Attachment 1: Supplemental material

Intervention details: For the intervention group, the first event took place at a dog training area of K-9 Suchhundezentrum. The participants were introduced to the crew and to each other. At first, the children/adolescents learned about dog's needs, behaviour and how to handle mantrailing dogs. Afterwards they were introduced to the dogs, could pet them and walk them on a leash. The second intervention took place in a quiet area, where the kids were instructed to prepare a trail, lead a man mantrailing dog, how to give a treat to the dog after work and how communication works between dogs and humans. In the third intervention for children, the focus was to learn how dogs show their emotions in different situations for example on a stand-up paddle on Ammersee. The next intervention took place in a high wire area, where the participants had to do the "flying fox" with the dog. The following intervention took place at Munich airport and the participants had the opportunity to work as a dog trainer. The next intervention took place in a forest with support from a local hunter. He showed the participants important features of forests, for example tracks from different animals. Intervention ten took place in a retirement home. In the following intervention, the participants were introduced to lead the dogs safe between the compounds of a zoo. The last intervention took place in the training area of K-9 Suchhundezentrum, where the participants received their certificate. The first two interventions of the adolescent group were the same as of children's. Thereafter, interventions of adolescents took place in former barracks, Munich's Hofgarten, and at Munich airport.

Attachment 1 to Kiesewetter J, Herbach N, Laudes I, Mayer J, Elgner V, Orle K, Grunow A, Langkau R, Gratzer C, Jansson AF. *Dog assisted education in children with rheumatic diseases and adolescents with chronic pain in Germany.* GMS J Med Educ. 2023;40(4):Doc44. DOI: 10.3205/zma001626

Supplementary 1: Clinical diagnoses of the participants

- File name: diagnoses.xlsx

- Title of data: Diagnose

- Description of data: Data is sorted by number of participants the diagnoses are entered using their ICD-10 number.

Children of the intervention group suffered from rheumatic disorders: juvenile idiopathic arthritis (JIA, n=6), chronic recurrent multifocal osteomyelitis (CRMO, n=4), Arthritis (n=3) and Dermatomyositis (n=1). Children of the control group showed JIA (11), CRMO (n=3) and Polyarthritis (n=2). The diseases of children were not necessarily associated with pain. Pain influences quality of life, and chronic pain syndromes are a challenge to treat - not only in rheumatic disorders. Therefore, adolescents suffering from chronic pain were recruited for the second group. The adolescents from the intervention group exhibited chronic pain syndrome (n=7), arthritis (n=1), JIA (n=2), and fibromyalgia (n=1), chronic diseases of the gastrointestinal tract (n=3), migraine (n=1), and some showed concurrent depression (n=2). Adolescents of the control group were diagnosed with chronic pain syndrome (n=7), JIA (n=3), chronic joint pain (n=1) and soft tissue rheumatism (n=1), as well as juvenile kyphosis (n=1) and juvenile osteoporosis (n=1).

Attachment 1 to Kiesewetter J, Herbach N, Laudes I, Mayer J, Elgner V, Orle K, Grunow A, Langkau R, Gratzer C, Jansson AF. *Dog assisted education in children with rheumatic diseases and adolescents with chronic pain in Germany.* GMS J Med Educ. 2023;40(4):Doc44. DOI: 10.3205/zma001626

Supplementary 2: methods for additional questionnaires

Overview: The German pain questionnaire for children, adolescents and parents (DSF-KJ) was implemented to analyse pain characteristics of the adolescent participants. The Visual Analogue Scale (VAS) is a self-assessment questionnaire to monitor pain and was implemented in children only. The Child Behavior Check list (CBCL/4-18) was implemented to characterize the adolescent participants with respect to pathological values for competences (activities, social, school) and syndromes (e.g anxious/depressed, somatic complaints). The Junior Temperament and Character Inventory (JTCI) was implemented in order to characterize overall personality of the adolescents. The Questionnaire on Emotional Regulation in Children and Adolescents (FEEL-KJ) served to analyze changes in adaptive and maladaptive strategies of adolescents over the time-course of the study, that could lead to better pain coping assessed by PPCI. The Strength and Difficulties Questionnaire (SDQ) and Depression Inventory for Children and Adolescents (DIKJ) was used to identify psychiatric disorders in children. In addition, we generated a questionnaire to identify external influences that might have an impact on intervention-outcome. The Coping Health Inventory for Parents (CHIP) was completed by parents of adolescents in order to test if pain coping improves due to the interventions. A questionnaire rating the subjective outcome of the interventions was completed by the adolescents as well.

DSF-KJ (German Pain Questionnaire for Children, Adolescents and parents)

- File name: dsf_15-18.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted in four cards: Patient info, pain quality, pain intensity and negative influence of pain on life.

The DSF-KJ was implemented to analyse pain characteristics. This questionnaire is a modular self-assessment tool for characterization of pain. The basic questionnaire includes 57 items regarding:

1. demographic data (seven items, e.g. age, sex, school-type, parents work)
2. pain characteristics (22 items, localization, frequency, duration, timely changes, intensity scale –numerical rating scale (NRS)- from 0-10, pain perception scale - (German: Schmerzempfindungsskala; SES)- and others) [10]. pain causing, alleviating and increasing conditions (six items)
3. medical records (nine items, e.g. former and to date treatment and medication, diagnosis, number of clinicians)
4. pain-associated disability (seven items, missed activities and school days, sum of the Paediatric Pain Disability Index, PPDI [11],
5. cognitive-emotional and behavioural consequences and subjective disease concept (six items, e.g. reaction of adolescents and parent in response to pain, expectations relating to pain coping and regarding being pain-free).

The DSF-KJ was answered by adolescents before and three months after starting the intervention as well as one week and six months after completion of the trial (Table 2).

VAS (Visual Analogue Scale)

- File name: VAS.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted in one card with patient idntifier, time point of measurement and pain frequency as dependent variable.

The VAS is a self-assessment questionnaire to monitor pain (‘yes/no’-decision), pain-frequency (three-step rating scale ’seldom’, ‘often’, ‘all the time’) and pain intensity (ten-step rating scale from none to intolerable). It was implemented in children (7-12 years) before, six months after beginning and one week after finishing the study.

CBCL/4-18 (Child Behaviour Check List)

- File name: cbcl_4-18.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted in two cards: Competences, showing the competences and their scores compared to mean scores and syndrome scales, showing how their disease is influencing their lives.

The CBCL/4-18 (Achenbach 1991) is a validated parental-assessment questionnaire, used to determine social competences and syndromes. It consists of two parts, the first determines competences, using three scales (activities, social and school) and seven items. The total competence Score comprises the sum of the three scale Scores. T-Scores below 37 are considered clinical.

The second part determines syndrome and problem scales for behavioural, emotional and somatic abnormalities, using 113 problem items for eight problem scales. Five of the eight scales are summed up as a measure of internalizing and externalizing problems. Internalizing problems consist of three scales: anxious/depressed, withdrawn and somatic complaints. Externalizing problems include the two dimensions, delinquent and aggressive behaviour. The other three scales, that don’t’ fit into the two subsets, are social, thought and attention problems. All items are summed up to create the total problem scale. Raw Scores are assigned to T-Scores.and syndrome Scores over 70 and externalizing, internalizing as well as total Scores over 63 are clinical.

The CBCL/4-18 test was answered by parents of the group of adolescents one week and six months after completing the study.

JTCI 12-18R (Junior Temperament and Character INovelty Seekingentory)

- File name: JTCI_12_18.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is in cards for the subscores and the first card as an aggregated score by the number of participant.

The JTCI 12-18R is an objective, reliable and validated self-assessment questionnaire, consisting of 103 items and is used to determine the overall personality (Goth and Schmeck 2009).

The JTCI 12-18R includes the four temperament scales novelty seeking, harm avoidance, reward dependence and persistence as well as the character scales: self-directedness, cooperativeness and self-transcendence. The temperament scales describe differences in virtual automatic emotional reactions and give information on personality styles. The character scales detect differences in central self-concepts and are an indicator of personal maturity. Temperament, according to Cloninger, the basis, character is what you make out of it and both contribute to the individuals' personality.

Scores of the different items are summed up to raw Scores and can be assigned to T-Scores. T-Scores below 40 are considered below average, and greater than 60 are above average.

The JTCI was implemented in adolescents before beginning and one week after completing the study.

FEEL-KJ (Questionnaire on Emotional Regulation in Children and Adolescents)

- File name: Feel.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is in cards for T-scores and the first card as an aggregated score by the number of participant.

The FEEL-KJ (Grob and Smolemski 2009) is a validated self-assessment scale, used to determine emotional regulation of fear, sadness and aggression in relation to the subjective well-being of a person. This test can be used to determine resource profiles, development of emotion regulation strategies of children, psychosocial competences, stress perception and coping as well as to measure progress during intervention programs. Adaptive and maladaptive strategies are calculated by summing up the respective scales and assigned to T-Scores. T-Scores lower than 40 (adaptive) and above 60 (maladaptive) denote inadequate use of emotion regulation strategies.

The FEEL test was filled out by adolescents before and 2 months after beginning the AAE and one week and six months after completing the study.

SDQ-D (Strengths and Difficulties Questionnaire, German)

- File name: SDQ.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group they belong two and score as well as aggregated score in the same card.

The SDQ can predict the presence of a psychiatric disorder with good specificity and moderate sensitivity (sdqinfo.org). The SDQ is an external assessment (parent or teacher) or a self-

assessment questionnaire (over the age of 11 years) that contains 25 items, comprising five scales of five items each. The three-step rating scale ranges from ‘not true’, ‘somewhat true’ and ‘certainly true’. Raw Scores for ‘not true’ and ‘certainly true’ vary with the item (0 or 2), ‘somewhat true’ is always Scored one. The Scores for the five scales range from 0 to 10. The total difficulties Score is calculated from four scales und consequently ranges from 0 to 40. Raw Scores above 16 are considered abnormal (Goodman 1997, Woerner, Becker et al. 2002, Goodman, Ford et al. 2004)

The SDQ was answered by parents of the younger age group before, six months after the beginning and two weeks after completion of the trial.

DIKJH was implemented to exclude children with major depression.

The DIKJ (Naab, Hauer et al. 2015) is a reliable and validated self-assessment tool to examine the degree of depression of children and adolescents. The DIKJ consists of 26 Items with a three-step scale: no/seldom, moderate/sometimes and severe/most times (0-3). Raw Scores above 17 are conspicuous of a certain degree of depression. The DIKJ was implemented in the younger age group before starting the study, six months after the beginning and two weeks after completion of the trial.

CHIP-D (Coping Health Inventory for Parents, German version)

- File name: Chip-D.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant on two card. The second card (Messwdh) shows the data of the other time points of measurement.

The CHIP is a consistent, reliable and validated self-assessment instrument to determine the ability of parents to cope with a chronic disease of their children and contains 45 items (MacCubbin 2001). The four-step rating scale ranges from 0=not, 1=minimally, 2=moderately

to 3=very helpful. The sum of all 45 items equals the total scale (CHIP-ALL). The three main subscales (dimensions) are

1. maintaining family integration, cooperation and optimistic view of the situation (19 items, CHIP-FAM)

2. maintaining social support, self-esteem and psychological stability (18 items, CHIP-SUP)

3. understanding the healthcare situation through communication with medical staff and other parents (eight items, CHIP-MED). The scale raw Scores are transformed into percentile ranks. The CHIP was implemented before and at the end of the intervention program.

External Influences

External influences on the intervention program were considered in the group of adolescents. One week and six months after completion of the trial, adolescents were asked for supportive instruments and positive or negative changes in their life.

One week after completion, three adolescents of the intervention and five of the control group profited from physiotherapy, gymnastics, sports, non-medical practitioners therapy and psychotherapy. Five kids from the intervention and three from the control group found support by new friends. Negative events were death of close persons (1 intervention, 1 control) and separation of the parents (1 control) or from the boyfriend (1 intervention). Three participants from the intervention group reported on problems in school.

Six months after completion of the AAP, four adolescents mentioned positive impact of physiotherapy and osteopathy on their disease. Positive incidents were mentioned by eight adolescents of the intervention group and six of the control group, e.g. finishing school, working or starting an apprenticeship and new friends. None of the girls mentioned problems in school or at work.

Rating of the Intervention Program

To determine the rating and the subjective outcome of the interventions, a questionnaire was developed by the eo ipso Strategie & Entwicklung GmbH (www.eo-ipso.com). The eo ipso questionnaire is a free text questionnaire for self-assessment and parental assessment of the intervention program. We determined overall rating (positive, negative) and effects on psyche and/or physical constitution as well as the influence on pain perception of adolescents. The parents were asked to describe changes of the child during the intervention program that they consider to be the result of the intervention, especially if there was an influence on pain. The eo ipso questionnaire was completed by adolescents after the last intervention.

Supplementary 3: Detailed statistical analyses of main parameters

Abbrevations

T, time point

T0, before starting the intervention program

T1-TX, one to x months after starting the program

T_final, last intervention

T6M, six months follow-up

PedsQl

- File name: PedsQL.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group one card. Last column represents the aggregated score.

Children (self-assessment)

Descriptive Statistics				
	Group	Mean	SD	N
SMEAN (PedsQL_C_t1)	Intervention	76.9179	16.03057	14
	Control	86.4475	9.16035	16
	Total	82.0003	13.49008	30
SMEAN (PedsQL_C_t2)	Intervention	85.9818	11.85440	14
	Control	90.7871	6.28607	16
	Total	88.5446	9.45403	30
SMEAN (PedsQL_C_t3)	Intervention	86.5714	11.22074	14
	Control	91.4418	6.83786	16
	Total	89.1689	9.31300	30
SMEAN (PedsQL_C_t4)	Intervention	88.8634	8.77118	14
	Control	92.5275	6.72325	16
	Total	90.8176	7.83100	30
SMEAN (PedsQL_C_t5)	Intervention	87.4348	8.90996	14
	Control	93.4044	6.72474	16
	Total	90.6186	8.25551	30
SMEAN (PedsQL_C_t6)	Intervention	92.4990	5.70701	14
	Control	91.7629	8.27568	16
	Total	92.1064	7.08266	30
SMEAN (PedsQL_C_t7)	Intervention	90.2958	9.46693	14
	Control	93.0919	6.58804	16
	Total	91.7870	8.03978	30
SMEAN (PedsQL_C_t8)	Intervention	89.8612	8.75641	14
	Control	91.9838	7.98614	16
	Total	90.9932	8.27770	30
SMEAN (PedsQL_C_t9)	Intervention	93.4293	4.81754	14
	Control	92.4481	7.86465	16
	Total	92.9060	6.53028	30
SMEAN (PedsQL_C_t10)	Intervention	90.0185	11.79506	14
	Control	93.7519	5.31697	16
	Total	92.0097	8.97646	30
SMEAN (PedsQL_C_t11)	Intervention	90.7993	10.15334	14
	Control	93.8856	6.74571	16
	Total	92.4453	8.49719	30
SMEAN (PedsQL_C_t12)	Intervention	89.0340	10.14511	14
	Control	93.2750	7.51237	16
	Total	91.2959	8.94203	30

Children Repeated measures ANOVA with group as between subjects variable

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
PedsQL_C	Greenhouse-Geisser	5.373	8.173	.000	.226	1.000
PedsQL_C * Group	Greenhouse-Geisser	5.373	1.784	.114	.060	.623
Error (PedsQL_C)	Greenhouse-Geisser	150.456				

Children parental-assessment

Descriptive Statistics				
	Group	Mean	SD	N
SMEAN (PedsQL_C_P_t1)	Intervention	77.8300	12.38876	14
	Control	83.1531	12.05677	16
	Total	80.6690	12.29987	30
SMEAN (PedsQL_C_P_t2)	Intervention	81.9396	11.63843	14
	Control	86.0170	8.38422	16
	Total	84.1142	10.06780	30
SMEAN (PedsQL_C_P_t3)	Intervention	81.0462	13.71659	14
	Control	86.7783	8.69802	16
	Total	84.1033	11.48620	30
SMEAN (PedsQL_C_P_t4)	Intervention	82.7265	10.85143	14
	Control	91.3400	7.97397	16
	Total	87.3203	10.23606	30
SMEAN (PedsQL_C_P_t5)	Intervention	85.0463	10.17073	14
	Control	89.4019	7.85419	16
	Total	87.3693	9.11941	30
SMEAN (PedsQL_C_P_t6)	Intervention	85.1590	8.13858	14
	Control	88.2463	10.89973	16
	Total	86.8055	9.67453	30
SMEAN (PedsQL_C_P_t7)	Intervention	85.3529	10.70834	14
	Control	86.5481	11.15561	16
	Total	85.9904	10.77685	30
SMEAN (PedsQL_C_P_t8)	Intervention	85.5398	10.71594	14
	Control	83.8594	11.21498	16
	Total	84.6436	10.82865	30

SMEAN (PedsQL_C_P_t9)	Intervention	89.3637	5.12947	14
	Control	86.4813	9.94524	16
	Total	87.8264	8.06804	30
SMEAN (PedsQL_C_P_t10)	Intervention	85.0936	10.75530	14
	Control	88.0194	9.98627	16
	Total	86.6540	10.27819	30
SMEAN (PedsQL_C_P_t11)	Intervention	86.8000	8.64195	14
	Control	88.6556	9.60704	16
	Total	87.7897	9.06114	30
SMEAN (PedsQL_C_P_t12)	Intervention	85.4443	11.49208	14
	Control	85.3938	11.18336	16
	Total	85.4173	11.13075	30

Children parental assessment Repeated measures ANOVA with group as between subjects variable

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
PedsQL_C_P	Greenhouse-Geisser	6.671	3.197	.004	.102	.939
PedsQL_C_P * Group	Greenhouse-Geisser	6.671	1.894	.076	.063	.727
Error (PedsQL_C_P)	Greenhouse-Geisser	186.788				

PPCI

- File name: PPCI.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group on each card. First card represents pain coping, second card social support, third card positive self-instruction, fourth card, dates of data acquisition.

Children

Descriptive Statistics

	Group	Mean	SD	N
PPCI T0	Intervention	26.7692	28.58074	13
	Control	22.2000	7.38918	15
	Total	24.3214	19.91845	28
PPCI T_final	Intervention	19.8462	6.26958	13
	Control	22.4667	8.30548	15
	Total	21.2500	7.41682	28

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
PPCI	Sphericity Assumed	1	.647	.429	.024	.121
PPCI * Group	Sphericity Assumed	1	.755	.393	.028	.133
Error (PPCI)	Sphericity Assumed	26				

Adolescents

Descriptive Statistics				
	Group	Mean	SD	N
Total PPCI T1	Intervention	2.9192	.53566	12
	Control	2.6850	.74112	12
	Total	2.8021	.64360	24
Total PPCI T_final	Intervention	2.6908	.76382	12
	Control	2.2917	.65217	12
	Total	2.4913	.72389	24
Total PPCI T6M follow-up	Intervention	2.7242	.69378	12
	Control	2.5508	.72818	12
	Total	2.6375	.70117	24

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Total	Sphericity Assumed	2	2.517	.092	.103	.478
Total * Group	Sphericity Assumed	2	.355	.703	.016	.103
Error (Total)	Sphericity Assumed	44				

Adolescents (self-assessment)

Descriptive Statistics				
	Group	Mean	SD	N
Total Score T1	Intervention	63.6000	15.01999	10
	Control	58.0000	20.21700	12
	Total	60.5455	17.85851	22
Total Score T2	Intervention	65.7000	15.42040	10
	Control	61.2500	19.93227	12
	Total	63.2727	17.75275	22
Total Score T3	Intervention	69.6000	16.90628	10
	Control	63.4167	17.33341	12
	Total	66.2273	17.02360	22
Total Score T4	Intervention	63.3000	16.65366	10
	Control	67.6667	21.01659	12
	Total	65.6818	18.84621	22
Total Score T5	Intervention	64.8000	13.79855	10
	Control	67.2500	19.67982	12
	Total	66.1364	16.91237	22
Total Score T6	Intervention	65.2000	15.38975	10
	Control	61.1667	20.45764	12
	Total	63.0000	18.02644	22
Total Score T6M follow-up	Intervention	67.9000	17.54011	10
	Control	77.4167	12.07144	12
	Total	73.0909	15.22188	22

Adolescents Repeated measures ANOVA with group as between subjects variable

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Total	Greenhouse-Geisser	2.873	2.013	.125	.091	.480
Total * Group	Greenhouse-Geisser	2.873	1.312	.280	.062	.325
Error (Total)	Greenhouse-Geisser	57.466				

Adolescents parental-assessment

Descriptive Statistics				
	Group	Mean	SD	N
Total Score T1	Parents Intervention	67.8333	13.61706	12
	Parents Control	55.2308	21.85236	13
	Total	61.2800	19.10611	25
Total Score T2	Parents Intervention	67.9167	12.83786	12
	Parents Control	58.1538	26.44758	13
	Total	62.8400	21.21454	25
Total Score T3	Parents Intervention	72.0000	12.14309	12
	Parents Control	57.2308	22.28659	13
	Total	64.3200	19.30397	25
Total Score T4	Parents Intervention	66.9167	21.72329	12
	Parents Control	65.6923	21.67712	13
	Total	66.2800	21.25151	25
Total Score T 5	Parents Intervention	73.6667	13.60036	12
	Parents Control	61.9231	20.97801	13
	Total	67.5600	18.45734	25
Total Score T6	Parents Intervention	69.6667	17.80364	12
	Parents Control	64.0769	20.38570	13
	Total	66.7600	19.00500	25

Adolescents parental assessment Repeated measures ANOVA with group as between subjects variable

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Total_Parents	Sphericity Assumed	5	1.180	.323	.049	.407
Total_Parents * Group	Sphericity Assumed	5	1.279	.278	.053	.440
Error (Total_Parents)	Sphericity Assumed	115				

STAIC-S (children)

- File name: STAIState.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group. Data is presented for each point of measurement.

Descriptive Statistics				
	Before-After	Mean	SD	N
SMEAN (STAIC_S_t1_v)	Before	29.3077	5.63485	14
	After	27.2308	4.38799	14
	Total	28.2692	5.06722	28
SMEAN (STAIC_S_t2_v)	Before	26.3636	2.83583	14
	After	26.5385	3.81526	14
	Total	26.4510	3.29978	28
SMEAN (STAIC_S_t3_v)	Before	25.3077	2.69999	14
	After	24.5385	3.24903	14
	Total	24.9231	2.95736	28
SMEAN (STAIC_S_t4_v)	Before	26.0000	4.18789	14
	After	24.3846	3.85384	14
	Total	25.1923	4.03385	28
SMEAN (STAIC_S_t5_v)	Before	26.5000	4.64923	14
	After	25.4167	3.77152	14
	Total	25.9583	4.19052	28
SMEAN (STAIC_S_t6_v)	Before	25.8462	4.25795	14
	After	24.7692	3.76530	14
	Total	25.3077	3.98199	28
SMEAN (STAIC_S_t7_v)	Before	26.8182	3.13340	14
	After	27.5455	4.54657	14
	Total	27.1818	3.84932	28
SMEAN (STAIC_S_t8_v)	Before	25.5000	3.15009	14
	After	25.4167	3.81209	14
	Total	25.4583	3.43169	28
SMEAN (STAIC_S_t9_v)	Before	26.1111	4.32247	14
	After	25.1111	2.33516	14
	Total	25.6111	3.44683	28

SMEAN (STAIC_S_t10_v)	Before	26.5000	5.18504	14
	After	25.9286	4.51432	14
	Total	26.2143	4.77925	28
SMEAN (STAIC_S_t11_v)	Before	26.6429	5.85212	14
	After	25.8571	4.81755	14
	Total	26.2500	5.27485	28
SMEAN (STAIC_S_t12_v)	Before	25.5000	4.30116	14
	After	23.5000	3.14398	14
	Total	24.5000	3.83454	28

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
STAIC	Greenhouse-Geisser	5.455	3.018	.010	.104	.876
STAIC * Pre_Post	Greenhouse-Geisser	5.455	.496	.794	.019	.188
Error (STAIC)	Greenhouse-Geisser	141.839				

STAI-S (adolescents)

Descriptive Statistics				
	Before After	Mean	SD	N
T1	Before	40.75	9.401	12
	After	28.92	3.753	12
	Total	34.83	9.249	24
T2	Before	36.33	4.334	12
	After	28.50	6.360	12
	Total	32.42	6.659	24
T3	Before	39.25	7.187	12
	After	31.92	4.400	12
	Total	35.58	6.928	24
T4	Before	37.83	8.222	12
	After	31.92	3.343	12
	Total	34.88	6.842	24
T5	Before	42.75	7.313	12
	After	29.83	5.289	12
	Total	36.29	9.082	24
T6	Before	44.08	8.393	12
	After	31.67	6.415	12
	Total	37.88	9.674	24

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
STAI	Greenhouse-Geisser	2.926	2.283	.089	.094	.544
STAI * Before_After	Greenhouse-Geisser	2.926	1.589	.202	.067	.394
Error (STAI)	Greenhouse-Geisser	64.379				

Statistics for Paired Samples					
		Mean	N	SD	Standard Error of Means
Pair 1	T1 Before	40.75	12	9.401	2.714
	T1 After	28.92	12	3.753	1.083
Pair 2	T2 Before	36.33	12	4.334	1.251
	T2 After	28.50	12	6.360	1.836
Pair 3	T3 Before	39.25	12	7.187	2.075
	T3 After	31.92	12	4.400	1.270
Pair 4	T4 Before	37.83	12	8.222	2.374
	T4 After	31.92	12	3.343	.965
Pair 5	T 5 Before	42.75	12	7.313	2.111
	T 5 After	29.83	12	5.289	1.527
Pair 6	T 6 Before	44.08	12	8.393	2.423
	T 6 After	31.67	12	6.415	1.852

Correlations for Paired Samples				
		N	Correlation	Significance
Pair 1	T 1 Before - After	12	.056	.863
Pair 2	T 2 Before - After	12	.475	.119
Pair 3	T 3 Before - After	12	.297	.349
Pair 4	T 4 Before - After	12	-.477	.117
Pair 5	T 5 Before - After	12	-.043	.893
Pair 6	T 6 Before - After	12	.441	.151

Test for Paired Samples									
		Paired Differences							
					95% confidence interval for difference				
		Mean	SD	Standard Error of Means	Lower	Upper	T	df	Sig. (2-tailed)
Pair 1	T 1 Before - After	11.833	9.925	2.865	5.527	18.140	4.130	11	.002
Pair 2	T 2 Before - After	7.833	5.750	1.660	4.180	11.487	4.719	11	.001
Pair 3	T 3 Before - After	7.333	7.228	2.087	2.741	11.926	3.515	11	.005
Pair 4	T 4 Before - After	5.917	10.247	2.958	-.594	12.427	2.000	11	.071
Pair 5	T 5 Before - After	12.917	9.209	2.658	7.065	18.768	4.859	11	.001
Pair 6	T 6 Before - After	12.417	8.005	2.311	7.330	17.503	5.373	11	.000

Attachment 1 to Kiesewetter J, Herbach N, Laudes I, Mayer J, Elgner V, Orle K, Grunow A, Langkau R, Gratzer C, Jansson AF. *Dog assisted education in children with rheumatic diseases and adolescents with chronic pain in Germany.* GMS J Med Educ. 2023;40(4):Doc44. DOI: 10.3205/zma001626

Descriptive Statistics			
	Mean	SD	N
T 1 Before	40.75	9.401	12
T 2 Before	36.33	4.334	12
T 3 Before	39.25	7.187	12
T 4 Before	37.83	8.222	12
T 5 Before	42.75	7.313	12
T 6 Before	44.08	8.393	12

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Vor_SMEAM	Greenhouse-Geisser	2.575	2.025	.140	.155	.432
Error (Vor_SMEAM)	Greenhouse-Geisser	28.321				

Descriptive Statistics			
	Mean	SD	N
T 1 After	28.92	3.753	12
T 2 After	28.50	6.360	12
T 3 After	31.92	4.400	12
T 4 After	31.92	3.343	12
T 5 After	29.83	5.289	12
T 6 After	31.67	6.415	12

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Nach_SMEAM	Sphericity Assumed	5	1.676	.156	.132	.539
Error (Nach_SMEAM)	Sphericity Assumed	55				

Descriptive Statistics			
	Mean	SD	N
Difference T 1	11.833	9.9255	12
Difference T 2	7.833	5.7498	12
Difference T 3	7.333	7.2279	12
Difference T 4	5.917	10.2466	12
Difference T 5	12.917	9.2093	12
Difference T 6	12.417	8.0052	12

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Diff_SMEAM	Sphericity Assumed	5	2.062	.084	.158	.642
Error (Diff_SMEAM)	Sphericity Assumed	55				

STAIC-T Trait anxiety

- File name: STAITrait.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group. Data is presented for the two points of measurement.

Descriptive Statistics				
	Group	Mean	SD	N
STAIC_T_T0	Intervention	32.00	7.328	14
	Control	29.88	7.070	16
	Total	30.87	7.147	30
STAIC_T_T13	Intervention	30.43	6.465	14
	Control	26.56	5.597	16
	Total	28.37	6.228	30

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
STAIC_T	Sphericity Assumed	1	3.442	.074	.109	.433
STAIC_T * Group	Sphericity Assumed	1	.437	.514	.015	.098
Error (STAIC_T)	Sphericity Assumed	28				

Supplementary 4: results of additional questionnaires

Summary of additional questionnaire results:

Briefly, externalizing, internalizing and total scores of the Child Behaviour Check list (CBCL/4-18) decreased within the period investigated. In the intervention group externalizing and total scores decreased significantly until the end of the study. In the control group, externalizing and internalizing scores were significantly lower at 6 months follow-up. Over all participants and time points, the frequencies of clinical scores were high for somatic complaints (49%) and internalizing (32%) behaviour. Withdrawal (23%), total syndrome scale scores (18%) and anxious/depressed (16%) scores were less often clinical. Clinical scores for delinquent, externalizing, aggressive, thought and attention problems were rarely noted (1-7%).

Scores of the Junior Temperament and Character Inventory did not change during the study period and there were no differences between groups. However, about 40% of the participants showed reduced self-directedness (T values < 40), which implicates reduced personal maturity of adolescents with chronic pain, participating in the study. Reduced self-directedness typifies an "insecure-ineffective" style, which is characterized by e.g. helplessness, dissatisfaction and aimlessness.

Nearly half of the adolescents of the intervention and control group showed conspicuously altered temperament scales, i.e. decreased novelty seeking, which characterizes "stoic-dispassionate" personality style and increased harm avoidance, typical of a "cautious-anxious" personality style (e.g. pessimistic, doubtful, insecure, weak, shy). The combination of low novelty seeking, and high harm avoidance characterize the second order temperament type "ridged-introverted" which was evident in seven adolescents before starting and six adolescents after completion of the study.

The questionnaire on Emotional Regulation in Children and Adolescents (FEEL) did not change in the period studied and there were no differences between groups. About 40% of the adolescents with chronic pain use adaptive emotion regulation strategies to promote well-being less often than the normative sample (total adaptive strategies T-scores below 40), over 50% show below average scores for distraction, problem solving and acceptance scales. Around 50% of the adolescents participating in this study used emotion regulation strategies that are disadvantageous to well-being (total maladaptive regulation T-scores above 60). Most remarkable is the above average scores for social withdrawal and rumination.

CBCL/4-18 (Child Behaviour Check List)

- File name: cbcl_4-18.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted in two cards: Competences, showing the competences and their scores compared to mean scores and syndrome scales, showing how their disease is influencing their lives.

The CBCL/4-18 was filled out by parents of the adolescence group one week after completion of the intervention and at 26 weeks follow up.

There were no significant changes of the different competence Scores with time, but the interaction time and group of the total competence Score was borderline significant (p=0.054). The total competence Scores of the intervention group decreased slightly and those of the control group increased by tendency from the end of the study to 26 weeks follow up. Competence Scores of the intervention and control group did not differ.

The internalizing, externalizing and total Scores of the syndrome scales changed with time (p=0.02, F(,)= eta2=0.222) but the interaction of time and group was not significant. Over all participants, the three main Scores were lower at 26 weeks follow up than one week after the study.

Descriptive Statistics				
	Group	Mean	SD	N
Total Competence Score T0	Intervention	61.57	11.984	7
	Control	52.50	16.887	10
	Total	56.24	15.344	17
Total Competence Score T_final	Intervention	56.14	12.890	7
	Control	51.20	11.163	10
	Total	53.24	11.777	17
Total Competence Score T6M follow-up	Intervention	53.43	14.293	7
	Control	57.10	12.206	10
	Total	55.59	12.802	17

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Total	Greenhouse-Geisser	1.399	1.006	.356	.063	.178
Total * Group	Greenhouse-Geisser	1.399	3.754	.054	.200	.530
Error (Total)	Greenhouse-Geisser	20.986				

Descriptive Statistics				
	Group	Mean	SD	N
Total Syndrome Score T_final	Intervention	63.83	8.526	12
	Control	58.92	11.285	12
	Total	61.38	10.099	24
Total Syndrome Score T6M Follow-up	Intervention	59.92	9.624	12
	Control	55.17	14.038	12
	Total	57.54	12.018	24

Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Total Syndrome Score	Sphericity Assumed	1	6.281	.020	.222	.669
Total Syndrome * Group	Sphericity Assumed	1	.003	.957	.000	.050
Error (Total Syndrome Score)	Sphericity Assumed	22				

JTCI (Junior Temperament and Character Inventory)

- File name: JTCI_12_18.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is in cards for the subscores and the first card as an aggregated score by the number of participant.

The JTCI was filled out by adolescents before and one week after completion of the program. The intervention program had no impact on the adolescents' temperament and character styles. Repeated measures ANOVA did not reveal significant changes of the seven scales of both groups over time.

Descriptive Statistics

	Group	Mean	SD	N
Novelty seeking T0	Intervention	40.25	8.137	12
	Control	40.31	9.340	13
	Total	40.28	8.600	25
Novelty seeking T_final	Intervention	41.33	8.489	12
	Control	54.23	15.611	13
	Total	48.04	14.076	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Novelty seeking	Greenhouse-Geisser	1.000	5.900	.023	.204	.643
Novelty seeking * Group	Greenhouse-Geisser	1.000	4.319	.049	.158	.512
Error (Novelty seeking)	Greenhouse-Geisser	23.000				

Descriptive Statistics				
	Group	Mean	SD	N
Harm Avoidance T0	Intervention	59.75	9.097	12
	Control	53.38	16.251	13
	Total	56.44	13.435	25
Harm Avoidance T_final	Intervention	59.67	10.688	12
	Control	47.54	16.616	13
	Total	53.36	15.121	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Harm Avoidance	Greenhouse-Geisser	1.000	.606	.444	.026	.116
Harm Avoidance * Group	Greenhouse-Geisser	1.000	.573	.457	.024	.112
Error (Harm Avoidance)	Greenhouse-Geisser	23.000				

Descriptive Statistics				
	Group	Mean	SD	N
Persistence T0	Intervention	52.25	7.375	12
	Control	45.62	15.735	13
	Total	48.80	12.656	25
Persistence T_final	Intervention	52.17	8.451	12
	Control	47.23	9.418	13
	Total	49.60	9.133	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Persistence	Greenhouse-Geisser	1.000	.055	.817	.002	.056
Persistence * Group	Greenhouse-Geisser	1.000	.068	.797	.003	.057
Error (Persistence)	Greenhouse-Geisser	23.000				

Descriptive Statistics				
	Group	Mean	SD	N
Cooperativeness T0	Intervention	57.33	6.184	12
	Control	55.77	10.910	13
	Total	56.52	8.813	25
Cooperativeness T_final	Cooperativeness	56.00	8.135	12
	Control	48.23	15.178	13
	Total	51.96	12.697	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Cooperativeness	Greenhouse-Geisser	1.000	1.776	.196	.072	.248
Cooperativeness * Group	Greenhouse-Geisser	1.000	.869	.361	.036	.145
Error (Cooperativeness)	Greenhouse-Geisser	23.000				

Descriptive Statistics				
	Group	Mean	SD	N
Self Directedness T0	Intervention	41.42	11.501	12
	Control	43.62	14.086	13
	Total	42.56	12.692	25
Self Directedness T_final	Intervention	40.00	13.287	12
	Control	48.62	10.071	13
	Total	44.48	12.285	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Self Directedness	Sphericity Assumed	1	.392	.537	.017	.092
Self Directedness * Group	Sphericity Assumed	1	1.258	.274	.052	.189
Error (Self Directedness)	Sphericity Assumed	23				

Descriptive Statistics				
	Group	Mean	SD	N
Self Transcendence T0	Intervention	54.00	11.290	12
	Control	47.77	16.037	13
	Total	50.76	14.039	25
Self Transcendence T_final	Intervention	50.67	10.120	12
	Control	58.38	12.339	13
	Total	54.68	11.771	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Self Transcendence	Sphericity Assumed	1	1.694	.206	.069	.239
Self Transcendence * Group	Sphericity Assumed	1	6.217	.020	.213	.666
Error (Self Transcendence)	Sphericity Assumed	23				

Descriptive Statistics				
	Group	Mean	SD	N
Reward Dependence T0	Intervention	49.17	10.116	12
	Control	48.00	15.050	13
	Total	48.56	12.669	25
Reward Dependence T_final	Intervention	50.00	12.606	12
	Control	46.46	14.892	13
	Total	48.16	13.674	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Reward Dependence	Sphericity Assumed	1	.018	.894	.001	.052
Reward Dependence * Group	Sphericity Assumed	1	.206	.654	.009	.072
Error (Reward Dependence)	Sphericity Assumed	23				

FEEL-KJ (Questionnaire on Emotional Regulation in Children and Adolescents)

- File name: Feel.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is in cards for T-scores and the first card as an aggregated score by the number of participant.

The FEEL-KJ was answered by adolescents before the beginning of the study, two months after starting as well as one and 26 weeks after completion of the intervention program. There were no statistically significant differences between control and intervention groups at the four time-points. Repeated measures ANOVA did not reveal significant time-dependent changes for emotion regulation strategies of the intervention or control group.

Descriptive Statistics

	Group	Mean	SD	N
Adaptive Strategies Total T0	Intervention	41.83	10.573	12
	Control	41.77	13.516	13
	Total	41.80	11.941	25
Adaptive Strategies Total T3	Intervention	60.92	13.548	12
	Control	58.92	17.231	13
	Total	59.88	15.284	25
Adaptive Strategies Total T_final	Intervention	39.25	10.411	12
	Control	41.31	13.542	13
	Total	40.32	11.936	25
Adaptive Strategies Total T6M follow-up	Intervention	40.58	9.346	12
	Control	45.77	13.893	13
	Total	43.28	11.981	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Adaptive Strategies Total	Greenhouse-Geisser	1.268	13.463	.000	.369	.971
Adaptive Strategies Total * Group	Greenhouse-Geisser	1.268	.379	.592	.016	.096
Error (Adaptive Strategies Total)	Greenhouse-Geisser	29.164				

Descriptive Statistics				
	Group	Mean	SD	N
Maladaptive Strategies. Total T0	Intervention	60.92	13.548	12
	Control	58.92	17.231	13
	Total	59.88	15.284	25
Maladaptive Strategies. Total T3	Intervention	59.00	13.045	12
	Control	59.15	17.497	13
	Total	59.08	15.201	25
Maladaptive Strategies. Total T_final	Intervention	62.75	10.964	12
	Control	60.77	14.208	13
	Total	61.72	12.532	25
Maladaptive Strategies. Total T6M follow-up	Intervention	59.25	15.028	12
	Control	55.08	12.977	13
	Total	57.08	13.865	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Maladaptive Strategies Total	Sphericity Assumed	3	2.070	.112	.083	.508
Maladaptive Strategies Total * Group	Sphericity Assumed	3	.444	.723	.019	.135
Error (Maladaptive Strategies Total)	Sphericity Assumed	69				

Descriptive Statistics				
	Group	Mean	SD	N
Maladaptive Strategies. Anger. T0	Intervention	59.50	13.879	12
	Control	60.31	16.276	13
	Total	59.92	14.863	25
Maladaptive Strategies. Anger. T3	Intervention	59.33	13.839	12
	Control	59.85	14.194	13
	Total	59.60	13.733	25
Maladaptive Strategies. Anger. T_final	Intervention	61.00	10.694	12
	Control	60.15	10.049	13
	Total	60.56	10.153	25
Maladaptive Strategies. Anger. T6M follow-up	Intervention	57.33	16.053	12
	Control	53.15	14.053	13
	Total	55.16	14.879	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Maladaptive Strategies. Anger	Sphericity Assumed	3	2.230	.092	.088	.542
Maladaptive Strategies Anger * Group	Sphericity Assumed	3	.495	.687	.021	.146
Error (Maladaptive Strategies Anger)	Sphericity Assumed	69				

Descriptive Statistics				
	Group	Mean	SD	N
Maladaptive Strategies. Anxiety T0	Intervention	60.50	12.703	12
	Control	56.31	18.553	13
	Total	58.32	15.832	25
Maladaptive Strategies. Anxiety T3	Intervention	54.00	13.987	12
	Control	54.77	18.842	13
	Total	54.40	16.350	25
Maladaptive Strategies. Anxiety T_final	Intervention	61.25	12.084	12
	Control	58.15	17.530	13
	Total	59.64	14.936	25
Maladaptive Strategies. Anxiety T6M follow-up	Intervention	57.58	15.524	12
	Control	51.31	13.756	13
	Total	54.32	14.673	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Adaptive Strategies. Anxiety	Sphericity Assumed	3	2.890	.042	.112	.666
Adaptive Strategies. Anxiety * Group	Sphericity Assumed	3	.847	.473	.036	.225
Error (Adaptive Strategies. Anxiety)	Sphericity Assumed	69				

Descriptive Statistics				
	Group	Mean	SD	N
Maladaptive Strategies. Sadness T0	Intervention	60.00	10.514	12
	Control	57.46	15.634	13
	Total	58.68	13.212	25
Maladaptive Strategies. Sadness T3	Intervention	59.42	11.469	12
	Control	58.62	16.711	13
	Total	59.00	14.145	25
Maladaptive Strategies. Sadness T_final	Intervention	60.92	11.373	12
	Control	59.23	12.969	13
	Total	60.04	12.005	25
Maladaptive Strategies. Sadness T6M follow-up	Intervention	57.92	15.894	12
	Control	57.15	13.795	13
	Total	57.52	14.529	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Maladaptive Strategies Sadness	Sphericity Assumed	3	.424	.736	.018	.131
Maladaptive Strategies Sadness * Group	Sphericity Assumed	3	.069	.976	.003	.062
Error (Maladaptive Strategies Sadness)	Sphericity Assumed	69				

Descriptive Statistics				
	Group	Mean	SD	N
Adaptive Strategies Sadness T0	Intervention	44.00	10.804	12
	Control	42.23	13.633	13
	Total	43.08	12.134	25
Adaptive Strategies Sadness T3	Intervention	38.75	10.746	12
	Control	41.69	13.022	13
	Total	40.28	11.830	25
Adaptive Strategies Sadness T_final	Intervention	41.08	10.031	12
	Control	44.62	12.784	13
	Total	42.92	11.449	25
Adaptive Strategies Sadness T6M follow-up	Intervention	44.25	9.206	12
	Control	42.85	13.403	13
	Total	43.52	11.366	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Adaptive Strategies Sadness	Greenhouse-Geisser	2.212	1.156	.327	.048	.254
Adaptive Strategies Sadness * Group	Greenhouse-Geisser	2.212	1.003	.381	.042	.225
Error (Adaptive Strategies Sadness)	Greenhouse-Geisser	50.866				

Descriptive Statistics				
	Group	Mean	SD	N
Adaptive Strategies Anxiety T0	Intervention	41.75	10.306	12
	Control	41.92	13.009	13
	Total	41.84	11.546	25
Adaptive Strategies Anxiety T3	Intervention	39.50	9.959	12
	Control	43.38	13.345	13
	Total	41.52	11.765	25
Adaptive Strategies Anxiety T_final	Intervention	42.92	10.335	12
	Control	48.38	13.920	13
	Total	45.76	12.394	25
Adaptive Strategies Anxiety T6M follow-up	Intervention	46.92	8.867	12
	Control	45.00	11.825	13
	Total	45.92	10.340	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
Adaptive Strategies Anxiety	Sphericity Assumed	3	3.337	.024	.127	.735
Adaptive Strategies Anxiety * Group	Sphericity Assumed	3	1.634	.189	.066	.411
Error (Adaptive Strategies Anxiety)	Sphericity Assumed	69				

SDQ (Strengths and Difficulties Questionnaire)

- File name: SDQ.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant and group they belong two and score as well as aggregated score in the same card.

The SDQ was completed by the parents of the younger group before the intervention. six months after starting and two weeks after finishing the trial. There were no differences between intervention and control group and no change over time was evident. Scores of one parent of each group were above normal.

Descriptive Statistics

	Group	Mean	SD	N
SDQ_E_T0	Intervention	9.2	5.4	13
	Control	9.1	5.0	16
	Total	9.16	5.1	29
SDQ_E_T6	Intervention	8.5	4.1	13
	Control	8.9	5.1	16
	Total	8.8	4.6	29
SDQ_ E_T_final	Intervention	6.8	4.1	13
	Control	7.8	5.4	16
	Total	7.3	4.8	29

SDQ. Strenghts and Difficulties Questionnaire; E, parents; t0 before the study; t6, 6 months after beginning; t13, after completing study

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
SDQ	Greenhouse-Geisser	1.554	2.534	.103	.086	.423
SDQ * Group	Greenhouse-Geisser	1.554	.157	.801	.006	.071
Error (SDQ)	Greenhouse-Geisser	41.955				

DIKJ (Depression Inventory for Children and Adolescents)

The DIKJ was filled out by the first group of children before, six months after starting and one week after completing the study. There were no changes over time and no differences in Scores between intervention and control group. Two children of the intervention group and one of the control group showed Scores that were conspicuous for depression.

Descriptive Statistics				
	Group	Mean	SD	N
DIKJ_T0	Intervention	8.0833	5.68024	12
	Control	7.0000	7.36659	16
	Total	7.4643	6.60237	28
DIKJ_T6	Intervention	5.7500	5.47930	12
	Control	5.1250	3.61248	16
	Total	5.3929	4.42501	28
DIKJ_T_final	Intervention	7.5833	5.77547	12
	Control	5.4375	4.32001	16
	Total	6.3571	5.01268	28

DIKJ. Depression Inventory; t0 before the study; t6, 6 months after beginning; t13, after completing study

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
DIKJ	Sphericity Assumed	2	1.854	.167	.067	.369
DIKJ * Group	Sphericity Assumed	2	.255	.776	.010	.088
Error (DIKJ)	Sphericity Assumed	52				

CHIP-D (Coping Health Inventory for Parents. German version)

- File name: Chip-D.xlsx

- Title of data: Questionnaire Data

- Description of data: Data is sorted by the number of participant on two card. The second card (Messwdh) shows the data of the other time points of measurement.

The CHIP was answered by parents of the adolescent group before and at the end of the intervention program.

Before beginning the study, parents of the intervention group showed lower Scores for CHIP-FAM (p=0.016) and CHIP-ALL (p=0.022) than parents of the control group.

Parents of children of the intervention program considered social support more important at the end vs. before the survey (p=0.046). The Scores (percentiles) for CHIP-FAM (p=0.036), CHIP-MED (p=0.058) and CHIP-ALL (p=0.066) of parents of the control group at the end of the study were lower than at the beginning of the survey. At the end of the study. parents of both groups showed similar Scores.

Most parents of the intervention group rated *social support* average and above average at both time-points examined versus the norm group. F*amily and medical* support were considered less useful. Parents of the control group also considered *social support* very useful and, in contrast to parents of the intervention group, *family support* was rated average and above average prior to the study. At the end of the study, family and medical support were rated below average, usefulness of social support remained above average.

Descriptive Statistics				
	Group	Mean	SD	N
CHIPFAM T0	Intervention	27.950	19.6650	12
	Control	57.731	29.9980	13
	Intervention	43.436	29.2878	25
CHIPFAM T_final	Intervention	34.208	32.0754	12
	Control	39.715	32.9682	13
	Total	37.072	31.9825	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
CHIPFAM	Sphericity Assumed	1	1.527	.229	.062	.220
CHIPFAM * Group	Sphericity Assumed	1	6.509	.018	.221	.686
Error (CHIPFAM)	Sphericity Assumed	23				

Descriptive Statistics				
	Group	Mean	SD	N
CHIPSUP T0	Intervention	60.250	24.6254	12
	Control	71.369	18.9163	13
	Total	66.032	22.1133	25
CHIPSUP T_final	Intervention	68.525	19.8606	12
	Control	66.908	25.7882	13
	Total	67.684	22.6712	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
CHIPSUP	Sphericity Assumed	1	.238	.630	.010	.075
CHIPSUP * Group	Sphericity Assumed	1	2.653	.117	.103	.345
Error (CHIPSUP)	Sphericity Assumed	23				

Descriptive Statistics				
	Group	Mean	SD	N
CHIPMED T0	Intervention	28.642	28.4827	12
	Control	45.338	29.8804	13
	Total	37.324	29.8451	25
CHIPMED T_final	Intervention	28.617	23.2432	12
	Control	29.885	30.4210	13
	Total	29.276	26.6599	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
CHIPMED	Sphericity Assumed	1	1.651	.212	.067	.234
CHIPMED * Group	Sphericity Assumed	1	1.640	.213	.067	.233
Error (CHIPMED)	Sphericity Assumed	23				

Descriptive Statistics				
	Group	Mean	SD	N
CHIP T0	Intervention	35.067	26.5818	12
	Control	60.038	24.7113	13
	Total	48.052	28.1303	25
CHIP Total T_final	Intervention	42.225	32.5943	12
	Control	46.100	31.1859	13
	Total	44.240	31.2588	25

Tests of Within-Subjects Effects						
Source		df	F	Sig.	Partial Eta Squared	Observed Power[a]
CHIP Total	Sphericity Assumed	1	.501	.486	.021	.104
CHIP Total * Group	Sphericity Assumed	1	4.850	.038	.174	.560
Error (Total)	Sphericity Assumed	23				

Rating of the Intervention Program (eo ipso questionnaire), adolescents

In the eo ipso questionnaire all adolescents (n=12) rated the intervention program as positive and mentioned a considerable positive impact on the psyche. The interaction with the dogs, peers, with the dog trainers and other attendants were sensed pleasant by most of the adolescents (contact to dogs, peers, personnel: n=6; dogs only: n=2; peers only n=1). Positive emotions were noted by most adolescents, such as joy, excitement, pleasure, sense of self-worth, sense of responsibility and a sense of community (n=12). One attendant temporarily lost her dog-phobia. Changes of pain sensing and positive effects on physical performance was only mentioned by one participant, but most participants did not answer that section of the questionnaire. Five girls mentioned that the meetings were too seldom, that they had too little possibilities to have contact with the dogs and that it was very cold outside at times.

Four parents noticed changes in pain perception and dealing with pain of their adolescents, seven mentioned positive impact of the intervention e.g. on self-worth, openness, pleasure and that the contact with children, that also suffered from chronic pain, had a positive impact on their children.

Additional discussion of the additional results

Emotion regulation, mood and behaviour

The FEEL questionnaire was used to determine resource profiles, development of emotion regulation strategies, psycho-social competences, stress perception and coping as well as to measure progress during the intervention program.

We did not observe an impact of the intervention on emotion regulation strategies. This can be explained by the fact that chronic pain leads to alteration of pain sensitivity, pain perception and altered processing of rewarding stimuli. These changes occur through operant learning, making the treatment of chronic pain more difficult, since a re-learning process needs to occur but is inhibited by a permanently aroused state [21]. In contrast, in children with autism spectrum disorder, social approach and pro-social skills were augmented, and withdrawal was decreased when guinea pigs were kept in class rooms and children had the opportunity to interact with the animals for 20 minutes [7].

As shown by the results of the FEEL questionnaire, up to 50% of the adolescents of the intervention and control group showed below average adaptive emotion regulation (e.g. problem solving, acceptance, humour enhancement) and more frequent maladaptive emotion regulation strategies (e.g. social withdrawal, self-devaluation, rumination). These findings are in line with the hypothesis, that the development of chronic pain results from associative learning and depends on maladaptive aversive memory and extinction processes, leading to fear of pain and avoidant strategies, including inactivity and social withdrawal [21].

The JTCI was used to analyse automatic emotional reactions that characterize different personality styles (temperament scales) and to assess personal maturity, which is characterized by central self-concepts (character scales). The intervention did not influence scores of the temperament and character scales as compared to controls. According to Cloninger, the temperament is innate but can be modulated by the character. The character develops through socio-cultural learning processes and is influenced by the temperament [34].

About 40% of the participants completing this study showed reduced personal maturity with reduced self-directedness, typifying an "insecure-ineffective" character style (e.g. helpless, dissatisfied and aimless). Nearly half of the adolescents of the intervention and control group showed "stoic-dispassionate" and/or "cautious-anxious" personality style (e.g. uninterested, clumsy, pessimistic, doubtful, insecure, weak, shy). The combination of low novelty seeking, and high harm avoidance characterizes the second order temperament type "rigid-introverted" which was evident in a quarter of the participants (passive, introverting anger, looking for security and silence). A recent investigation of children with migraine also reported a high prevalence of harm avoidance and persistence as well as decreased scores for novelty seeking. Supporting our data, the prevalence of self-directedness was lower in children with migraine [35]. Likewise, patients with chronic pain, not associated with migraine (peripheral neuropathy, radiculopathies, osteoarthritis) also showed high scores of harm avoidance and low scores for novelty seeking, self-directedness and cooperativeness [36]. Harm avoidance is an inherited predisposition to early fear and leads to automatic inhibition, e.g. fear of pain may automatically leads to avoidant behaviour [37]. A higher harm avoidance score could therefore be *due to* chronic pain but could also *predispose* to the development of chronic pain [37]. Avoiding behaviour is thought to be a central aspect of chronic pain. Pain, fear, anxiety, chronic pain and avoidance perpetuate one another. The incongruence of emotional and sensory pain, where the painful stimulus has remitted but fear and avoidance remain, lead to the development of the

fear avoidance model of exaggerated pain perception. The fear of movement model bases on the expectation of recurring pain due to movement leading to an increased distress and disability [38, 39]. Fear and avoidance contribute to persistence of pain behaviour and disability. A vicious cycle of catastrophising pain, fear and safety behaviour develops [37] and eventually fear, expectation and overestimation of pain may be more disabling than pain itself [38].

The CBCL determines behavioural, emotional and somatic abnormalities. The intervention did not change competence or syndrome scale scores as evidenced by the CBCL but externalizing, internalizing and total syndrome scale scores were lower at 26 weeks follow up than right after the intervention.

Apart from somatic complaints, internalizing and withdrawal scores, were frequently clinical in both groups of adolescents. Total and anxious/depressed scores were less often clinical. Withdrawal is interpreted as dysfunctional, maladaptive avoidant behaviour, leading to fear, disability and pain persistence.

Interestingly, with parental-assessment, a lower percentage of anxious-depressive (16%) behaviour and less social withdrawal was evident (23%), as compared to self-assessment in the JTCI. Almost half of the adolescents showed increased JTCI scores related to insecure-ineffective and cautious anxious personality style. This deviation may be related to pain catastrophising, increased anxiety, sensitization for pain or decreased pain thresholds, which occur in adolescents with chronic pain [39]. In addition, a bias towards negative affect and motivation occurs due to aversive stimuli [21].

External Influences

A questionnaire was designed to evaluate possible external factors that may have influenced the study outcome. The questions were answered with either ‘yes’ or ‘no’ and included deepening free text fields. The questions were:

1. Changes in medication that led to improvement of the disease
2. New support offered
3. Parents received new support
4. Meaningful negative coincidences
5. Meaningful positive influences

The questionnaire was completed by adolescents of the intervention and control group one and 26 weeks after finishing the study.

References to the Supplemental Material

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