

Supplement:

1. Standard diagnostic workup performed for every patient:

- Blood workup: differential blood count, TPZ, INR, aPTT, thrombin time, fibrinogen, antithrombin-III, d-dimer, electrolytes, potassium, phosphate, creatinine, cystatin-C, urea, CK, CK-MB, troponin T, myoglobin, NT-pro BNP, transaminases, LDH, CRP, triglycerides, C3, C4, haptoglobin, IgA/M/G/E, blood sedimentation, blood gas analysis, Cortisol, TSH, fT4, SARS-CoV-2-IgG, 25-OH-vitamin D, vitamins B1, B6, and B12, folate and sprue diagnostics, ferritin, ANA, ANCA, Serotonine, Urinalysis: Status and Microscopy, 24-hour Cortisol levels in the Urin. - The laboratory diagnostics were expanded in a symptom-oriented manner.
- Standardized Apparative Diagnostics: Echocardiography, 12-Lead ECG, Long-term ECG, Long-term Blood Pressure Monitoring, Pulmonary Function Testing, Abdominal Ultrasound, Thyroid Ultrasound, EEG (Electroencephalography) if necessary: Nerve Conduction Velocity Testing, MRI of the Brain, Spine, or Heart, etc.
- And depending on symptoms consils with child and adolescentes psychiatrist, ENT, gynocology etc. were made

2. Questionnaires (all evaluated in studies before; those shown here are examples for age 7-12 years)

2.1 PedsQL (<https://www.pedsql.org>)

PARENT VERSION - Questionnaire on QUALITY OF LIFE AND FATIGUE -

PedsQLTM PedsQL (Visits 1-3) Version 4.0 - Short Form (SF15) – German (Germany)

Has your child had the following problems or difficulties in the PAST 4 WEEKS?

PROBLEMS WITH HEALTH AND ACTIVITIES

My child...

never Rarely sometimes often Almost always ...

had trouble walking more than 100 meters. 0 1 2 3 4 ...

had trouble running. 0 1 2 3 4 ...

had trouble participating in sports activities. 0 1 2 3 4 ...

had trouble lifting something heavy. 0 1 2 3 4 ...

had trouble doing household chores. 0 1 2 3 4

PROBLEMS WITH MOOD/EMOTIONS

My child...

never Rarely sometimes often Almost always ...

felt afraid. 0 1 2 3 4 ...

was sad. 0 1 2 3 4 ...

was angry. 0 1 2 3 4 ...

worried about what would happen to him/her. 0 1 2 3 4

PROBLEMS IN INTERACTIONS WITH OTHER YOUTH

never Rarely sometimes often Almost always ...

had trouble getting along with other children. 0 1 2 3 4 ...

had problems because other children did not want to be friends with him/her 0 1 2 3 4 ...

was teased by other children. 0 1 2 3 4

PROBLEMS AT SCHOOL

never Rarely sometimes often Almost always ...

had trouble paying attention in class. 0 1 2 3 4 ...

forgot things. 0 1 2 3 4 ...

had trouble completing schoolwork and tasks. 0 1 2 3 4

PROBLEMS WITH GENERAL FATIGUE

My child...

never Rarely sometimes often Almost always ...

felt tired. 0 1 2 3 4 ...

felt physically weak (not strong). 0 1 2 3 4 ...

felt too tired to do things they like. 0 1 2 3 4 ...

felt too tired to spend time with friends. 0 1 2 3 4 ...

had trouble finishing things they started. 0 1 2 3 4 ...

had trouble starting things. 0 1 2 3 4

PROBLEMS WITH FATIGUE / NEED FOR REST

My child...

never Rarely sometimes often Almost always ...

slept a lot. 0 1 2 3 4 ...

had trouble sleeping through the night. 0 1 2 3 4 ...

felt tired when they woke up in the morning. 0 1 2 3 4 ...

rested a lot. 0 1 2 3 4 ...

took many naps. 0 1 2 3 4 ...

spent a lot of time in bed. 0 1 2 3 4

PROBLEMS WITH MENTAL FATIGUE

My child...

never Rarely sometimes often Almost always ...

had trouble focusing on things. 0 1 2 3 4 ...

had trouble remembering what people told them. 0 1 2 3 4 ...

had trouble remembering things they just heard. 0 1 2 3 4 ...

had trouble thinking quickly. 0 1 2 3 4 ...

had trouble remembering what they just thought. 0 1 2 3 4 ...

had trouble remembering more than one thing at a time. 0 1 2 3 4

PATIENT VERSION – Quality of Life and Fatigue Questionnaire - PedsQL™ PedsQL

Version 4.0 - Short Form (SF15) – German (Germany) QUESTIONNAIRE for

ADOLESCENTS

In the past 4 WEEKS, did you experience the following problems or difficulties?

HEALTH AND ACTIVITY PROBLEMS

Never Almost Never Sometimes Often Almost Always

It was hard for me to walk more than 100 meters. 0 1 2 3 4

It was hard for me to run. 0 1 2 3 4

It was hard for me to participate in sports activities. 0 1 2 3 4

It was hard for me to lift something heavy. 0 1 2 3 4

It was hard for me to do household chores. 0 1 2 3 4

MOOD/FEELING PROBLEMS

Never Almost Never Sometimes Often Almost Always

I felt afraid. 0 1 2 3 4

I was sad. 0 1 2 3 4

I was angry. 0 1 2 3 4

I worried about what would happen to me. 0 1 2 3 4

PROBLEMS WITH OTHER ADOLESCENTS

Never Almost Never Sometimes Often Almost Always

I had trouble getting along with other kids. 0 1 2 3 4

Other kids didn't want to be friends with me. 0 1 2 3 4

Other kids teased me. 0 1 2 3 4

PROBLEMS AT SCHOOL

Never Almost Never Sometimes Often Almost Always

I had trouble paying attention in class. 0 1 2 3 4

I forgot things. 0 1 2 3 4

I had trouble completing schoolwork and tasks. 0 1 2 3 4

GENERAL EXHAUSTION PROBLEMS

Never Almost Never Sometimes Often Almost Always

I feel tired. 0 1 2 3 4

I feel physically weak (not strong). 0 1 2 3 4

I feel too tired to do things I like. 0 1 2 3 4

I feel too tired to spend time with friends. 0 1 2 3 4

I have trouble finishing things I start. 0 1 2 3 4

I have trouble starting things. 0 1 2 3 4

FATIGUE/NEED FOR REST PROBLEMS

Never Almost Never Sometimes Often Almost Always

I sleep a lot. 0 1 2 3 4

I have trouble sleeping through the night. 0 1 2 3 4

I feel tired when I wake up in the morning. 0 1 2 3 4

I rest a lot. 0 1 2 3 4

I take a lot of naps. 0 1 2 3 4

I spend a lot of time in bed. 0 1 2 3 4

MENTAL FATIGUE PROBLEMS

Never Almost Never Sometimes Often Almost Always

I have trouble keeping my attention focused. 0 1 2 3 4

I have trouble remembering what people tell me. 0 1 2 3 4

I have trouble remembering things I just heard. 0 1 2 3 4

I have trouble thinking quickly. 0 1 2 3 4

I have trouble remembering what I was just thinking. 0 1 2 3 4

I have trouble remembering more than one thing at a time. 0 1 2 3 4

3. Therapy Effect

PARENT VERSION – Questions on Therapy Effects (GEEE Current Effects)

Rief W, Nestoriuc Y, Mueller EM. Generic rating scale for previous treatment experiences, treatment expectations, and treatment effects (GEEE). PsychArchives 2021.doi:10.23668/psycharchives.4717)

In the following section, please describe any changes your child has experienced since participating in this study, based on your perception:

1. How much improvement in symptoms has your child experienced since then?
No improvement 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable improvement
2. How much worsening of symptoms has your child experienced since then?
No worsening 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable worsening
3. How many complaints/side effects from the treatment has your child experienced since then?
No complaints 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable complaints

PATIENT VERSION – Questions on Therapy Effects (GEEE Current Effects)

Rief W, Nestoriuc Y, Mueller EM. Generic rating scale for previous treatment experiences, treatment expectations, and treatment effects (GEEE). PsychArchives 2021.doi:10.23668/psycharchives.4717

In the following section, please describe any changes you have experienced since participating in this study:

1. How much improvement in symptoms have you experienced since then?
No improvement 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable improvement
2. How much worsening of symptoms have you experienced since then?
No worsening 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable worsening

3. How many complaints/side effects from the treatment have you experienced since then?

No complaints 0 1 2 3 4 5 6 7 8 9 10 Maximum imaginable complaints

4. Daily online Diary

To help us understand how you are feeling during the study, we ask you to fill out the first part daily and the second part after your training sessions.

Quality of Life and Resilience

Never Almost Never Sometimes Often Almost Always

It was hard for me to walk more than 100 meters. 0 1 2 3 4

I feel physically weak (not strong). 0 1 2 3 4

I need to rest a lot. 0 1 2 3 4

I have trouble concentrating. 0 1 2 3 4

If you felt good today, you don't need to answer this question. If you didn't feel well, list your top 3 symptoms. Please name the symptom that bothered you the most first.

Free text:

Other

I went to school today: Yes, No

How long did you go to school in hours:

Other (e.g., I was sick today): Free text

I had was physical active today: Yes No

What did you do: Free text

Do you want to tell us something: Free text

The flowering were only answered on exercise therapy days:

What did you like about the training session, and did you enjoy it? What didn't you like: Free text:

Do you feel that your symptoms have improved compared to the last training session: Free text:

Do you have any wishes for the next training session: Free text

Did you exercise independently between training sessions: Free text

If yes, how often and for how long? What did you do: Free text

Did you use an activity tracker: Yes, No

If No – Why: Free text

Entry by physical therapist on days of exercise therapy:

Were there any technical problems?

Was everyone on time?

Break times?

Unplanned events/incidents?

5. Further Results

Table 1: Impact of exercise therapy on quality of life and overall treatment effect, as well as physical testing

| | | | Group 1 - 12 weeks intervention group | | | | | | | | Group 2 - 6 weeks intervention group | | | | | | | |
|---|-----------|----------|---------------------------------------|----|----|-----|-----|----|-----|------------------|--------------------------------------|-----|-----|----|-----|----|-----|-------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Mean (CI) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Mean (CI) |
| | | | quality of life (score)* | | | | | | | | | | | | | | | |
| Problems with health and activities (5 items) | Visit I | parent | 40 | 30 | 35 | 85 | 60 | 30 | 70 | 50 (31.3-68.7) | 55 | 25 | 35 | 45 | 100 | 35 | 70 | 52.1 (28.3–76.0) |
| | | patient | 40 | 30 | 25 | 55 | 60 | 25 | 75 | 44.3 (27.1-61.5) | 50 | 95 | 65 | 38 | 100 | 21 | 54 | 60.4 (33.8–87.1) |
| | Visit II | parents | 70 | 55 | 45 | 100 | 80 | 40 | 60 | 64.3 (45.5-83.1) | 60 | 90 | 45 | 50 | 85 | 35 | - | 60.8 (37.5–84.2) |
| | | patients | 75 | 50 | 45 | 90 | 95 | 50 | 85 | 70.0 (51.7-88.3) | 63 | 100 | 42 | 56 | 54 | 17 | - | 55.3 (26.8–83.9) |
| | Visit III | parents | 80 | 35 | 65 | 100 | 90 | 65 | 80 | 73.6 (55.3-91.9) | 85 | 100 | 100 | 50 | 85 | 60 | 90 | 81.4 (63.6–99.3) |
| | | patient | 75 | 60 | 70 | 100 | 90 | 60 | 100 | 79.3 (61.3-97.3) | 100 | 100 | 100 | 58 | 79 | 50 | 100 | 83.9 (63.6–104.1) |
| | Visit IV | parent | 75 | 50 | 60 | 85 | 100 | 75 | - | 74.2 (55.8-92.3) | 50 | 100 | 85 | 30 | 100 | 55 | 100 | 74.3 (47.5–101.0) |
| | | patient | 75 | 40 | 35 | 90 | 95 | 60 | - | 65.8 (41.2-90.5) | 42 | 100 | 71 | 25 | 75 | 42 | 100 | 65.0 (37.7–92.3) |
| problems with mood and feelings (4 items) | Visit I | parent | 69 | 50 | 44 | 88 | 44 | 25 | 62 | 54.6 (35.2-74.0) | 100 | 38 | 75 | 19 | 81 | 44 | 44 | 57.3 (30.9–83.7) |
| | | patient | 56 | 50 | 50 | 69 | 25 | 25 | 69 | 49.1 (33.8-64.5) | 50 | 31 | 63 | 38 | 63 | 19 | 75 | 48.4 (29.9–67.0) |
| | Visit II | parents | 50 | 50 | 56 | 100 | 81 | 75 | 94 | 72.3 (55.1-89.5) | 94 | 50 | 94 | 25 | 75 | 44 | - | 63.7 (33.9–93.5) |
| | | patients | 69 | 88 | 56 | 75 | 38 | 75 | 81 | 68.9 (53.2-84.6) | 94 | 38 | 94 | 50 | 56 | 19 | - | 58.5 (26.7–90.3) |
| | Visit III | parents | 100 | 69 | 69 | 100 | 94 | 63 | 75 | 81.4 (67.3-95.6) | 100 | 100 | 100 | 44 | 81 | 31 | 81 | 76.7 (50.5–103.0) |
| | | patient | 94 | 63 | 56 | 75 | 38 | 75 | 94 | 70.7 (52.0-89.5) | 100 | 100 | 100 | 75 | 88 | 38 | 100 | 85.9 (64.5–107.3) |
| | Visit IV | parent | 69 | 69 | 63 | 75 | 100 | 56 | - | 72.0 (56.1-87.9) | 63 | 100 | 100 | 44 | 75 | 44 | 75 | 71.6 (50.1–93.0) |

| | | | | | | | | | | | | | | | | | | |
|---------------|-----------|----------|------------|-----------|-----------|------------|-----------|-----------|-----------|-------------------------|------------|------------|------------|-----------|------------|-----------|------------|--------------------------|
| | | patient | 88 | 75 | 56 | 75 | 56 | 50 | - | 66.7 (51.1-82.2) | 75 | 100 | 100 | 18 | 100 | 38 | 88 | 74.1 (43.3–105.0) |
| | Visit I | parent | 17 | 25 | 17 | 100 | 25 | 22 | 58 | 37.7 (9.2-66.3) | 25 | 25 | 33 | 17 | 58 | 25 | 42 | 32.1 (19.4–45.0) |
| | | patient | 42 | 8 | 17 | 100 | 17 | 17 | 58 | 37.0 (6.6-67.4) | 25 | 33 | 33 | 8 | 50 | 8 | 58 | 30.7 (13.0–48.4) |
| | Visit II | parents | 42 | 42 | 50 | 100 | 42 | 42 | 33 | 50.1 (29.3-71.0) | 25 | 42 | 33 | 17 | 67 | 0 | - | 30.7 (6.7–54.7) |
| Problems with | | patients | 67 | 50 | 50 | 100 | 33 | 67 | 67 | 62.0 (42.6-81.4) | 25 | 25 | 33 | 17 | 52 | 0 | - | 25.3 (7.3–43.4) |
| peers | Visit III | parents | 100 | 33 | 42 | 100 | 42 | 75 | 67 | 65.6 (39.9-91.3) | 100 | 100 | 100 | 50 | 50 | 17 | 100 | 73.9 (42.0–105.7) |
| (3 items) | | patient | 100 | 42 | 58 | 100 | 50 | 67 | 75 | 70.3 (49.1-91.5) | 100 | 100 | 83 | 67 | 83 | 17 | 100 | 78.6 (51.0–106.2) |
| | Visit IV | parent | 67 | 50 | 42 | 100 | 75 | 58 | - | 65.3 (43.7-87.0) | 42 | 100 | 100 | 25 | 67 | 17 | 100 | 64.4 (30.4–98.4) |
| | | patient | 67 | 33 | 42 | 100 | 67 | 58 | - | 61.2 (36.6-85.8) | 42 | 100 | 100 | 17 | 100 | 33 | 92 | 69.1 (35.1–103.2) |
| | Visit I | parent | 17 | 25 | 17 | 100 | 25 | 33 | 58 | 39.3 (11.3-67.2) | 25 | 25 | 33 | 17 | 58 | 25 | 42 | 48.4 (29.9–67.0) |
| | | patient | 42 | 8 | 17 | 100 | 17 | 17 | 58 | 37.0 (6.6-67.4) | 25 | 33 | 33 | 8 | 50 | 8 | 58 | 63.7 (33.9–93.5) |
| | Visit II | parents | 42 | 42 | 50 | 100 | 42 | 42 | 33 | 50.1 (29.3-71.0) | 25 | 42 | 33 | 17 | 67 | 0 | - | 58.5 (26.7–90.3) |
| Problems with | | patients | 67 | 50 | 50 | 100 | 33 | 67 | 67 | 62.0 (42.6-81.4) | 25 | 25 | 33 | 17 | 52 | 0 | - | 25.3 (7.3–43.4) |
| school (3 | Visit III | parents | 100 | 33 | 42 | 100 | 42 | 75 | 67 | 65.6 (39.9-91.3) | 100 | 100 | 100 | 50 | 50 | 17 | 100 | 73.9 (42.0–105.7) |
| items) | | patient | 100 | 42 | 58 | 100 | 50 | 67 | 75 | 70.3 (49.1-91.5) | 100 | 100 | 83 | 67 | 83 | 17 | 100 | 78.6 (51.0–106.2) |
| | Visit IV | Parent | 67 | 50 | 42 | 100 | 75 | 58 | - | 65.3 (43.7-87.0) | 42 | 100 | 100 | 25 | 67 | 17 | 100 | 64.4 (30.4–98.4) |
| | | Patient | 67 | 33 | 42 | 100 | 67 | 58 | - | 61.2 (36.6-85.8) | 42 | 100 | 100 | 17 | 100 | 33 | 92 | 69.1 (35.1–103.2) |
| | Visit I | Parent | 21 | 33 | 21 | 96 | 17 | 33 | 50 | 38.7 (13.2-64.3) | 75 | 29 | 50 | 25 | 83 | 29 | 21 | 44.6 (21.1–68.0) |
| | | Patients | 42 | 42 | 29 | 83 | 42 | 21 | 63 | 46.0 (26.7-65.3) | 83 | 46 | 42 | 42 | 58 | 13 | 71 | 50.7 (29.7–71.6) |
| Problems with | Visit II | parent | 67 | 46 | 38 | 92 | 67 | 50 | 50 | 58.6 (41.7-75.4) | 79 | 67 | 42 | 25 | 67 | 21 | - | 50.1 (24.7–75.7) |
| general | | patient | 58 | 54 | 42 | 92 | 46 | 63 | 71 | 60.9 (45.3-76.5) | 79 | 38 | 38 | 21 | 60 | 13 | - | 41.5 (15.8–67.2) |
| fatigue | Visit III | parents | 83 | 46 | 58 | 96 | 50 | 67 | 63 | 66.1 (49.6-82.7) | 88 | 96 | 67 | 50 | 96 | 25 | 83 | 72.1 (47.5–96.8) |
| (6 items) | | patients | 83 | 67 | 46 | 100 | 54 | 71 | 75 | 70.9 (54.3-87.5) | 88 | 96 | 83 | 50 | 91 | 25 | 100 | 76.1 (50.3–102.0) |
| | Visit IV | parent | 67 | 50 | 50 | 92 | 67 | 50 | - | 62.7 (45.2-80.1) | 46 | 100 | 71 | 25 | 83 | 25 | 83 | 61.9 (34.1–89.6) |

| | | | | | | | | | | | | | | | | | | |
|--|-----------|----------|-----|-----|-----|-----|-----|-----|------------------|---------------------|-----|-----|-----|-----|-----|-----|-------------------|---------------------|
| Problems with fatigue / need to rest (6 items) | Visit I | Patients | 71 | 50 | 25 | 88 | 79 | 42 | - | 59.2 (33.9-84.5) | 54 | 100 | 67 | 25 | 79 | 42 | 100 | 66.7 (40.3-93.1) |
| | | Parent | 42 | 58 | 25 | 92 | 46 | 38 | 33 | 47.7 (27.3-68.2) | 67 | 33 | 63 | 50 | 38 | 25 | 25 | 43.0 (27.0-59.0) |
| | | Patients | 29 | 25 | 33 | 75 | 71 | 29 | 42 | 43.4 (24.1-62.8) | 58 | 29 | 71 | 54 | 42 | 29 | 38 | 45.9 (31.3-60.4) |
| | Visit II | parent | 46 | 54 | 38 | 92 | 83 | 67 | 46 | 60.9 (42.0-79.8) | 58 | 33 | 75 | 46 | 50 | 33 | - | 49.2 (32.4-66.0) |
| | | patient | 71 | 42 | 21 | 88 | 79 | 33 | 79 | 59.0 (34.6-83.5) | 58 | 33 | 71 | 38 | 38 | 21 | - | 43.2 (24.1-62.2) |
| | Visit III | parents | 75 | 33 | 54 | 83 | 83 | 75 | 63 | 66.6 (49.8-83.4) | 79 | 67 | 92 | 50 | 50 | 38 | 75 | 25.3 (7.3-43.4) |
| | | patients | 75 | 50 | 54 | 96 | 79 | 50 | 88 | 70.3 (52.7-87.8) | 79 | 67 | 92 | 67 | 63 | 67 | 71 | 73.9 (42.0-105.7) |
| | Visit IV | parent | 58 | 50 | 38 | 71 | 75 | 54 | - | 57.7 (43.3-72.0) | 54 | 100 | 79 | 46 | 38 | 42 | 88 | 78.6 (51.0-106.2) |
| | | Patients | 54 | 33 | 25 | 83 | 92 | 25 | - | 52.0 (20.9-83.1) | 58 | 100 | 67 | 29 | 38 | 67 | 83 | 64.4 (30.4-98.4) |
| | Visit I | Parent | 42 | 50 | 21 | 100 | 17 | 50 | 54 | 47.7 (22.5-73.0) | 38 | 33 | 67 | 38 | 88 | 13 | 54 | 69.1 (35.1-103.2) |
| | | Patients | 33 | 38 | 38 | 100 | 54 | 33 | 63 | 51.3 (28.8-73.8) | 46 | 29 | 50 | 50 | 83 | 0 | 50 | 44.6 (21.1-68.0) |
| | Visit II | parent | 46 | 79 | 50 | 100 | 50 | 63 | 63 | 64.4 (46.6-82.3) | 63 | 75 | 63 | 50 | 63 | 33 | - | 50.7 (29.7-71.8) |
| | patient | 75 | 38 | 38 | 100 | 54 | 42 | 75 | 60.3 (38.3-82.2) | 79 | 38 | 71 | 67 | 88 | 0 | - | 50.2 (24.7-75.7) | |
| Problems with mental fatigue (6 items) | Visit III | parents | 67 | 46 | 63 | 100 | 63 | 67 | 75 | 68.7 (53.6-83.8) | 100 | 79 | 75 | 54 | 96 | 29 | 100 | 41.5 (15.8-67.2) |
| | | patients | 63 | 88 | 71 | 100 | 75 | 50 | 75 | 74.6 (59.6-89.6) | 100 | 92 | 88 | 100 | 100 | 33 | 96 | 72.1 (47.5-96.8) |
| Visit IV | parent | 67 | 63 | 50 | 100 | 96 | 63 | - | 73.2 (52.1-94.3) | 96 | 100 | 96 | 50 | 96 | 29 | 100 | 76.1 (50.3-102.0) | |
| | | Patients | 71 | 33 | 38 | 100 | 96 | 42 | - | 63.3 (31.9-94.8) | 63 | 100 | 92 | 50 | 83 | 17 | 100 | 61.9 (34.1-89.6) |
| Physical testing | | | | | | | | | | | | | | | | | | |
| 6-Minute-Walking-Test | | | | | | | | | | | | | | | | | | |
| | Visit I | | 500 | 242 | 404 | 357 | 599 | 334 | 336 | 396.0 (286.1-505.9) | 392 | 635 | 397 | 482 | 432 | 285 | 380 | 429.0 (328.6-529.5) |
| | Visit II | | 714 | 200 | 481 | 443 | 730 | 745 | 534 | 549.6 (366.0-733.1) | 392 | 587 | 383 | 586 | 570 | 386 | 480 | 483.4 (393.5-573.3) |
| | Visit III | | 894 | 423 | 585 | 587 | 763 | 369 | 878 | 642.7 (449.2-836.2) | 922 | 844 | 459 | 867 | 653 | 534 | 997 | 753.7 (563.5-943.9) |
| | Visit IV | | 632 | 216 | 383 | 979 | 661 | 623 | 820 | 616.3 (380.5-852.1) | 401 | 800 | 765 | 516 | 570 | 500 | 659 | 601.6 (466.4-736.8) |
| Sit-to-Stand | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|-----------|-----------|-------------|-------------|-------------|-------------|------------|-------------|-------------|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------------------|
| Hand-Grip | Visit I | 21 | 22 | 15 | 50 | 27 | 21 | 22 | 25.43 (14.9–35.96) | 17 | 34 | 30 | 25 | 15 | 9 | 21 | 21.6 (13.5–29.7) |
| | Visit II | 24 | 24 | 20 | 63 | 33 | 33 | 34 | 33.0 (19.8–46.3) | 17 | 37 | 34 | 24 | 17 | 11 | 20 | 22.9 (14.1–31.6) |
| | Visit III | 32 | 28 | 20 | 116 | 28 | 31 | 34 | 41.3 (10.5–72.0) | 23 | 48 | 44 | 34 | 32 | 32 | 49 | 37.4 (28.4–46.4) |
| | Visit IV | 24 | 24 | 14 | 76 | 34 | 22 | 34 | 32.6 (13.7–51.4) | 21 | 43 | 33 | - | 30 | 30 | 33 | 31.7 (24.2–39.1) |
| | Visit I | 13 | 8 | 15 | 22 | 31 | 11 | 16 | 16.6 (9.4–23.7) | 15 | 29 | 18 | 18 | 22 | 10 | 9 | 17.3 (10.9–23.7) |
| | Visit II | 31 | 13 | 31 | 22 | 37 | 17 | 26 | 25.3 (17.4–33.2) | 15 | 30 | 16 | 23 | 20 | 10 | 9 | 17.6 (10.7–24.4) |
| | Visit III | 43 | 16 | 31 | 24 | 32 | 21 | 29 | 28.0 (19.9–36.1) | 20 | 36 | 19 | 28 | 33 | 18 | 12 | 23.7 (15.6–31.8) |
| | Visit IV | 38 | 12 | 28 | 34 | 30 | 20 | 28 | 27.1 (19.1–35.2) | 19 | 34 | 19 | 23 | 28 | 17 | 15 | 22.1 (15.9–28.4) |
| VC (%) | Visit I | 4,26 | 2,66 | 2,24 | 2,98 | 2,24 | 2,78 | 3,67 | 3.0 (2.3–3.7) | 3,04 | 2,72 | 3,94 | 2,81 | 2,39 | 2,61 | 1,65 | 2.7 (2.1–3.4) |
| | Visit II | 4,3 | 3,29 | 3,89 | 2,98 | 3,2 | 2,29 | 3,54 | 3.4 (2.8–4.0) | 3,54 | 3,44 | 3,33 | 2,93 | 2,16 | 2,83 | - | 3.0 (2.5–3.6) |
| | Visit III | 4,42 | 3,29 | 3,89 | 2,98 | - | 2,39 | 3,44 | 3.4 (2.7–4.1) | 3,44 | - | 3,26 | 2,74 | 2,16 | 2,83 | 0,61 | 2.5 (1.4–3.6) |
| | Visit IV | 4,95 | 3,75 | 4,17 | 2,44 | - | 2,73 | 3,67 | 3.6 (2.7–4.6) | 3,44 | 4,78 | 2,88 | 2,93 | - | - | 1,61 | 3.1 (1.7–4.6) |
| CK (U/l) | Visit I | 186 | 101 | 136 | 119 | 89 | 146 | 112 | 127.0 (97.0–157.0) | 129 | 80 | 93 | 66 | 49 | 108 | 108 | 90.4 (65.0–115.9) |
| | Visit II | 214 | 132 | 133 | 284 | 103 | 222 | 152 | 177.1 (117.6–236.7) | 129 | 80 | 78 | 70 | 68 | 108 | 129 | 94.6 (69.7–119.5) |
| | Visit III | 175 | 198 | 160 | 107 | 92 | 114 | 111 | 136.7 (99.3–174.1) | 169 | 75 | 105 | 77 | 75 | 150 | 177 | 118.3 (75.8–160.8) |
| | Visit IV | 169 | 120 | 214 | 182 | 85 | 121 | 80 | 138.7 (91.8–185.7) | 124 | 75 | 93 | 55 | 60 | 43 | 101 | 78.7 (52.1–105.3) |

* mean value of visits from PedsQL (higher scores (100 the highest) indicate better HRQoL / health related quality of life); all values are rounded to a whole number, CI rounded to one numer after the point; bold vales are taken after exercise therapy

Table 2 Groups characteristics, impact of exercise therapy on participation in daily life and treatment effect

| | | | Group 1 - 12 weeks intervention group | | | | | | | Group 2 - 6 weeks intervention group | | | | | | |
|--------------------------|------------------|---------|---------------------------------------|----------|----------|----------|-----------|----------|-----------|---|-----------|----------|----------|----------|-----------|-----------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Treatment effect* | | | | | | | | | | | | | | | | |
| Improve-ment* | Visit II | parent | 4 | 4 | 3 | 0 | 5 | 5 | 6 | no values as there had been no intervention so far. | | | | | | |
| | | patient | 6 | 2 | 6 | 1 | 3 | 7 | 6 | | | | | | | |
| | Visit III | parent | 8 | 6 | 5 | 4 | 5 | 7 | 5 | 8 | 8 | 5 | 8 | 0 | 7 | 7 |
| | | patient | 8 | 8 | 7 | 8 | 7 | 9 | 9 | 9 | 10 | 8 | 6 | 5 | 8 | 10 |
| | Visit IV | parent | 8 | 6 | 6 | 1 | 10 | 7 | 10 | 6 | 10 | 8 | 2 | 1 | 10 | 9 |
| | | patient | 8 | 5 | 8 | 8 | 10 | 7 | 10 | 9 | 10 | 4 | 2 | 2 | 10 | 9 |
| | Deterio-ration * | parent | 0 | 0 | 0 | 0 | 0 | 0 | 2 | no values as there had been no intervention so far. | | | | | | |
| | | patient | 1 | 0 | 2 | 0 | 0 | 3 | 0 | | | | | | | |
| Deterio-ration * | Visit III | parent | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 |
| | | patient | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 4 | 0 | 0 | 1 |
| | Visit IV | parent | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| | | patient | 0 | 0 | 0 | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

* all values are rounded to a whole number, bold values are taken after exercise therapy – one being the lowest and 10 the highest score for improvement or deterioration

Table 3 Detailed Results of the Linear Mixed Effects Model

| Fixed Effects | 6MWT | | | | Handgrip | | | | Sit-to-Stand | | | | CK | | | |
|--------------------------------|---------------|------------|----------------|-------|---------------|------------|--------------|-------|---------------|------------|---------------|-------|---------------|------------|---------------|--------|
| | Estimates | std. Error | CI | p | Estimate | std. Error | CI | p | Estimate | std. Error | CI | p | Estimates | std. Error | CI | p |
| Group I (12 Weeks – Intercept) | 396.13 | 66.44 | 262.39 – 529.8 | <0.00 | 16.41 | 3.00 | 10.38 – 22.4 | <0.00 | 25.43 | 6.24 | 12.86 – 37.9 | <0.00 | 127.00 | 15.72 | 95.36 – 158.6 | <0.001 |
| Visit 2 | 153.37 | 76.05 | 0.29 – 306.45 | 0.050 | 8.73 | 1.89 | 4.93 – 12.53 | <0.00 | 7.57 | 4.36 | -1.20 – 16.35 | 0.089 | 50.14 | 16.95 | 16.02 – 84.27 | 0.005 |
| Visit 3 | 246.66 | 76.05 | 93.58 – 399.74 | 0.002 | 11.41 | 1.89 | 7.62 – 15.21 | <0.00 | 15.86 | 4.36 | 7.08 – 24.63 | 0.001 | 9.71 | 16.95 | - | 0.569 |
| Visit 4 | 220.13 | 76.05 | 67.05 – 373.21 | 0.006 | 9.27 | 1.89 | 5.47 – 13.07 | <0.00 | 7.14 | 4.36 | -1.63 – 15.92 | 0.108 | 11.71 | 16.95 | - | 0.493 |
| Group II (6 Weeks - Reference) | 32.87 | 93.96 | - | 0.728 | 0.94 | 4.24 | -7.59 – 9.48 | 0.825 | -3.86 | 8.83 | - | 0.664 | -36.57 | 22.23 | -81.31 – 8.17 | 0.107 |
| Visit 2 * Group (Reference: 6) | -99.10 | 107.55 | - | 0.362 | -8.51 | 2.67 | -13.89 – - | 0.003 | -6.29 | 6.16 | -18.69 – 6.12 | 0.313 | -46.00 | 23.98 | -94.26 – 2.26 | 0.061 |
| Visit 3 * Group (Reference: 6) | 78.06 | 107.55 | - | 0.472 | -5.09 | 2.67 | - | 0.063 | 0.00 | 6.16 | - | 1.000 | 18.14 | 23.98 | - | 0.453 |
| Visit 4 * Group (Reference: 6) | -47.66 | 107.55 | - | 0.660 | -4.61 | 2.67 | -9.99 – 0.76 | 0.090 | 4.75 | 6.16 | -7.66 – 17.16 | 0.445 | -23.43 | 23.98 | - | 0.334 |
| Random Effects | | | | | | | | | | | | | | | | |
| σ² | 20241.92 | | | | 12.46 | | | | 66.50 | | | | 1006.00 | | | |
| τ ₀₀ | 10657.85 | | | | 50.49 | | | | 206.30 | | | | 723.25 | | | |
| ICC | 0.34 | | | | 0.80 | | | | 0.76 | | | | 0.42 | | | |
| Model-level summary statistics | | | | | | | | | | | | | | | | |
| Marginal R² / Conditional R² | 0.290 / 0.535 | | | | 0.211 / 0.844 | | | | 0.139 / 0.790 | | | | 0.345 / 0.619 | | | |

σ^2 = residual (within-group) variance, τ_{00} = random intercept (between-group) variance, Intraclass Correlation Coefficient (between Group difference), N = number of patients,;

Marginal R² = variance explained by fixed effects only, Conditional R² = variance explained by fixed effects only

