

# Executive functioning following paediatric kidney transplantation

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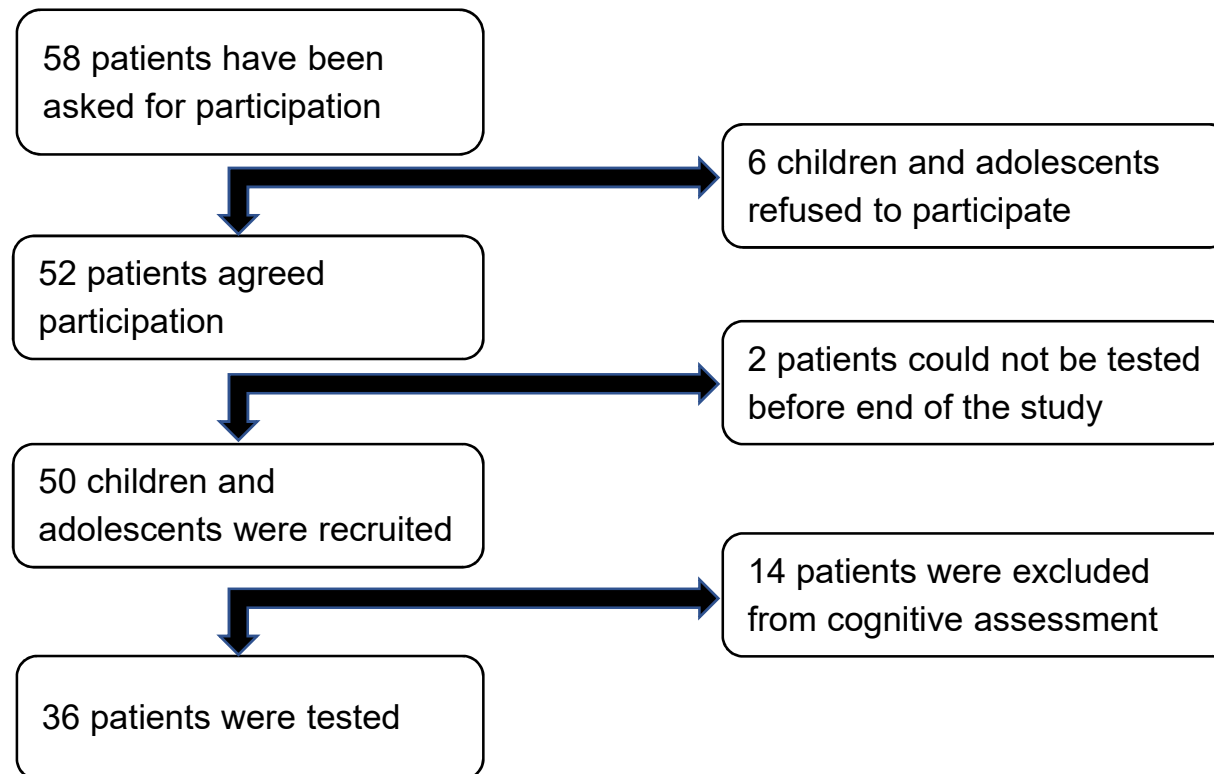
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# 1. Scientific background

- Neurocognitive function of children following renal transplantation is reported to be below those of healthy children but better than the achievement of children on dialysis
- Other studies have shown associations between cognitive performance / IQ and age at start of renal replacement therapy
- Children with CKD have a reduced attention-span as compared to healthy children; which tends to improve after transplantation
- Children with CKD have a lower performance in working memory tasks with improvements after transplantation

## 2. Study Design

### Recruitment



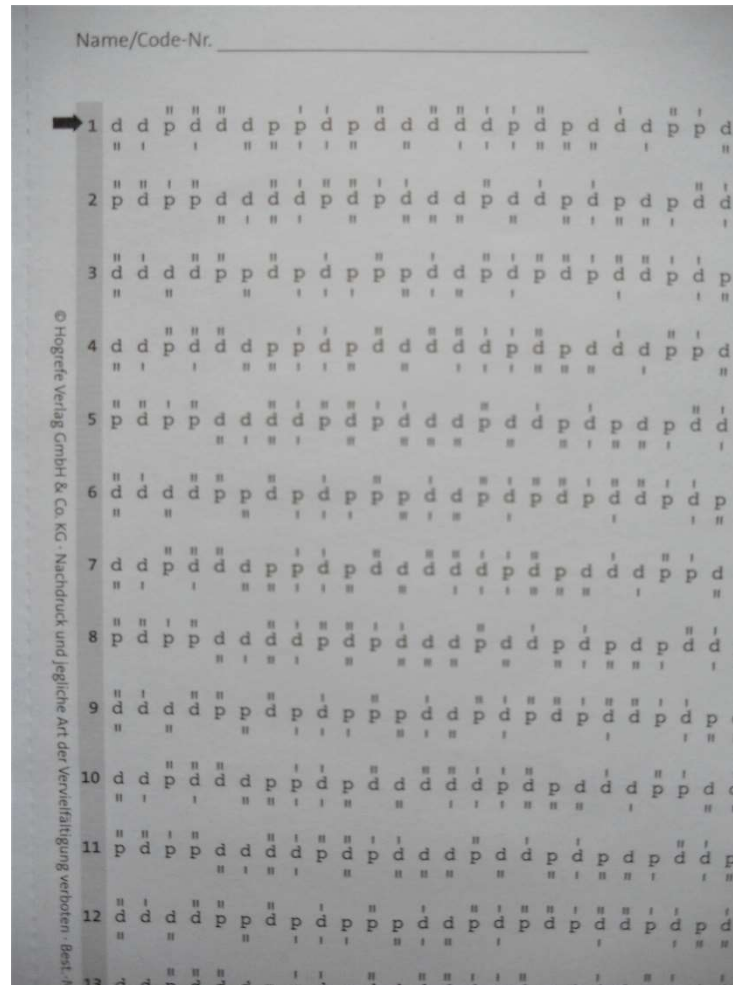
# 2. Study Design

## Research methods

- Cross-sectional design
- Patients age 8-18 at least 3 months post transplantation
- 3 cognitive tests::
  - d2-R Test** -> attention and concentration
  - Digit span of WISC** -> working memory
  - Wisconsin Card Sorting Test** -> cognitive flexibility
- Knowledge about kidney disease and medication for personal responsibility
- Additional information based on a questionnaire and patients hospital file regarding underlying disease, treatment and medication

# 2. Study Design

## d2-R



# 2. Study Design

## Digit span

0 1 2

Rohwertsumme  
(Max. = 44)

### 3. Zahlen nachsprechen (ZN)

**Start** Alter 6-16: Vorwärts: Aufgabe 1 Rückwärts: Beispiel, dann Aufgabe 1

**Abbruch** Vorwärts: wenn beide Versuche einer Aufgabe nicht oder falsch gelöst wurden. Rückwärts: wenn beide Versuche einer Aufgabe nicht oder falsch gelöst wurden.

**Bewertung** Jeder Versuch wird mit 0 oder 1 Punkt bewertet.  
**ZN-V & ZN-R:** Gesamtrohwert für ZN vorwärts bzw. rückwärts  
**LZ-V & LZ-R:** Anzahl der Ziffern, die in der letzten mit 1 Punkt bewerteten Aufgabe genannt werden.

**Achtung: Zahlen gleichmäßig und ohne Betonung vorgeben!**

#### Zahlen nachsprechen vorwärts: ZN-V

Aufgabe	1. Versuch	Punkte	2. Versuch	Punkte	0, 1 oder 2 Punkte
1.	2 - 9	0 1	4 - 6	0 1	0 1 2
2.	3 - 8 - 6	0 1	6 - 1 - 2	0 1	0 1 2
3.	3 - 4 - 1 - 7	0 1	6 - 1 - 5 - 8	0 1	0 1 2
4.	8 - 4 - 2 - 3 - 9	0 1	5 - 2 - 1 - 8 - 6	0 1	0 1 2
5.	3 - 8 - 9 - 1 - 7 - 4	0 1	7 - 9 - 6 - 4 - 8 - 3	0 1	0 1 2
6.	5 - 1 - 7 - 4 - 2 - 3 - 8	0 1	9 - 8 - 5 - 2 - 1 - 6 - 3	0 1	0 1 2
7.	1 - 8 - 4 - 5 - 9 - 7 - 6 - 3	0 1	2 - 9 - 7 - 6 - 3 - 1 - 5 - 4	0 1	0 1 2
8.	5 - 3 - 8 - 7 - 1 - 2 - 4 - 6 - 9	0 1	4 - 2 - 6 - 9 - 1 - 7 - 8 - 3 - 5	0 1	0 1 2

Längste Zahlenspanne vorwärts (LZ-V) (Max. = 9)  Rohwertsumme vorwärts (ZN-V) (Max. = 16)

#### Zahlen nachsprechen rückwärts: ZN-R

Aufgabe	1. Versuch	Punkte	2. Versuch	Punkte	0, 1 oder 2 Punkte
1.	8 - 2	0 1	5 - 6	0 1	0 1 2
2.	2 - 1	0 1	1 - 3	0 1	0 1 2
3.	3 - 5	0 1	6 - 4	0 1	0 1 2
4.	5 - 7 - 4	0 1	2 - 5 - 9	0 1	0 1 2
5.	7 - 2 - 9 - 6	0 1	8 - 4 - 9 - 3	0 1	0 1 2
6.	4 - 1 - 3 - 5 - 7	0 1	9 - 7 - 8 - 5 - 2	0 1	0 1 2
7.	1 - 6 - 5 - 2 - 9 - 8	0 1	3 - 6 - 7 - 1 - 9 - 4	0 1	0 1 2
8.	8 - 5 - 9 - 2 - 3 - 4 - 6	0 1	4 - 5 - 7 - 9 - 2 - 8 - 1	0 1	0 1 2
8.	6 - 9 - 1 - 7 - 3 - 2 - 5 - 8	0 1	3 - 1 - 7 - 9 - 5 - 4 - 8 - 2	0 1	0 1 2

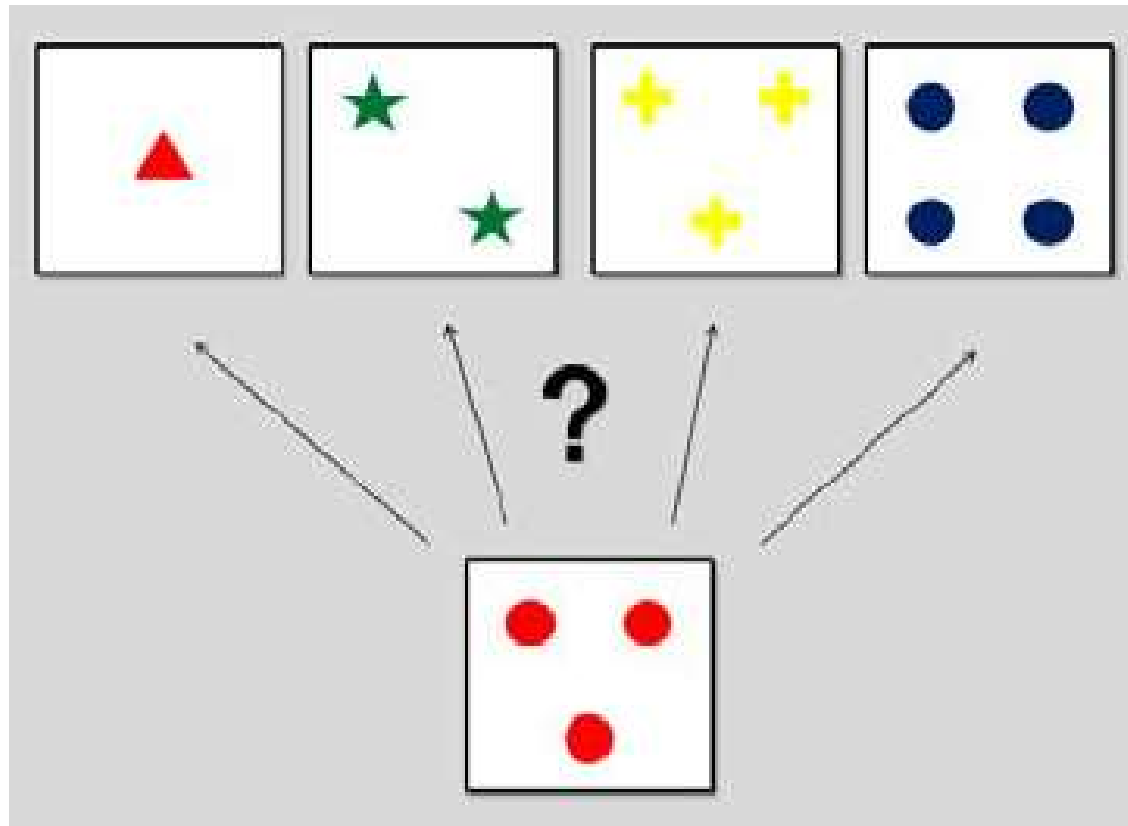
Längste Zahlenspanne rückwärts (LZ-R) (Max. = 8)  Rohwertsumme rückwärts (ZN-R) (Max. = 16)

Gesamtrohwert (Max. = 32)

5

## 2. Study Design

### Wisconsin Card Sorting Test





# 2. Study Design

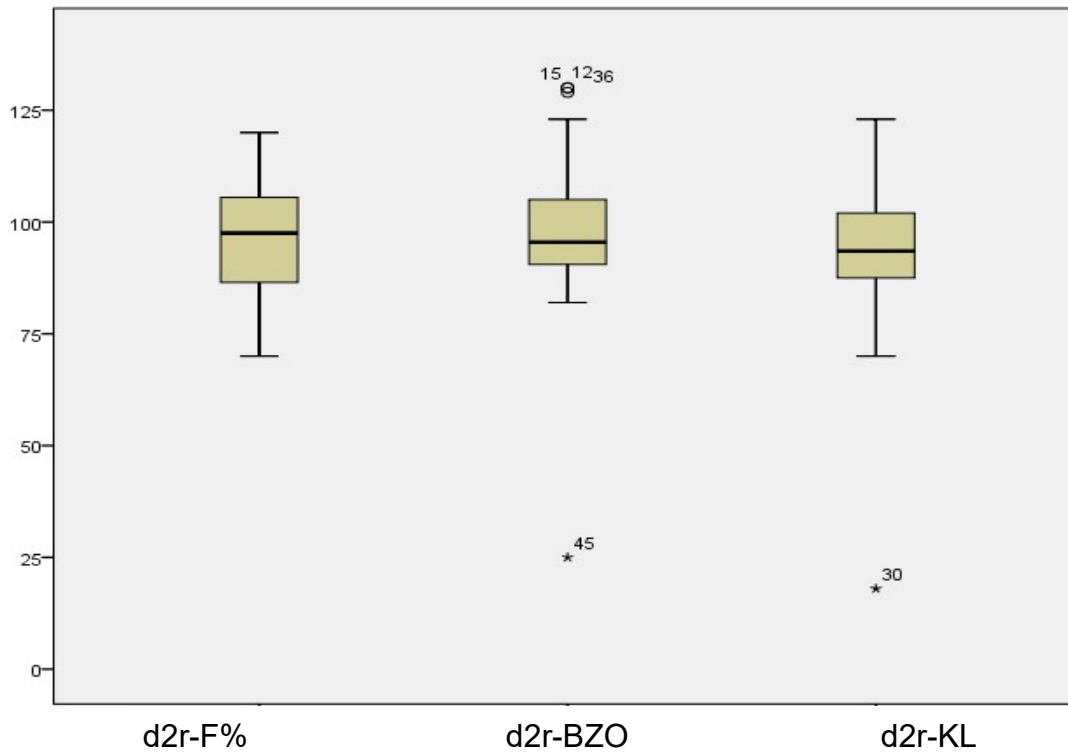
## WCST

CATEGORY SEQUENCE: C F N C F N

___ 1. CFNO	___ 17. CFNO	___ 33. CFNO	___ 49. CFNO
___ 2. CFNO	___ 18. CFNO	___ 34. CFNO	___ 50. CFNO
___ 3. CFNO	___ 19. CFNO	___ 35. CFNO	___ 51. CFNO
___ 4. CFNO	___ 20. CFNO	___ 36. CFNO	___ 52. CFNO
___ 5. CFNO	___ 21. CFNO	___ 37. CFNO	___ 53. CFNO
___ 6. CFNO	___ 22. CFNO	___ 38. CFNO	___ 54. CFNO
___ 7. CFNO	___ 23. CFNO	___ 39. CFNO	___ 55. CFNO
___ 8. CFNO	___ 24. CFNO	___ 40. CFNO	___ 56. CFNO
___ 9. CFNO	___ 25. CFNO	___ 41. CFNO	___ 57. CFNO
___ 10. CFNO	___ 26. CFNO	___ 42. CFNO	___ 58. CFNO
___ 11. CFNO	___ 27. CFNO	___ 43. CFNO	___ 59. CFNO
___ 12. CFNO	___ 28. CFNO	___ 44. CFNO	___ 60. CFNO
___ 13. CFNO	___ 29. CFNO	___ 45. CFNO	___ 61. CFNO
___ 14. CFNO	___ 30. CFNO	___ 46. CFNO	___ 62. CFNO
___ 15. CFNO	___ 31. CFNO	___ 47. CFNO	___ 63. CFNO
___ 16. CFNO	___ 32. CFNO	___ 48. CFNO	___ 64. CFNO

# 3. Results

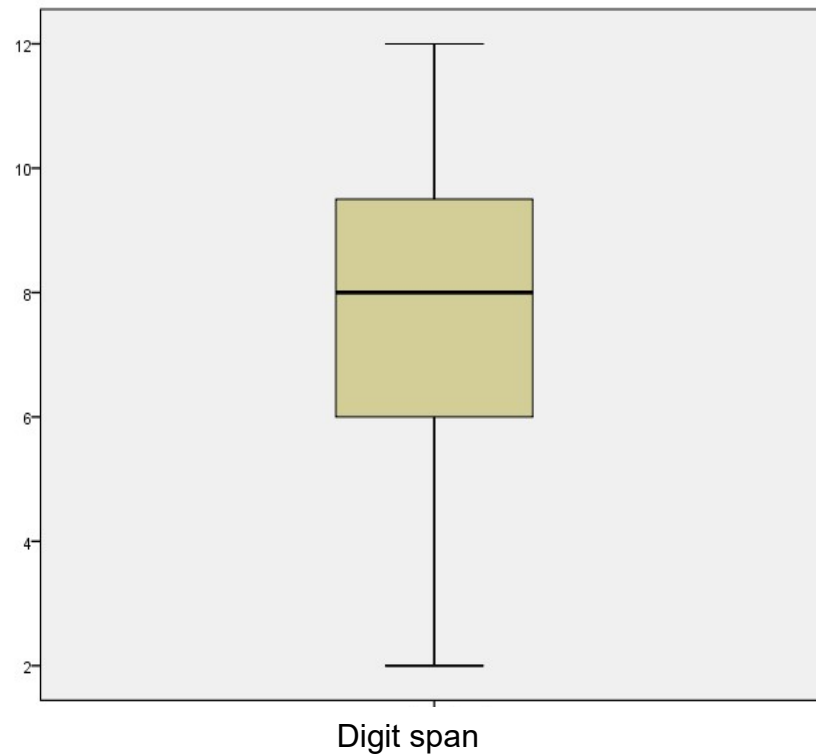
## d2-R



- Normal range: 85-115
- The median is <100
- Results of KL is significantly below the results of the healthy population yet within normal range

# 3. Results

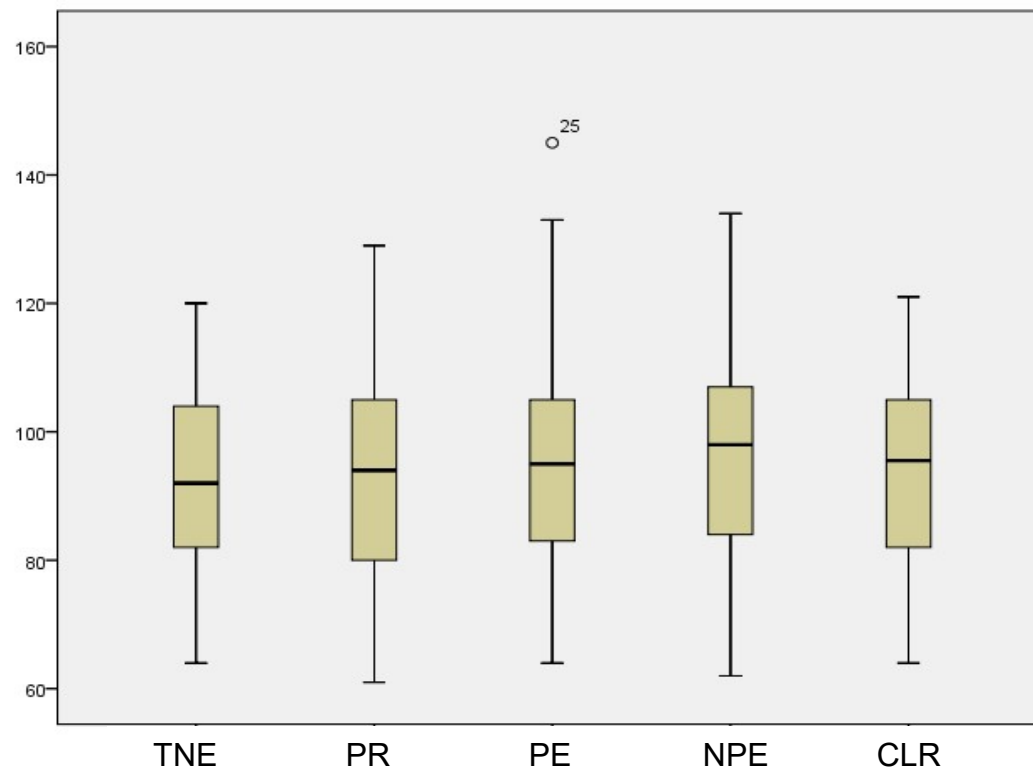
## Digit span



- Normal range: 7-13
- Median is <10
- Performance shows significantly below the normative population

# 3. Results

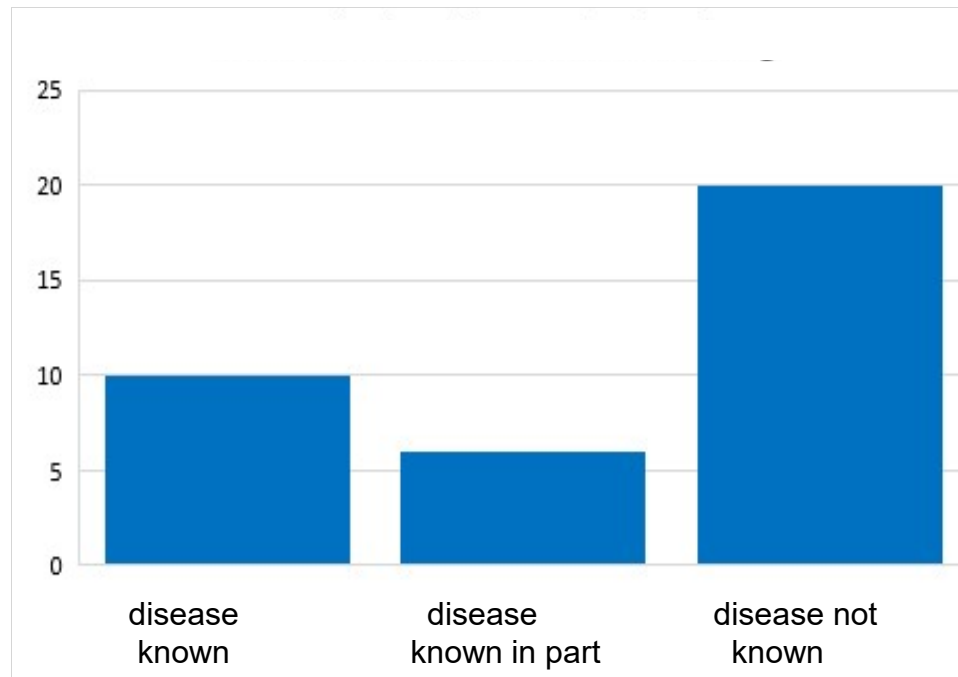
## WCST



- Normal range 91-107
- Median is <99
- TNE,CLR significant below the normal population yet within normal range

# 3. Results

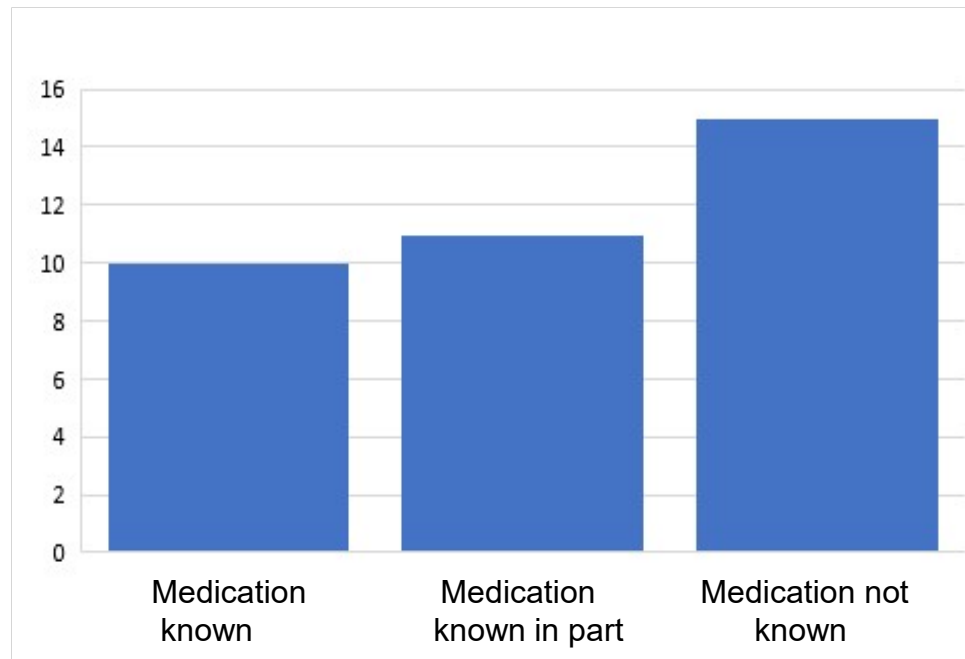
## Knowledge about the kidney disease



20 children and adolescent did not know anything about the kidney disease

# 3. Results

## Knowledge of the medication



15 children and adolescent did not know anything about their medication

## 4. Take Home

- In comparison to healthy children executive functions are reduced
- Duration of dialysis, age at dialysis/ transplantation and time period between transplantation and date of testing correlate with results
- Immunosuppression other than standard of care (i.e. CyA+Everolimus) seems to have a negative influence on cognitive functioning
- Maintenance steroids appear to have a negative influence on executive functioning
- Increasing number of antihypertensive medication and the number of Co-morbidities have correlate with poorer executive functioning
- Knowledge about disease and medication is below the expected level

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# Thank you for attention!

Are there any  
questions?