

## Introduction

Cognitive impairment is a well-recognized complication of ESRD and only 13% of hemodialysis patients have normal cognitive function. Cognitive decline often starts early in the progression of kidney disease and continues to decline while undergoing HD at a rate much faster than the general population. This is associated with multiple adverse consequences including difficulty of care, depression, dialysis withdrawal, increased hospitalizations, low quality of life and increased mortality. There are many potential causes, including uraemic toxins (neurotoxins), common underlying factors responsible for progression of both renal impairment and cognitive dysfunction (as diabetes mellitus, hypertension, increased oxidative stress and persistent chronic inflammation), as well as increased prevalence of silent cerebral infarction, cerebral atrophy and cerebral microbleeds. Executive function is the domain of cognition that is most affected by HD initiation. In an attempt to reduce cognitive decline in patients on HD, There is research on non-pharmacological approaches to minimize cognitive impairment or improve daily functioning as cognitive rehabilitation and recently intradialytic cognitive training by playing some video games was assessed and found to improve certain cognitive tasks that may even extend to involve other untrained tasks.

## Aim of the Work

The aim of this work was to study whether an intra-dialytic supervised cognitive training program, administered via smartphone, can prevent or slow down the decline of cognitive functions among MHD patients

## Patients and Methods

Our study included 60 ESRD patients treated with thrice weekly low flux MHD for > 6 months, they were distributed into two groups each contained 30 participants, one of them trained to use (Lumosity) "Intra-Dialytic Cognitive Training" as smartphone application for 20 – 30 minutes during the first half of the dialysis sessions and the other group is "untrained". The study included Patients with ESRD, on hemodialysis, In Stable condition, Free of infection or hemorrhage, Undergoing hemodialysis 2–3 times a week, 4–5 h each, able to understand content of the questionnaire and Voluntary to participate in the study. We excluded patients with established dementia, delirium, or major psychiatric illness, recent cerebrovascular accident, acute inflammatory conditions, Visual, auditory or motor disabilities that interfere with cognitive training and assessment, Intake of drugs that interfere with mental acuity.

We assessed cognitive function of participants with Basic version (MoCA-B), Trail making test, parts A and B, and D-symbol substitution test.

In trained group under guidance and supervision by the attending physician, brain games provided by smartphone application (Lumosity) was practiced by the patients assigned for the (Trained) group. Follow up was done for a period of 4 months (about 50 dialysis sessions).

## Results

The impact of intradialytic cognitive training by lumosity application was statically highly significant on improvement of tests that assess cognitive function on short term follow up with no significant statical change among the untrained group .

Table 1: shows the tests of cognitive function assessment among the studied group (n =60)

		n =60
<b>MOCA B test</b>	Mean±SD Range	23.1±2.95 16 – 28
<b>TRAIL making A test</b>	Mean±SD Range	70.5±35.6 25– 140
<b>TRAIL making B test</b>	Mean±SD Range	206.47±122.23 55 – 380
<b>D SYMBOL test</b>	Mean±SD Range	126.83±42.99 55 – 215

Table 2: Table shows the tests of cognitive function assessment among the trained group (n = 30)

	Pre-training	Post-training	n=30 p-value
<b>MOCA B test</b>			
Mean±SD	23.3±2.78	26.1±2.14	<0.0001*
Range	18 – 27	21 – 29	
<b>TRAIL making A test</b>			
Mean±SD	61.87±29.02	52.67±24.92	<0.0001*
Range	25 – 120	21– 100	
<b>TRAIL making B test</b>			
Mean±SD	195.67±114.02	150.7±95.69	<0.0001*
Range	55 – 364	38 – 330	
<b>D SYMBOL test</b>			
Mean±SD	123±43.02	96.23±33.43	<0.0001*
Range	55 – 190	40 – 163	

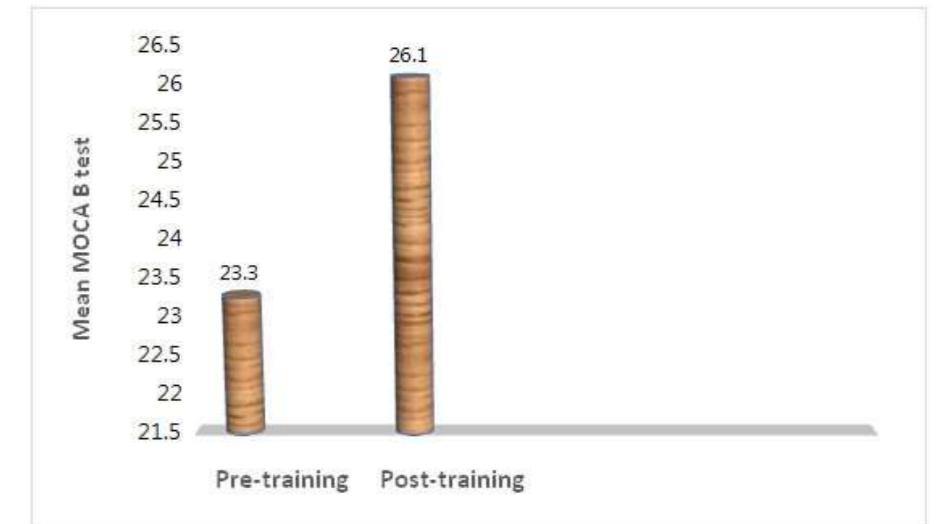


Figure: Bar chart displaying the pre- and post-training mean MOCA B test among the trained group (n =30)

## Conclusion

An intradialytic supervised cognitive training program, administered via smartphone, can slow down the decline of cognitive functions among maintenance hemodialysis (MHD) patients. It is thought that CT impacts cognitive function by improving neural functions.