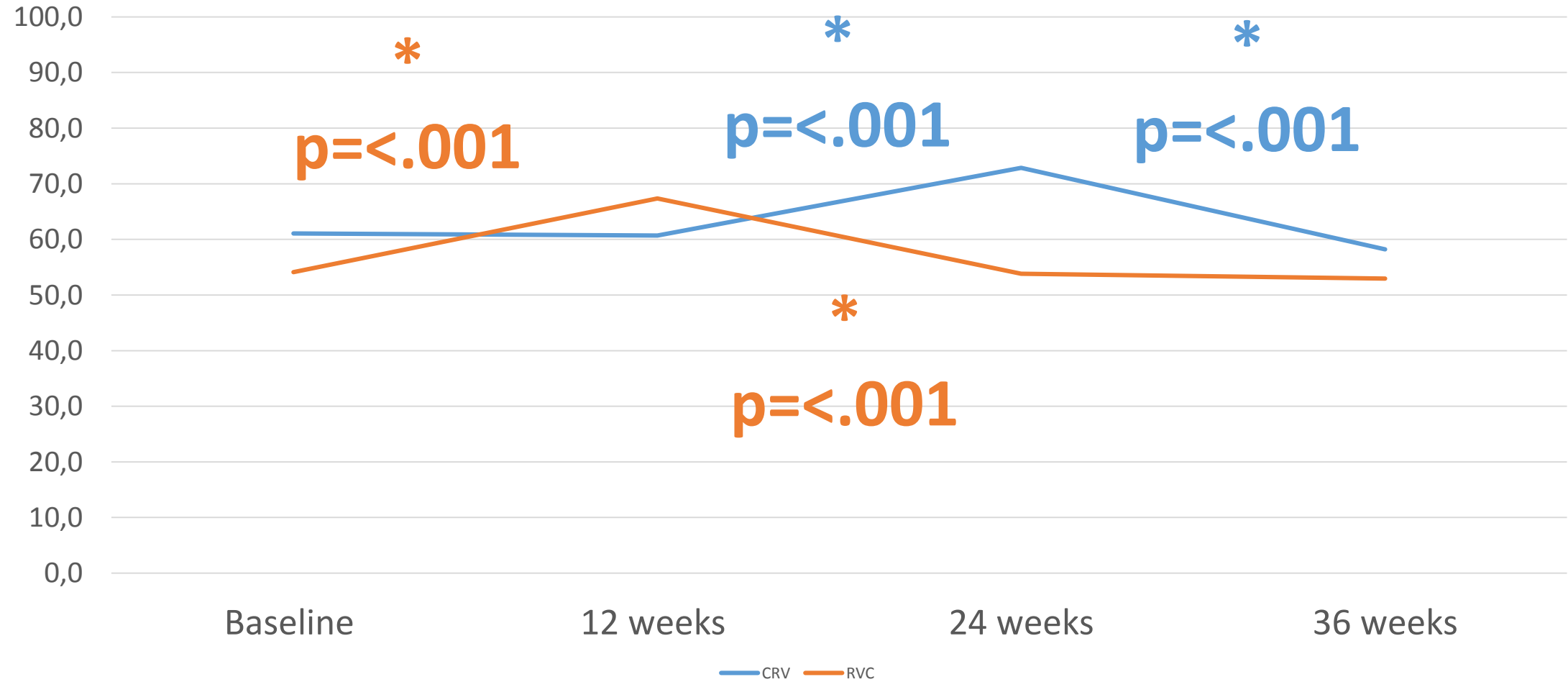


	RVC (N=17) Median (min-max)	CRV (N=14) Median (min-max)
Age (years) Median	72 (48-85)	75 (41-83)
Men/Women	10/7	9/5
Body Mass Index (Kg/m ²)	24.8 (20.3-41.0)	27.2 (21.3-36.0)
Albumine (mg/dL)	3.9 (3.3-4.3)	3.8 (3.3-4.3)
Hemoglobine (g/dL)	12.2 (9.3-13.4)	11.1 (8.5-13)
Charlson Index	6 (2-12)	7.5 (1-12)

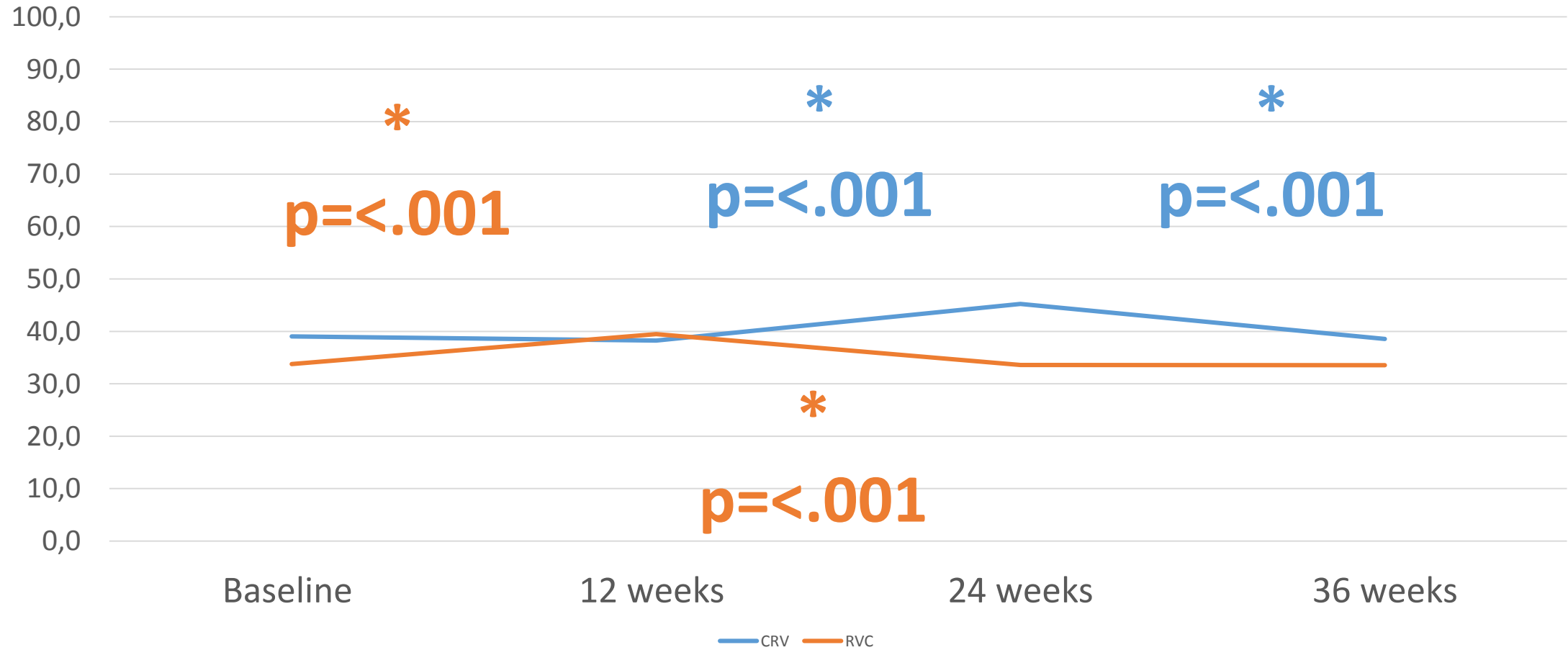
Physical Function



Vitality

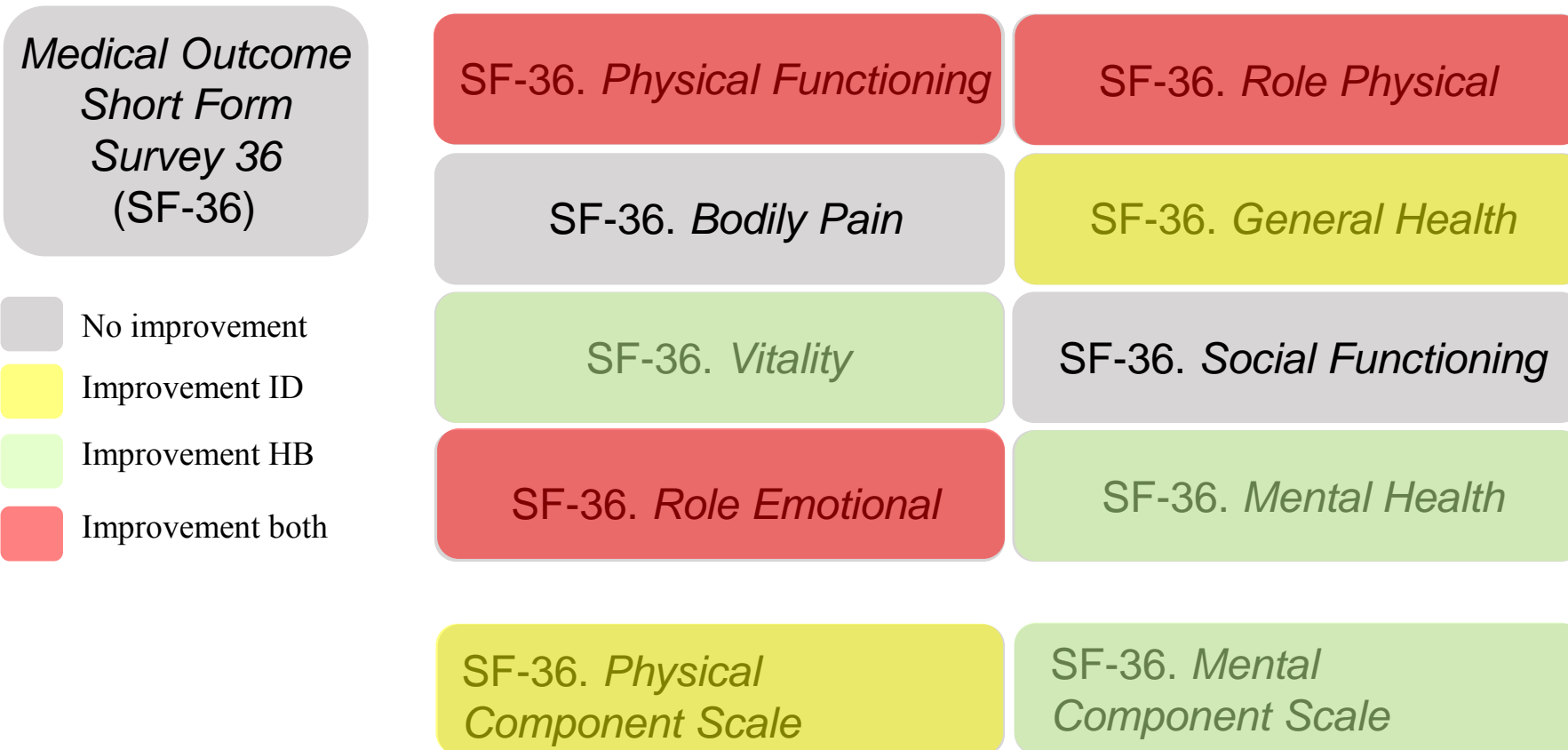


Physical Component Scale



ROLE PHYSICAL	Baseline	12 weeks	24 weeks	36 weeks
CRV	73.2	73.2	91.1	73.2
RVC	64.7	77.9	60.3	61.8
BODY PAIN	Baseline	12 weeks	24 weeks	36 weeks
CRV	72.4	73.4	84.1	71.4
RVC	56.9	73.3	59.4	55.1
GENERAL HEALTH	Baseline	12 weeks	24 weeks	36 weeks
CRV	40.0	38.8	47.6	35.6
RVC	28.6	36.8	31.0	33.4
MENTAL HEALTH	Baseline	12 weeks	24 weeks	36 weeks
CRV	73.4	74.6	82.6	70.9
RVC	75.8	82.1	71.5	72.9

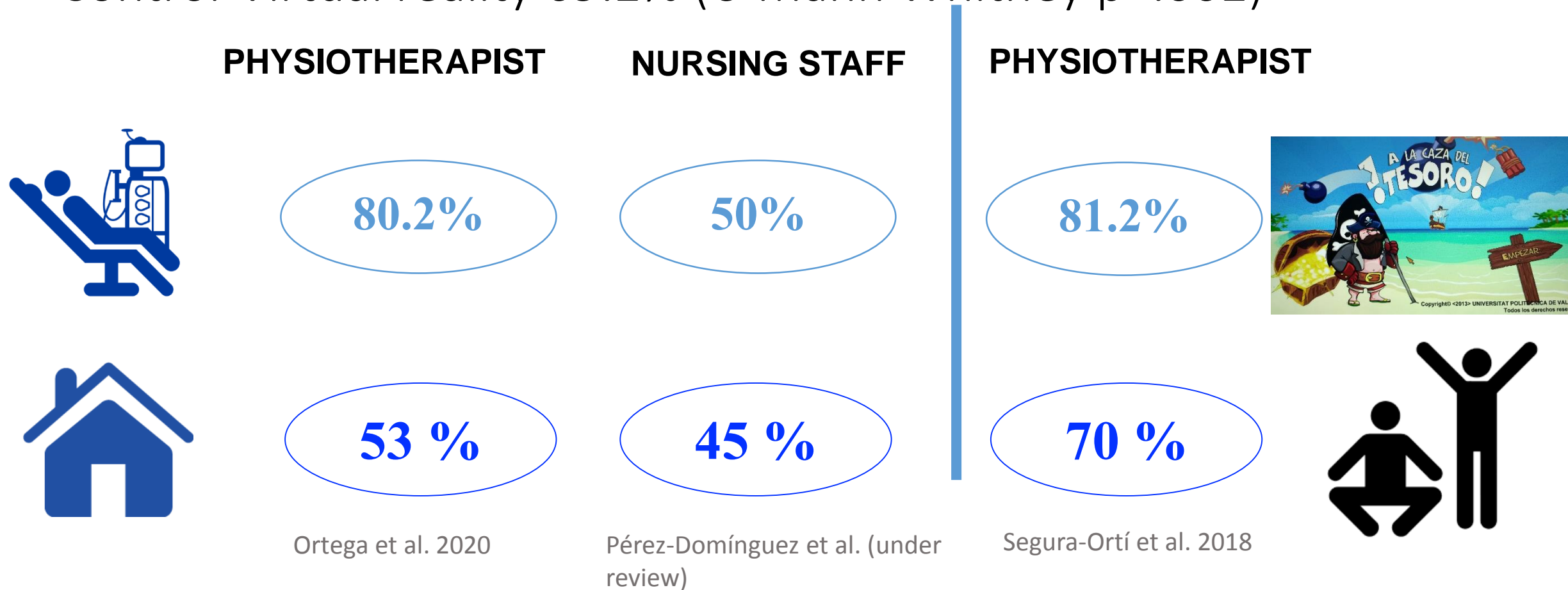
Health-related quality of life HRQoL



Adherence (Sessions attended/offered)

Virtual reality-Control 84%

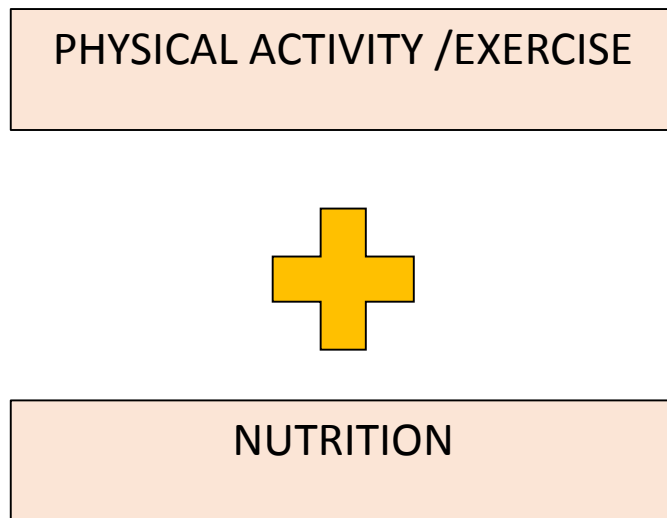
Control-Virtual reality 69.2% (U Mann Whitney $p=.002$)



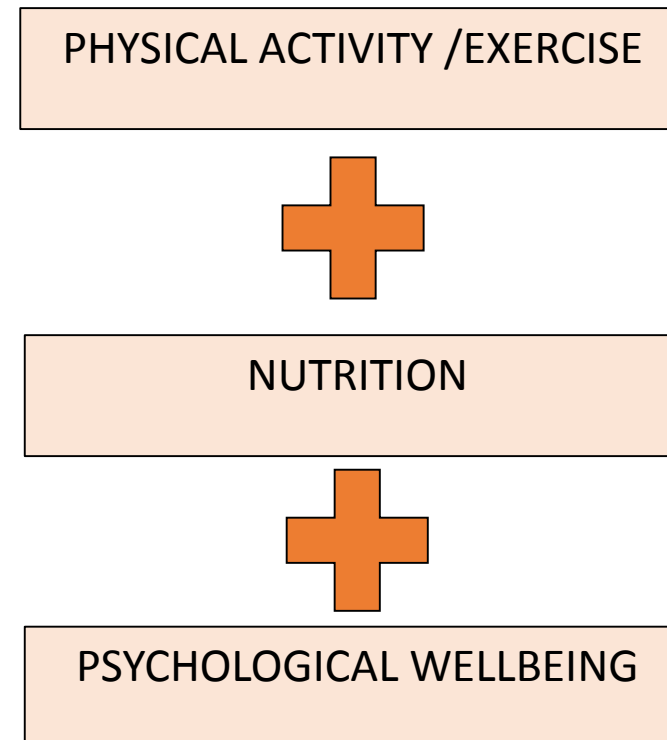


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REVID



GoodRENal



1. Small sample
2. Short exercise program
3. Not a clear definition of which type of exercise is VR. RPE within the limits of strength training.
4. Scientific community perception is that is 'freak' and difficult to apply, but it is the opposite
5. Future studies with longer programs should check if greater improvement can be achieved.

1. 12 weeks of VR exercise intradialysis results in improved health-related quality of life (physical function, vitality, physical component scale).
2. Adherence to this type of exercise is high

THANK YOU Questions?

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