Supplemental Online Content

Vita A, Barlati S, Ceraso A, et al. Effectiveness, core elements, and moderators of response of cognitive remediation for schizophrenia: a systematic review and meta-analysis of randomized clinical trials. *JAMA Psychiatry*. Published online April 20, 2021. doi:10.1001/jamapsychiatry.2021.0620

This supplemental material has been provided by the aSuthors to give readers additional information about their work.

eAppendix 1. Materials and Methods – Detailed section.

Search strategy and selection criteria

As an initial step, the reference list of Wykes et al.[1] was screened against eligibility criteria. Then, a systematic literature search was conducted on three electronic databases (PubMed, Scopus, and PsycINFO; from January 2011 to October 2018, updated in February 2020) using the following strategy: ("cognitive" or "cognit*") AND ("training" or "remediation" or "rehabilitation" or "enhancement") AND ("schizophrenia" or "psychosis") AND ("random" or "randomized control trial" or "clinical trial"). Emerging meta-analyses/reviews, and reference lists of papers fulfilling inclusion criteria were also hand-searched. Finally, keywords of the search strategy were used to conduct an additional search of Google Scholar.

All reports were assessed by at least two independent reviewers, firstly based on title and abstract, then through full-text inspection; the same reviewers independently extracted data; disagreements were resolved with the assistance of a third author. Only papers available in English and published in peer-reviewed journals were considered.

Eligibility criteria were purposely broad, in line with the aim of adopting a comprehensive approach. Inclusion focused on RCTs comparing CR to any control condition other than CR, among patients diagnosed with schizophrenia spectrum disorders (any diagnostic criteria), independently of setting. Included studies were required to present outcomes at baseline and early post-treatment phase.

Feasibility trials were retrieved, if appropriately randomized. Pseudo- and quasi-randomized trials were excluded; in case of crossover trials, only data up to the point of crossover were used.

Eligible populations were required to include at least 70% of patients diagnosed with a schizophrenia spectrum disorder; alternatively, specific outcome data on diagnostic subgroups had to be available.

Included studies had to investigate a structured intervention fulfilling the standard Experts Workshop definition for CR (Florence, Italy, 2010), either applied as a stand-alone treatment or combined with other psychosocial interventions (if adequately controlled for), with no restrictions in terms of duration, intensity and mode of delivery. Studies evaluating selected modules of manualized CR programs (i.e. pre-specified set of exercises that can be administered independently, usually covering a specific content or cognitive domain, and meeting by themselves the CR definition) were eligible. Suitable interventions specifically targeting

metacognition were also included, since several recent CR programs tend to focus on metacognitive aspects rather than on task practice only.[2]

Particular attention was devoted to the definition of comparison groups, an overlooked but crucial aspect for the understanding of measured outcomes of psychosocial interventions.[3] Both the "absolute" effect of CR and the "relative" effect of specific intervention ingredients were of interest for the present work. Rather than simply classifying comparison conditions as "passive" or "active", they were specifically categorized into four groups: 1. Treatment as usual (TAU: drug treatment/case management only, waiting lists, insufficient details); 2. Active TAU (including multidisciplinary rehabilitative programs); 3. Active non-specific interventions (controlling for non-specific aspects and matched with CR for duration and schedule, e.g. social stimulation, leisure activities, computer activities); 4. Active evidence-based interventions[4,5] specifically implemented for comparison purpose. This categorization was designed to account for the heterogeneity of the concept of TAU and to separate interventions simply controlling for non-specific aspects of attending a new treatment (e.g. time spent with a therapist, computer use).

Quality assessment

Included studies were assessed by two independent reviewers using the Clinical Trials Assessment Measure (CTAM),[6] a tool designed to examine trials of cognitive behavioral therapy[6] but already adopted to evaluate trials of CR[1] or other psychosocial interventions.[7] The CTAM total score (0-100) provides an overall display of study quality according to six domains: sample recruitment, allocation, outcome assessment, comparison groups, analysis, and treatment description. A cut-off of 65 points[8] was used to identify and compare adequate *versus* inadequate methodology. The most meaningful CTAM items (i.e. description of random sequence generation, use and description of blinding, handling of missing data, testing treatment fidelity) were also treated as dichotomous variables, to account for the potential extent of bias due to the different weight provided by each domain to the total score. Study authors were not contacted to confirm CTAM scoring, but quality ratings were compared with those of other review groups reported in available publications.[1,9,10] Studies where a significant risk of reporting bias was identified were separately noted, as

selective reporting is not represented in the CTAM, but is known to produce overestimates of intervention effects.[11,12]

Outcome measures

Primary outcomes were changes in global cognitive performance and overall functioning from baseline to post-treatment; these outcomes were also subsequently investigated through meta-regressions, subgroup, and sensitivity analyses. Additional outcomes were changes in specific cognitive domains and in symptom severity.

For cognitive performance, data on all objective and validated cognitive tasks were extracted and classified into the seven categories derived from the NIMH-MATRICS Neurocognition Committee:[13] attention/vigilance, speed of processing, working memory, verbal learning and memory, visual learning and memory, reasoning and problem solving, social cognition. Since no general consensus exists regarding the attribution of specific neuropsychological tools to cognitive domains, we referred to previous publications.[1,14] If a clear agreement could not be reached even after collegial discussion between at least five reviewers, the scales were not used. Subjective rating scales for cognition and instruments modified by study authors or not appropriately validated in a previously published study were not extracted. The list of scales and corresponding cognitive domains is reported in Supplementary Table 1.

For each study, domain-specific effect sizes were calculated by averaging available effect sizes of the individual measures referring to that specific domain; then, a composite global cognition effect size was calculated by averaging the available domain-specific effect sizes. The aggregation of effect sizes within each study before meta-analyzing the results over studies represents an often-employed approach to the problem of dependent effect sizes.[15] Wykes et al.[1] also adopted this strategy and demonstrated that combining measures did not influence the estimate of global effects; since covariance tends to increase the composite effect size and to underestimate standard error,[16] this method can be viewed as conservative.

For functioning outcomes, all available and validated measures were extracted for each study. Self-, caregiver- and investigator-rated instruments were all eligible, independently from the area of functioning (e.g. daily life, education, work, interpersonal relationships). Both direct and indirect measures of functioning, such as functional capacity, and living and social skills, were included to obtain a comprehensive picture. Accordingly, quality of life measures were also included.[17]

When studies used multiple rating instruments for symptoms, only one scale per study was chosen, prioritizing the Positive And Negative Syndrome Scale (PANSS),[18] or, if not available, the Brief Psychiatric Rating Scale,[19] following the procedures suggested by the Cochrane Collaboration[20] and adopted in previous high-quality meta-analyses.[21] If multiple rating instruments were applied but neither of these scales was included, the most representative tool was identified based on the hypothesized frequency of use. Positive and negative symptoms were analyzed separately; an effect size for global symptoms was derived only if full-scale total scores were available.

For studies with multiple treatment arms, each comparison of interest was considered separately, if based on appropriate allocation procedure. As including multiple effect sizes per study (dependent effect sizes) could produce biased statistical inferences, this issue was addressed in sensitivity analyses restricted to one effect size per study, both randomly and choosing the most substantial comparison.[22,23]

Effect-size calculation

For each outcome measure, Cohen's d was calculated according to the formula by Carlson & Schmidt,[24] which allows to control for baseline values and heterogeneity of variance.[25] The standard errors of the effect sizes were calculated using the formula recommended by Cooper et al.[16] If the raw group means, Z-scores and standard deviations were not available, they were extracted using WebPlotDigitizer version 4.2 (Rohatgi, San Francisco, CA, USA, 2019) or group x time interaction F values or t values were used.[26] Where standard deviations were missing, they were calculated from available data (standard error or p values for between-group differences).[20] Scores of each scale were adapted so that a higher score reflected a better performance;

in this way a positive Cohen's d value was indicative of a positive treatment effect. Missing data were treated using an available-case approach; data resulting from intention-to-treat were preferred when reported.

Meta-analytic procedure

All meta-analyses used a random effects approach. Statistical heterogeneity was investigated through visual inspection of forest plots and assessment of χ^2-tests and I^2 statistic. Potential reasons for heterogeneity were then explored through subgroup analyses for categorical variables and restricted-maximum-likelihood-random-effect meta-regressions for continuous variables. All the meta-analyses were performed using Review Manager, version 5.3 (The Cochrane Collaboration, Copenhagen, DK, 2014), except for the meta-regressions, conducted using Comprehensive Meta-Analysis version 3.0 (Biostat, Englewood, NJ, USA, 2013). Descriptive statistics and analyses were performed using SPSS version 14.0 (SPSS Inc., Chicago, IL, USA, 2005).

Moderator effects

Potential moderators were investigated for primary outcomes. Firstly, study-related moderators were investigated: publication year, overall methodological quality (based on total CTAM score and on the 65-points cut-off), blinding of study condition/outcome assessment, use of intention-to-treat, comparison category, inclusion of diagnoses other than schizophrenia. Then, characteristics of included treatments were explored, primarily the four core elements of CR identified in the most recent expert consensus[27], along with individual or group format of delivery, computer use, treatment duration (weeks) and intensity (sessions/week and hours/week). Finally, patient- and illness-related moderators were investigated: age, gender (% female subjects), years of education, premorbid IQ, age of onset, duration of illness, baseline treatment dose (chlorpromazine equivalents - CPZeq) and baseline symptom severity. For medication, when CPZeq was not explicitly reported, the daily dose was derived from available data.[28] Baseline symptom severity was expressed as total PANSS score; eventual Brief Psychiatric Rating Scale scores were converted to PANSS.[29] Interconnections between moderators emerging as significant were explored through inferential statistics to check for potential collinearity.

Certainty of the evidence

Confidence in pooled results for primary outcomes was further evaluated through sensitivity analyses: use of a fixed effect model, exclusion of clear outliers, inclusion of only one ES per study, exclusion of studies with inadequate methodology (according to CTAM) or insufficient details on allocation, providing only completers data, evaluating interventions designed for trial purpose, not testing intervention quality/fidelity to manual. Publication bias was assessed by visual inspection of funnel plots and statistical test of asymmetry (Egger's test).[30] In case of significant asymmetry, adjustment of effect estimates was investigated with the trim-and-fill method using both a random-random and a fixed-random effects model.[31,32] Finally, other potential determinants of quality of evidence (i.e. consistency, precision and directness) were explored, according to experts' recommendation.[33]

eReferences

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eTable 1. List of rating scales and corresponding cognitive domains.

Attention/Vigilance	**Verbal Learning and Memory**	**Social Cognition**	**Social Functioning**
Continuous Performance Tests (CPT)	Hopkins Verbal Learning Test (HVLT)	Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)	UCSD Performance-Based Skills Assessment (UPSA)
Sustained Attention Test (SAT)	Rey Auditory Verbal Learning Test (RAVLT)	Bell Lysaker Emotion Recognition Task (BLERT)	Independent Living Scales, Problem Solving Factor (ILS-PS)
Test of Sustained and Selective Attention (TASS)	California Verbal Learning Test (CVLT)	Facial Emotion Identification Test (FEIT)	Medication Management Ability Assessment
Tests for Attentional Performance (TAP) Vigilance	WMS Logical Memory	Face Emotion Discrimination Task (FEDT)	Micro-Module Learning Test (MMLT)
Attention Stress Test	WMS Memory Passages	Facial Emotion Recognition Task (TREF)	Social Skills Performance Assessment (SSPA)
Scanning Test	WMS Verbal Paired Associates	Penn Emotion Recognition Test (ER-40)	Independent Living Skills Survey (ILSS)
Digit Vigilance Test	BACS Verbal Memory	Ekman 60 Faces Test	Life Skills Profile (LSP)
Go/No-go	LPAD Word Memory	Vienna Emotion Recognition Test (VERT-K)	Maryland Assessment of Social Competence
Triads Test	NCSE Memory	Geneva Emotion Recognition Test (GERT)	Work Behavior Inventory (WBI)
Span of Apprehension tests	Hong Kong List Learning Test (HKLLT)	Pictures of Facial Affect (PFA)	Assessment of Interpersonal Problem Solving Skills (AIPSS)
Letter Cancellation Test	Other Word List recall tests	Emotion Recognition Questionnaire (EMOREC)	UCLA Module Specific Skills Assessment
Embedded Stimulus tests	Free and Cued Selective Reminding Test (FCSRT)	Emotion in Biological Motion (EmoBio)	Global Assessment of Functioning (GAF; GAF-f)
Backward Masking Test (BMT)	Prose Recall tests	fMRI Emotion Recognition tasks	Global Assessment Scale (GAS)
COGLAB Preattentional Processing	Denman Neuropsychological Memory Test	The Awareness of Social Inference Task (TASIT)	Children Global Assessment Scale (C-GAS)
WMS Information	Rivermead Behavioral Memory Test (RBMT)	Reading the Mind in the Eyes Test (RMET)	Social Functioning Scale (SFS)
		Reading Mind in the Voices (RMV)	Personal and Social Performance (PSP)
Speed of Processing		Hinting Task	Specific Levels of Functioning (SLOF)
Reaction Time tests		Happè Stories	Role Functioning Scale (RFS)
Tests for Attentional Performance (TAP) Alertness		Movie for the Assessment of Social Cognition (MASC)	WHO Disability Assessment Scale (WHO-DAS)
Trail Making Test, Part A (TMT-A)	**Visual Learning and Memory**	Social Behavior Sequencing Task (SBST)	Interview for the Assessment of Disability (AD)
Stroop Test, Color and Word conditions	Brief Visuospatial Memory Test (BVMT)	Social Cognition Screening Questionnaire – Theory of Mind	Social and Occupational Functioning Assessment Scale (SOFAS)
WAIS Digit Symbol	Benton Visual Retention Test (BVRT)	Profile of Non-Verbal Sensitivity (PONS)	Health of the Nation Outcome Scale (HoNOS)
Digit Symbol Substitution Test	Rey Osterrieth Complex Figure	Schema Component Sequencing Task (SCST)	Employability Appraisal Scale (EAS)
Symbol Digit Modalities Test (SDMT)	Rey Visual Design Learning Test (RVDLT)	Situational Feature Recognition Test (SFRT)	Life Assessment Scale for the Mentally Ill (LASMI)
BACS Symbol Coding	LPAD Complex Figure	Script Test	Social Adjustment Scale (SAS)
BACS Token Motor	WMS Visual Reproduction	Mach IV Scale	Social Behavior Scale (SBS)
Finger Tapping Test (FTT)	WMS Memory for Faces	Relationships Across Domains (RAD)	Major Role Adjustment Inventory (MRAI)
Tactile Performance	Face Memory Test (FMT)	Faux Pas Detection Test	VADO Personal and Social Functioning Scale
Verbal Fluency tests (Category and Letter)	Kimura Recurring Figures Test	Davos Assessment of Cognitive Biases (DACOBS) – Social Cognition Problems	Vineland Adaptive Behavior Scale (VABS)
D-KEFS Symbol Search	Denman Neuropsychological Memory Test	Self-Report Cognitive Biases (CBQp) Emotion Based Reasoning	Performance Potential Inventory (PPI)
D-KEFS Color Naming	Rivermead Behavioral Memory Test (RBMT)	Ambiguous Intentions Hostility Questionnaire (AIHQ)	Time use survey
		Internal Personal and Situational Attribution Questionnaire (IPSAQ)	Nurses Observation Scale for Inpatient Evaluation (NOSIE)
		Attributional Style Questionnaire (ASQ)	Scale of Social Skills of chronic schizophrenia inpatients (SSSI)
		Self-Report Cognitive Biases (CBQp) – Intentionalizing	Occupational Self-Assessment (OSA)
		Empathic Accuracy Test	Behavior Rating Inventory of Executive Functions (BRIEF-A)
		Unexpected Outcome Test (UOT)	Informant- report and Self-report Heinrichs Carpenter Quality of Life Scale (QLS)
		Questionnaire of Cognitive and Affective Empathy	WHO Quality of Life (WHOQOL; WHOQOL-BREF)
			EUROHIS Quality of Life (EUROHIS-QOL)
			Self-Report Quality of Life in schizophrenia (SQol)

			Personal Well-Being Index (PWI) Quality of Life Interview (QoLI) Quality of Life Scale (QOLS)
Working Memory WAIS, WISC or WMS Digit Span Digit Span Distractibility Test BACS Digit Sequencing Other Digit Span tasks WAIS or WMS Letter-Number Sequencing Auditory Number Sequencing (ANS) Maintenance and Manipulation Task WAIS Arithmetic Other arithmetic tasks WMS Mental Control Trail Making Test, Part B (TMT-B) Self Ordered Pointing Task (SOPT) Visual Conditional Associative Learning (VCALT) Sentence Span tests N-back Auditory Consonant Trigrams (ACT) WMS Visual/Spatial Span Dual Span CANTAB Spatial Working Memory Test for Attentional Performance (TAP) Working Memory	**Reasoning and Problem Solving** Wisconsin Card Sorting Test (WCST) or COGLAB Card Sorting Test - Categories achieved and Perseverative Errors Delis Kaplan Executive Function System (D-KEFS) (all problem solving, planning, abstract reasoning, switching and response inhibition subtests) BACS Tower of London Tower of Hanoi WAIS or WISC Picture Arrangement/Block Design WAIS Matrix Reasoning NCSE Construction Mazes test Trail Making Test, Part B-A (TMT B-A) Stroop Test, Interference condition Response Inhibition Test Penn Conditional Exclusion Test Strategic Target Detection Test (STDT) WAIS Similarities NCSE Reasoning Booklet Category Test Six Elements Test Labyrinth Test Proverb Interpretation tasks Behavioral Assessment of the Dysexecutive Syndrome (BADS) Ecological Shopping Test	**Cognitive measures of multiple domains (included when available)** Global Cognition composite scores Mini Mental State Examination (MMSE) **Cognitive measures lacking consensus (excluded)** Cognitive Style tests Hayling Sentence Completion Task WMS Orientation Purdue Pegboard Auditory Frequency Discrimination Test Subjective rating scales to assess cognition Emotion Processing tests: Reaction time, Confidence in responses Other measures of "confidence in decision" **Cognitive measures not considered sensitive to change (excluded)** WAIS Comprehension WAIS Vocabulary	**Symptoms** Positive and Negative Syndrome Scale (PANSS) Global score Brief Psychiatric Rating Scale (BPRS) Global score **Positive Symptoms** PANSS Positive Scale or Factor Score BPRS Positive Symptoms factors Scale for the Assessment of Positive Symptoms (SAPS) Psychotic Symptom Rating Scale (PSYRATS) Inkblot test **Negative Symptoms** PANSS Negative Scale or Factor BPRS Negative Symptoms factors Scale for the Assessment of Negative Symptoms (SANS)

BACS: Brief Assessment of Cognition in Schizophrenia; CANTAB: Cambridge Neuropsychological Test Automated Battery; fMRI: Functional Magnetic Resonance Imaging; LPAD: Learning Potential Assessment Device; NCSE: Neurobehavioral Cognitive Status Examination; WAIS: Wechsler Adult Intelligence Scale; WISC: Wechsler Intelligence Scale for Children; WMS: Wechsler Memory Scale.

eAppendix 2.

References of included studies

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eTable 2. Cognitive remediation programs adopted in included studies.

Categories of CR programs	Single CR programs applied in studies
Computer-based neurocognitive interventions (CACR)	**BrainHQ software:** Thomas 2018 **Captain's Log software:** Burda 1994, Bellucci 2003, Au 2015 **CineMotion:** Sevos 2018 **Computerized Interactive Remediation of Cognition-Training for Schizophrenia (CIRCuiTS)**: Drake 2014, Reeder 2017 **Cogpack**: McGurk 2005, Sartory 2005, Wölwer 2005 (Cogpack arm), Lindenmayer 2008 (+group discussion), Klingberg 2011, Vita 2011 (CACR arm), Kidd 2014 (+group discussion), Jahshan 2019 (Cogpack arm) **Cog-trainer software:** Lee 2013 **Computer Drill Training:** Byrne 2013 **FesKits program:** Gomar 2015 **Japanese Cognitive Rehabilitation Program for Schizophrenia (JCORES)**: Morimoto 2018 **MyBrainGymmer software:** Cassetta 2019 **MyBrainTraining software:** Moritz 2015 (home-based) **NEUROCOM program:** Østergaard Christensen 2014 **NPT-MH software:** Fernandez-Gonzalo 2015 **PositScience software, Auditory**: Fisher 2009-2016, Fisher 2015; **Aristotle:** Horan 2011 (NR arm); **Brain Fitness:** Kukla 2018, Jahshan 2019 (PositScience arm); **multiple tasks**: Rass 2012, Mahncke 2019 (including novel exercises) **PSSCogrehab software**: D'Souza 2013, Tan 2013, Fiszdon 2016, Choi 2017 **RehaCom software**: D'Amato 2011, Royer 2012, Mak 2013, Garcia-Fernandez 2019 **Unspecified/Other programs used in single studies**: Kurtz 2007, Dickinson 2010, Man 2012 (CAEL arm), Garrido 2013, Kurtz 2015, Fan 2017, Tan 2019
Pencil-and-paper neurocognitive interventions	**Compensatory Cognitive Training (CCT)**: Twamley 2008-2012, Mendella 2015 **Cognitive Remediation Therapy (CRT)**: Wykes 1999, Wykes 2007a, Wykes 2007b, Lu 2012, Puig 2014, Tan 2016, Pijnenborg 2019 (adapted from CRT) **Frontal/Executive Program**: Penades 2006, Penades 2013, Omiya 2016, Penades 2018 **Other programs used in single studies:** Gharaeipour 2012 (own program), Hegde 2012 (own program, home-based), Man 2012 (TAEL arm), Tao 2015
Interventions targeting single neurocognitive domains	**Attention training**: Hermanutz 1991, Medalia 1998 (ORM software) **Attention Processing Training and Shaping**: Silverstein 2005, Silverstein 2009 **Cognitive Attention and Memory Training**: Pontes 2013 **Memory training**: Medalia 2000 (1st arm) **Problem Solving Training (Where in the USA is Carmen Sandiego? software)**: Medalia 2000 (2nd arm) **Working Memory Training**: Donohoe 2018 (low-support), Ramsay 2017 **Auditory Discrimination+Working Memory training**: Popova 2014 (CE arm)
Interventions targeting Social Cognition	**eMotional Training**: Maroño Souto 2018, Lado-Codesido 2019 (Voices) **Facial Affect recognition Training**: Popova 2014 (FAT arm) **Social Cognition Enhancement Training (SCET)**: Choi 2006 **Social Cognitive Interaction Training (SCIT)**: Roberts 2014, Gordon 2018, Kanie 2019, Tas 2012 (family version) **Social Cognitive Skills Training (SCST)**: Horan 2009, Horan 2011 (SCST arm), Gohar 2013, Horan 2018 **Social Perception Training**: Matsui 2009 **Training of Affect Recognition (TAR)**: Wölwer 2005 (TAR arm), Habel 2010, Sachs 2012, Vaskinn 2019
Interventions based on an integrative approach	**Cognitive Enhancement Therapy (CET)**: Hogarty 2004, Eack 2009 **Instrumental Enrichment Program**: Hadas-Lidor 2001, Roncone 2004 **Integrated Neurocognitive Therapy (INT)**: Müller 2015, Müller 2017 **Integrated Psychological Therapy (IPT)**: Hermanutz 1991 (IPT arm, selected subprograms), Spaulding 1999, Garcia 2003 (cognitive subprograms), Zimmer 2007 (cognitive subprograms), Vita 2011a (IPT arm, cognitive subprograms), Vita 2011b (cognitive subprograms), Rakitzi 2016 (cognitive subprograms), Aloi 2018, Ueland 2004 (own program based on IPT) **Neuropsychological and Educational Approach to Remediation (NEAR)**: Hodge 2010, Katsumi 2019 **Neurocognitive Enhancement Therapy (NET)**: Bell 2001, Greig 2007 **Cognitive Rehabilitation Program in Psychosis (REHACOP):** Ojeda 2012, Peña 2016, Sanchez 2014 (integrated version) **Problem Solving and Cognitive Flexibility (REPYFLEC)**: Farreny 2012 **Social Skills and Neurocognitive Individualized Training (SSANIT)**: Galderisi 2010 **Thinking Skills for Work**: Bowie 2012, McGurk 2016, Iwata 2017 **Other programs used in single studies**: O'Reilly 2019 (manualized)
Metacognitive Training (MCT)	Aghotor 2010, Kumar 2010, Moritz 2011, Briki 2014, Favrod 2014, Van Oosterhout 2014, Gaweda 2015, So 2015, Ochoa 2017, Ahuir 2018

Combination of multiple interventions	**CACR+SCIT+NEAR**: Vidarsdottir 2019 **Cogpack+Cognitive Adaptation Training (CAT)**: Vauth 2005 **JCORES+group sessions focused on metacognition:** Matsuda 2016 **NET+NEAR:** Ventura 2019 **PositScience software+NEAR bridging group**: Keefe 2012, Ahmed 2015, Kantrowitz 2016 **PositScience software+computer-based Social cognition training**: Hooker 2012 **PositScience software+SCST**: Horan 2011 (Hybrid arm)
Other interventions	**Self-instructional Training**: Meichenbaum 1973

eTable 3. Summary of individual characteristics of included studies.

Study	Country, Design and Setting	Characteristics of included patients	Sample and Attrition	Duration (weeks)	Treatment Program and Schedule	Comparison	Quality Rating (CTAM)	Outcome Measures (included in the analyses)
Aghotor 2010	Germany, single center Inpatients Chronic, with active positive symptoms	Gender: 33,3% female Age: 30,6 years Illness duration: 11,6 years Onset: 19,1 years Education: n.i. IQ: n.i. Diagnosis: non-affective psychosis Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=30, 13% attrition rate	4	Metacognitive Training (MCT), 2 sessions/week of 45-60min each, N=16	Newspaper reading groups, N=14	62	Positive Symptoms
Ahmed 2015	USA, single center Inpatients in forensic setting	Gender: 13% female Age: 40,5 years Illness duration: 18,6 years Onset: 21,9 years Education: 9,8 years IQ: 94,2 Diagnosis: schizophrenia (69%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): 705,4 mg/day	N=78, 19% attrition rate	20	Computer-assisted remediation (mainly Posit Science tasks) + Bridging group discussions, 3 sessions/week of 1h each, with regular psychosocial rehabilitation, N=42	Computer games + Healthy behavior group discussions, with regular psychosocial rehabilitation, N=36	79	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Ahuir 2018	Spain, multi-center, crossover trial Outpatients Recent onset (<3 years)	Gender: 59,2% female Age: 23,6 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: first episode of psychosis Baseline PANSS: 50,3 Daily drug dose (CPZeq): n.i.	N=49, 26,5% attrition rate	8	Metacognitive Training (MCT), 1h/week, N=22	Psychoeducation, N=29	39	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Aloi 2018	Italy, single center Inpatients	Gender: 29% female Age: 51,1 years Illness duration: 23,1 years Onset: 27,9 years Education: n.i. IQ: n.i.	N=46, 11% attrition rate	36	Integrated Psychological Therapy (IPT), 2 sessions/week of 45min each, N=24	Treatment as usual, N=22	55	Global Cognition Processing Speed Working Memory Executive Functions Social Cognition Global Functioning Global Symptoms

		Diagnosis: schizophrenia Baseline PANSS: 91,6 Daily drug dose (CPZeq): 652,8 mg/day						Positive Symptoms Negative Symptoms
Au 2015	Hong Kong, single center Outpatients	Gender: 36,7% female Age: 36,1 years Illness duration: 11,2 years Onset: 24,9 years Education: 14,9 years IQ: n.i. Diagnosis: schizophrenia (58%), schizoaffective disorder Baseline PANSS: 41,9 Daily drug dose (CPZeq): n.i.	N=90, 10% attrition rate	12	Computer-assisted remediation, 3 sessions/week of 2h each + Integrated Supported Employment, N=45	Time-matched TV watching + Integrated Supported Employment, N=45	73	Global Cognition Attention/Vigilance Processing Speed Verbal Memory Visual Memory Executive Functions Social Cognition Global Functioning Global Symptoms
Bell 2001	USA, multi-center Outpatients	Gender: 26,2% female Age: 41,3 years Illness duration: 19,3 years Onset: 22 years Education: 13,3 years IQ: 87,6 Diagnosis: schizophrenia (69%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): 743,5 mg/day	N=65, dropouts n.i.	22	Neurocognitive Enhancement Therapy (NET), 3-4 sessions/week, + Work therapy N=31	Work therapy, N=34	60	Global Cognition Processing Speed Working Memory Executive Functions Social Cognition
Bellucci 2003	USA, single center Outpatients	Gender: 52,9% female Age: 42 years Illness duration: 16,6 years Onset: 25,4 years Education: 12,6 years IQ: n.i. Diagnosis: schizophrenia (47%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=34, no dropouts	8	Computer-assisted remediation using Captain's Log, 2 sessions/week of 90 min each, N=17	Multidisciplinary treatment as usual including skills training and psychoeducation, Waiting list, N=17	65	Global Cognition Processing Speed Working Memory Verbal Memory Negative Symptoms
Bowie 2012	USA, multi-center Outpatients	Gender: n.i. Age: 40,6 years	N=114, 27% attrition rate	12	Thinking Skills for Work, 2h/week, N=38	Functional Adaptation Skills Training, N=38	75	Global Cognition Global Functioning

		Illness duration: 20,2 years Onset: 20,4 years Education: 13,1 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.			Thinking Skills for Work + Functional Adaptation Skills Training, N=38			Positive Symptoms Negative Symptoms
Briki 2014	France, multi-center In- and outpatients Chronic, with active positive symptoms	Gender: 34% female Age: 41,1 years Illness duration: 16,2 years Onset: 24,9 years Education: 8,8 years IQ: n.i. Diagnosis: schizophrenia spectrum disorder Baseline PANSS: 86,6 Daily drug dose (CPZeq): 1437,5 mg/day	N=68, 26,5% attrition rate	8	Metacognitive training (MCT), 2 sessions/week of 45.60min each, N=35	Supportive therapy including psychoeducation elements, N=33	71	Global Functioning Positive Symptoms
Bryce 2018	Australia, single center In- and outpatients	Gender: 30% female Age: 41 years Illness duration: 14,1 years Onset: 26,9 years Education: 13,1 years IQ: 98,1 Diagnosis: schizophrenia (71%), schizoaffective disorder Baseline PANSS: 61,1 Daily drug dose (CPZeq): 703,8 mg/day	N=56, 23% attrition rate	10	Computer-assisted remediation using Cogpack, 2 sessions/week of 1h each, N=29	Computer games, N=27	72	Global Cognition All cognitive domains Global Functioning Global Symptoms
Burda 1994	USA, multi-center Inpatients	Gender: 2,8% female Age: 46,6 years Illness duration and onset: n.i. Education: 12,5 years IQ: n.i. Diagnosis: schizophrenia (68%), schizoaffective disorder	N=80, 14% attrition rate	8	Computer-assisted remediation using Captain's Log, 3 sessions/week of 30min each, N=40	Treatment as usual, N=40	54	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory

		Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.						
Byrne 2013	China, single center Inpatients	Gender: 100% male Age: 45,6 years Illness duration: 20,6 years Onset: 25 years Education: 11,3 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 390,2 mg/day	N=51, 39% attrition rate	6	Own computer-assisted program, schedule not described in detail, N=27	Treatment as usual, N=24	48	Global Cognition Working Memory Verbal Memory Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Cassetta 2019	Canada, multi-center Outpatients	Gender: 39,4% female Age: 40,2 years Illness duration: 13,7 years Onset: 26,6 years Education: 13,3 years IQ: n.i. Diagnosis: schizophrenia (61%), schizoaffective disorder Baseline PANSS: 79,4 Daily drug dose (CPZeq): n.i.	N=83, 14% attrition rate	10	Computer-assisted Working Memory training, N=28, or Processing Speed training, N=28, both using MyBrainGymmer, 5 sessions/week of 30min each	Treatment as usual, N=27	82	Global Cognition Processing Speed Working Memory Executive Functions Social Cognition Global Functioning Global Symptoms
Cavallaro 2009	Italy, multi-center Inpatients	Gender: n.i. Age: 33,6 years Illness duration: 8,2 years Onset: 25,1 years Education: 11,7 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=100, 14% attrition rate	12	Computer-assisted remediation using Cogpack, 3 sessions/week of 1h each, + Rehabilitation program, N=58	Computer activities + Rehabilitation program, N=42	51	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning
Choi 2006	South Korea, single center Outpatients	Gender: 44% female Age: 32,5 years Illness duration: 11,2 years Onset: 21,3 years Education: 12,4 years IQ: n.i.	N=34, 47% attrition rate	26	Social Cognition Enhancement Training (SCET), 2 sessions/week, N=17	Usual psychiatric rehabilitation program including social skills training, N=17	35	Global Cognition Executive Functions Social Cognition

		Diagnosis: schizophrenia (97%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.						
Choi 2017	South Korea, single center Inpatients	Gender: 42% female Age: 49,7 years Illness duration: 23 years Onset: 26,8 years Education: 11,2 years IQ: 95,9 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=38, 3% attrition rate	12	Computer-assisted remediation using PSS CogRehab, 2 sessions/week of 1h each + Comprehensive psychiatric rehabilitation, N=19	Comprehensive psychiatric rehabilitation including skill building therapies, N=19	66	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
D'Amato 2011	France, multi-center Inpatients	Gender: 24,7% female Age: 32,8 years Illness duration and onset: n.i. Education: 12,3 years IQ: 100,3 Diagnosis: schizophrenia Baseline PANSS: 74,4 Daily drug dose (CPZeq): 388,3 mg/day	N=77, no dropouts	7	Computer-assisted remediation using Rehacom, 2 sessions/week of 2h each, N=39	Treatment as usual, waiting list N=38	72	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
D'Souza 2013	USA, multi-center Outpatients	Gender: 25% female Age: 37,2 years Illness duration: 10,7 years Onset: 26,5 years Education: 12,7 years IQ: 91,2 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 56,9 Daily drug dose (CPZeq): 272,5 mg/day	N=53, 15% attrition rate	12	Computer-assisted remediation using PSS CogRehab, 5h/week, N=27 *Only the arm receiving placebo serine was included in the analysis	TV watching, N=26 *Only the arm receiving placebo serine was included in the analysis	62	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Dickinson 2010	USA, multi-center Outpatients	Gender: 35% female Age: 47,6 years Illness duration and onset: n.i.	N=69, 9% attrition rate	15	Computer-assisted remediation, 3sessions/week of 1h each, N=35	Computer games, N=32	82	Global Cognition Processing Speed Working Memory Executive Functions Global Functioning

		Education: 12,5 years IQ: n.i. Diagnosis: schizophrenia (78%), schizoaffective disorder Baseline PANSS: 66,5 Daily drug dose (CPZeq): n.i.						Global Symptoms Negative Symptoms
Donohoe 2018	Ireland, multi-center Outpatients	Gender: 60% female Age: 43,3 years Illness duration: 17,1 years Onset: 26,2 years Education: 14 years IQ: n.i. Diagnosis: psychotic disorder (63% schizophrenia; affective psychosis included) Baseline PANSS: n.i. Daily drug dose (CPZeq): 490,4 mg/day	N=90, 39% attrition rate	8	Computer-assisted low-support working memory training, 5 sessions/week of 30-40 min each + 45 min/week with therapist, N=48	Sham intervention, N=42	79	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Social Cognition Global Functioning
Drake 2014	Great Britain, multi-center Outpatients First-episode	Gender: 39,3% female Age: 24,1 years Illness duration and onset: n.i. Education: 12,7 years IQ: 104,4 Diagnosis: schizophrenia (85%), schizoaffective disorder Baseline PANSS: 70,4 Daily drug dose (CPZeq): n.i.	N=62, 3% attrition rate	12	Computer-assisted remediation using CIRCuiTS, 3-5 sessions/week of 1h each (40h total), followed by CBTp, N=31	Time-matched social contact, followed by CBTp, N=31	83	Global Cognition Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms
Eack 2009	USA, single center Outpatients Recent onset (<5 years)	Gender: 31% female Age: 28,9 years Illness duration: 3,2 years Onset: 22,7 years Education: n.i. IQ: 98,1 Diagnosis: schizophrenia (66%), schizoaffective disorder Baseline PANSS: n.i.	N=58, dropouts n.i.	104	Cognitive Enhancement Therapy (CET), 1h/week of neurocognitive training + 1,5h/week of social-cognitive training, + Enriched supportive therapy, N=31	Enriched supportive therapy (including skills training and psychoeducation), N=27	56	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

		Daily drug dose (CPZeq): 418,2 mg/day						
Fan 2017	China, single center Inpatients	Gender: 48% female Age: 40,5 years Illness duration: 17,4 years Onset: 23,4 years Education: 11,7 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 64,1 Daily drug dose (CPZeq): 490,8 mg/day	N=23, no dropouts	8	Computer-assisted remediation, 40 sessions total of 40min each, N=12	Treatment as usual, N=11	61	Global Cognition Processing Speed Working Memory Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
Farreny 2012	Spain, single center Outpatients	Gender: 32% female Age: 40,6 years Illness duration: 17,5 years Onset: 23,1 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia (89%), schizoaffective disorder Baseline PANSS: 65 Daily drug dose (CPZeq): 475 mg/day	N=62, 14,5% attrition rate	17	Problem solving and Cognitive flexibility Training (REPYFLEC), 2 sessions/week of 1h each, N=34	Leisure activities, N=28	76	Global Cognition Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Negative Symptoms
Favrod 2014	Switzerland, multi-center Outpatients Chronic, with active positive symptoms	Gender: 34,6% female Age: 36,7 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: non-affective psychosis (83% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): 400,5 mg/day	N=52, 8% attrition rate	8	Metacognitive training (MCT), 1h/week, N=26	Multidisciplinary treatment as usual including psychoeducation, N=26	69	Positive Symptoms
Fernandez-Gonzalo 2015	Spain, single center Outpatients Recent onset (<5 years)	Gender: 10% female Age: 30,5 years Illness duration: 2,6 years Onset: 27,9 years Education: 12,1 years IQ: 83,9 Diagnosis: schizophrenia	N=53, 21% attrition rate	22	Computer-assisted remediation using NPT-MH, 2 sessions/week of 1h each, N=28	Non-specific computer activities, N=25	40	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

		(81%), schizoaffective disorder Baseline PANSS: 56,4 Daily drug dose (CPZeq): n.i.						
Fisher 2015	USA, multi-center Outpatients Recent onset (<2 years)	Gender: 23,6% female Age: 21,2 years Illness duration: 1,63 years Onset: 19,6 years Education: 12,9 years IQ: 101,7 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 58,8 Daily drug dose (CPZeq): 245,9 mg/day	N=121, 29% attrition rate	8	Computer-assisted remediation using Posit Science Auditory training, 5 sessions/week of 1h each, N=63	Computer games, N=58	68	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms
Fisher 2009-2016	USA, single center Outpatients	Gender: 27,6% female Age: 41,9 years Illness duration and onset: n.i. Education: 13,3 years IQ: 102,3 Diagnosis: schizophrenia Baseline PANSS: 73,7 Daily drug dose (CPZeq): 370,6 mg/day	N=87, 15% attrition rate	10	Computer-assisted remediation using Posit Science Auditory training, 5 sessions/week of 1h each, N=46	Computer games, N=41	70	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms
Fiszdon 2016	USA, single center Outpatients	Gender: 26,7% female Age: 47,8 years Illness duration and onset: n.i. Education: 12,4 years IQ: 93,6 Diagnosis: psychotic disorder (81% schizophrenia, affective psychosis included) Baseline PANSS: 52,7 Daily drug dose (CPZeq): n.i.	N=75, 17% attrition rate	9	Computer-assisted remediation using PSS CogRehab tasks, 5 sessions/week of 1h hour each, N=50	Treatment as usual, N=25	39	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Galderisi 2010	Italy, multi-center Outpatients	Gender: 33,3% female Age: 39,8 years Illness duration: 15 years	N=60, 37% attrition rate	26	Social Skills and Neurocognitive Individualized Training (SSANIT), 2 sessions/week of 1h each, N=30	Structured leisure activities, N=30	63	Global Functioning

		Onset: 24,6 years Education: 10,3 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): 506,5 mg/day						
Garcia 2003	Spain, single center Outpatients	Gender: 30% female Age: 38,8 years Illness duration: 18,2 years Onset: 20,6 years Education: n.i. IQ: 74,8 Diagnosis: schizophrenia Baseline PANSS: 52,1 Daily drug dose (CPZeq): n.i.	N=23, 13% attrition rate	12	Integrated Psychological Therapy (IPT) Social perception subprogram, 2 sessions/week of 30-60min each, N=13	Treatment as usual, N=10	27	Global Cognition Attention/Vigilance Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Garcia-Fernandez 2019	Spain, single center Outpatients Recent onset (<1 year)	Gender: 31,4% female Age: 25,5 years Illness duration and onset: n.i. Education: 13,4 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 108,8 Daily drug dose (CPZeq): 1067,6 mg/day	N=110, 22% attrition rate	12	Computer-assisted remediation using Rehacom, 2 sessions/week of 1h each, N=54	Computer activities, N=56	73	Global Cognition All cognitive domains Global Functioning
Garrido 2013	Spain, single center Outpatients	Gender: 26,8% female Age: 33,3 years Illness duration: 11,4 years Onset: 21,9 years Education: 9,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 55,9 Daily drug dose (CPZeq): 317 mg/day	N=67, 27% attrition rate	26	Computer-assisted remediation, 2 sessions/week of 1h each, N=38	Video watching, N=29	70	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning
Gawęda 2015	Poland, single center Outpatients	Gender: 50% female Age: 51 years Illness duration: 21,8 years	N=50, 12% attrition rate	4	Metacognitive Training (MCT), 2 sessions/week of 45-60min each, N=26	Treatment as usual (intensive daily rehabilitation including psychoeducation), N=24	57	Global Cognition Processing Speed Working Memory Social Cognition Positive Symptoms

		Onset: 28,8 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 488 mg/day						
Gharaeipour 2012	Iran, single center Inpatients	Gender: 29% female Age: 28,7 years Illness duration: 15,3 years Onset: n.i. Education: 10,7 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=42, no dropouts	9	Own program, 5 sessions/week of 1h each + 1 group discussion/week, N=21	Group supportive therapy including psychoeducation elements, N=21	65	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Positive Symptoms Negative Symptoms
Gohar 2013	Egypt, single center Outpatients	Gender: 19% female Age: 31,9 years Illness duration: 10,2 years Onset: 22 years Education: 12,4 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 83 Daily drug dose (CPZeq): n.i.	N=42, no dropouts	8	Social Cognitive Skills Training (SCST), 2 sessions (week of 1h each, N=22	UCLA Skills Training, N=20	55	Global Cognition Social Cognition Global Symptoms Positive Symptoms Negative Symptoms
Gomar 2015	Spain, multi-center Inpatients	Gender: 31,5% female Age: 46,1 years Illness duration: 23,4 years Onset: 22,7 years Education: 9,7 years IQ: 86,1 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 75,9 Daily drug dose (CPZeq): 663,7 mg/day	N=130, 18% attrition rate	26	Computer-assisted remediation using FesKits, 2 sessions/week of 45min each, N=43	Computerized typing program, N=44 Treatment as usual, N=43	92	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning
Gordon 2018	Australia, multi-center Outpatients	Gender: n.i. Age: 35,5 years	N=36, 8% attrition rate	10	Social Cognition and Interaction Training (SCIT), 2 sessions/week of 1h each, N=21	Treatment as usual, Waiting list, N=15	59	Global Cognition Social Cognition Global Functioning

		Illness duration: 9,8 years Onset: 25,7 years Education: n.i. IQ: n.i. Diagnosis: non-affective psychosis (72% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.						
Greig 2007	USA, single center Outpatients	Gender: 46,8% female Age: 40,4 years Illness duration: 16,3 years Onset: 24,1 years Education: 12,7 years IQ: 87,1 Diagnosis: schizophrenia (66%), schizoaffective disorder Baseline PANSS: 79,5 Daily drug dose (CPZeq): n.i.	N=77, 19,5% attrition rate	52	Neurocognitive Enhancement Therapy (NET), 11h/week, + Vocational rehabilitation, N=40	Vocational rehabilitation, N=37	60	Global Cognition Working Memory Verbal Memory Visual Memory Executive Functions Social Cognition
Habel 2010	Germany, single center In- and outpatients	Gender: 100% male Age: 32,6 years Illness duration and onset and education: n.i. IQ: 111,4 Diagnosis: schizophrenia Baseline PANSS: 62,8 Daily drug dose (CPZeq): n.i.	N=20, no dropouts	6	Training of Affect Recognition (TAR), 12 sessions total of 45 min each, N=10	Treatment as usual, N=10	27	Global Cognition Social Cognition
Hadas-Lidor 2001	Israel, single center Outpatients	Gender: 39,6% female Age: 36 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=72, 19,5% attrition rate	52	Instrumental Enrichment program, 2-3 sessions/week of 1h each, N=36	Occupational therapy, treatment as usual consisting of daily rehabilitation program, N=36	54	Global Cognition Working Memory Verbal Memory Visual Memory
Hegde 2012	India, single center Outpatients	Gender: 17% female Age: 29,3 years	N=45, 31% attrition rate	9	Home-based program, flexible schedule over time, N=22	Treatment as usual including psychoeducation, N=23	35	Global Cognition Attention/Vigilance Executive Functions

	First-episode and recent onset (<2 years)	Illness duration and onset: n.i. Education: 12,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 89,7 Daily drug dose (CPZeq): 204 mg/day						Negative Symptoms
Hermanutz 1991	Germany, single center Inpatients	Gender: n.i. Age: 31,3 years Illness duration and onset: n.i. Education: 11 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 90,9 Daily drug dose (CPZeq): n.i.	N=30, no dropouts	4	Computer-assisted Attention training, unspecified schedule, N=10, or Integrated Psychological Therapy (IPT) selected subprograms, N=10	Treatment as usual, N=10	65	Global Cognition Attention/Vigilance Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Hodge 2010	Australia, multi-center In- and outpatients	Gender: 40,6% female Age: 31,3 years Illness duration and onset: n.i. Education: 11 years IQ: 93,7 Diagnosis: schizophrenia Baseline PANSS: 69,2 Daily drug dose (CPZeq): 649,9 mg/day	N=69, 48% attrition rate	10	Neuropsychological and Educational Approach to Remediation (NEAR), 2 sessions/week of 1h each, N=36	Treatment as usual, Waiting list N=33	60	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions
Hogarty 2004	USA, single center Outpatients	Gender: 41% female Age: 37,2 years Illness duration: 15,7 years Onset: 21,5 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia (70%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=121, 11,5% attrition rate	104	Cognitive Enhancement Therapy (CET), almost 2,5h/week, + Enriched supportive therapy, N=67	Enriched supportive therapy (including skills training and psychoeducation), N=54	63	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning
Hooker 2012	USA, single center Outpatients	Gender: 18% female Age: 46,1 years Illness duration: 24,3 years Onset: 21,8 years	N=22, no dropouts	10	Computer-assisted remediation using Posit Science Auditory training + Social cognition Training, 5 sessions/week of	Computer games, N=11	66	Global Cognition Social Cognition Global Functioning

		Education: 13,3 years IQ: 100,9 Diagnosis: schizophrenia (59%), schizoaffective disorder Baseline PANSS: 72,2 Daily drug dose (CPZeq): 312 mg/day			65-75min each, N=11			
Horan 2009	USA, single center Outpatients	Gender: 6% female Age: 48,2 years Illness duration and onset: n.i. Education: 12,3 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=34, 9% attrition rate	6	Social Cognitive Skills Training (SCST), 2 sessions/week, N=17	UCLA Illness Self-Management and Relapse Prevention Training, N=17	39	Global Cognition Social Cognition Global Symptoms Positive Symptoms Negative Symptoms
Horan 2011	USA, single center Outpatients	Gender: 11,8% female Age: 48,1 years Illness duration: 25,6 years Onset: 22,5 years Education: 12,9 years IQ: n.i. Diagnosis: non-affective psychosis (71% schizophrenia) Baseline PANSS: 55,9 Daily drug dose (CPZeq): n.i.	N=85, 22% attrition rate	12	Computer-assisted neurocognitive training using Posit Science Aristotle (NR), N=24 Social Cognitive Skills Training (SCST), N=19 Hybrid training (SCST+NR), N=21 In all cases: 2 sessions/week of 1h each	UCLA Skills Training, N=21	69	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Horan 2018	USA, single center Outpatients	Gender: 30,2% female Age: 47,3 years Illness duration: 25,6 years Onset: 21,7 years Education: 12,4 years IQ: n.i. Diagnosis: non-affective psychotic disorder Baseline PANSS: 50,9 Daily drug dose (CPZeq): n.i.	N=139, 6,5% attrition rate	12	Social Cognitive Skills Training (SCST) either in vivo, N=41 or clinic, N=49 In both cases: flexible schedule, 2 to 3 sessions/week of 1h each.	UCLA Illness Management Skills Training, N=49	85	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

Iwata 2017	Japan, multi-center Outpatients	Gender: 75% female Age: 34,4 years Illness duration: 11,9 years Onset: 22,5 years Education: n.i. IQ: 97,9 Diagnosis: schizophrenia Baseline PANSS: 58,9 Daily drug dose (CPZeq): 673,3 mg/day	N=60, no dropouts	12	Thinking Skills for Work, 2 sessions/week of 45-60 min each +1-group session/week, N=29	Treatment as usual including social skills training and psychoeducation, waiting list, N=31	67	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Jahshan 2019	USA, single center In- and outpatients	Gender: 22,2% female Age: 51,3 years Illness duration: 29,7 years Onset: 21,6 years Education: 12,8 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 53,1 Daily drug dose (CPZeq): n.i.	N=99, 16% attrition rate	12	Computer-assisted remediation using either Brain Fitness, N=39 or Cogpack, N=40 In both cases: 3 sessions/week	Computer games, N=20	69	Global Cognition All cognitive domains Global Functioning
Kanie 2019	Japan, multi-center Outpatients	Gender: 42,2% female Age: 36,5 years Illness duration: 14 years Onset: 22,5 years Education: 13,5 years IQ: 101,4 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 64,3 Daily drug dose (CPZeq): 632,5 mg/day	N=72, 15% attrition rate	24	Social Cognition and Interaction Training (SCIT), 20-24h/week, N=36	Multidisciplinary treatment as usual, N=36	75	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Kantrowitz 2016	USA, multi-center Outpatients	Gender: 35% female Age: 37,7 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 70,3	N=133, 34% attrition rate	15	Computer-assisted remediation using Posit Science Brain Fitness + bridging groups using Neuropsychological and Educational Approach to Remediation (NEAR), 2 sessions/week, N=63	Videogames, N=70	74	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

		Daily drug dose (CPZeq): 253 mg/day; stabilized on lurasidone at study start						
Katsumi 2019	Japan, single center Outpatients	Gender: 40,9% female Age: 37,8 years Illness duration: 13,9 years Onset: 23,9 years Education: 12 years IQ: 90,7 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 66,6 Daily drug dose (CPZeq): 664,4 mg/day	N=44, no dropouts	5	Neuropsychological and Educational Approach to Remediation (NEAR), 4 sessions/week, of 40-60min each, N=22	Treatment as usual consisting of an integrative rehabilitation program, N=22	42	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Keefe 2012	USA multi-center Outpatients	Gender: 26,4% female Age: 37 years Illness duration and onset: n.i. Education: 13,5 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 56,2 Daily drug dose (CPZeq): n.i.	N=53, 11% attrition rate	8	Computer-assisted remediation using Posit Science Brain Fitness + bridging groups using NEAR, 40h/week (flexible schedule), N=27	Computer games and Healthy lifestyle groups, N=26	82	Global Cognition All cognitive domains Global Functioning Global Symptoms
Kidd 2014	Canada, single center Outpatients, university students	Gender: 54% female Age: 34,2 years Illness duration: 6,9 years Onset: 27,3 years Education: 12,5 years IQ: n.i. Diagnosis: any psychotic disorder (affective psychosis included, 56% schizophrenia) Baseline PANSS: 65,1 Daily drug dose (CPZeq): n.i.	N=37, 16% attrition rate	20	Computer-assisted remediation using Cogpack, 2 sessions/week of 50min each + Group discussions 50min/week + Supported education program, N=19	Supported education program, N=18	65	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
Klingberg 2011	Germany, multi-center Outpatients	Gender: 43,9% female Age: 36,9 years Illness duration: 12,5 years Onset: 24,4 years	N=198, 15% attrition rate	39	Computer-assisted remediation using Cogpack, 20 sessions total, of almost 50min each, N=99	Cognitive Behavioral Therapy (CBT), N=99	91	Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

		Education: n.i. IQ: 107,6 Diagnosis: schizophrenia Baseline PANSS: 59,4 Daily drug dose (CPZeq): 543 mg/day						
Kukla 2018	USA, single center Outpatients	Gender: 8% female Age: 48,5 years Illness duration and onset: n.i. Education: 12,9 years IQ: n.i. Diagnosis: schizophrenia (70%), schizoaffective disorder Baseline PANSS: 75,1 Daily drug dose (CPZeq): n.i.	N=50, 14% attrition rate	26	Computer-assisted remediation using Posit Science Fitness and Insight, 1 session/week, + Cognitive Behavioral Therapy (CBT), N=25	Cognitive Behavioral Therapy (CBT), N=25	67	Global Cognition All cognitive domains Global Functioning
Kumar 2010	India, single center Inpatients Acute phase	Gender: 100% male Age: 32,8 years Illness duration: 7,1 years Onset: 25,7 years Education: 9,3 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 98,2 Daily drug dose (CPZeq): n.i.	N=16, no dropouts	4	Metacognitive training (MCT), 2 sessions/week of 45-60min each, N=8	Treatment as usual including psychoeducation, N=8	37	Global Symptoms Positive Symptoms Negative Symptoms
Kurtz 2007	USA, multi-center Outpatients	Gender: 33,3% female Age: 35 years Illness duration: 10,5 years Onset: 24,5 years Education: 13,1 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=42, no dropouts	52	Computer-assisted remediation, 100h total, N=23	Computer skills training, N=19	63	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions
Kurtz 2015	USA, single center Outpatients	Gender: 27% female Age: 36,6 years Illness duration: 12,6 years	N=64, 12,5% attrition rate	26	Computer-assisted own program + Social Skills Training, 50h total, N=32	Computer games + Social Skills Training, N=32	70	Global Cognition Attention/Vigilance Working Memory Verbal Memory Executive Functions

		Onset: 24,1 years Education: 12,1 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.						Global Functioning
Lado-Colesido 2019	Spain, multi-center Outpatients	Gender: 45% female Age: 40,9 years Illness duration, onset and education: n.i. IQ: 97,9 Diagnosis: schizophrenia (90%), schizoaffective disorder Baseline PANSS: 54,4 Daily drug dose (CPZeq): 1008,3	N=53, attrition rate 5,7%	4	Voices program (from e-Motional training), 2 sessions/week of 30min each, N=27	Treatment as usual (including psychotherapy), N=26	63	Global Cognition Social Cognition
Lee 2013	South Korea, single center Inpatients	Gender: 45% female Age: 43,5 years Illness duration: 17,6 years Onset: 25,3 years Education: 12,8 years IQ: 99,7 Diagnosis: schizophrenia Baseline PANSS: 64 Daily drug dose (CPZeq): 316,8 mg/day	N=66, 9% attrition rate	13	Computer-assisted program using Cog-Trainer, 20 sessions total, N=33	Treatment as usual (including social skills training and psychoeducation), N=33	68	Global Cognition Attention/Vigilance Working Memory Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Lindenmayer 2008	USA, single center Inpatients	Gender: 11% female Age: 43,5 years Illness duration: 25,1 years Onset: 18,4 years Education: 10,6 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=85, 15% attrition rate	12	Computer-assisted remediation using Cogpack, 2-3 computerized sessions/week of 45min each, + 1h group discussions/week + Work program, N=45	Computer games + Work program, N=40	57	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions
Lu 2012	China, single center	Gender: 38,9% female	N=126, 3%	12	Cognitive Remediation Therapy (CRT), 5	Treatment as usual, N=63	43	Global Cognition Executive Functions

	Inpatients	Age: 37,5 years Illness duration: 23,5 years Onset: 14 years Education: 10,5 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 745,5 mg/day, the majority receiving clozapine	attrition rate		sessions/week of 45min each, N=63			Global Functioning
Mahncke 2019	USA, multi-center Outpatients	Gender: 19% female Age: 42.9 years Illness duration and onset: n.i. Education: 12.7 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=150, 35% attrition rate	26	Computer-assisted training using a selection of Posit Science tasks and novel exercises, 5 sessions/week of 1h each, N=75	Computer games, N=75	83	Global Cognition Global Functioning
Mak 2013	Poland, single center Outpatients	Gender: 54% female Age: 36,5 years Illness duration: 10 years Onset: 26,5 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 58 Daily drug dose (CPZeq): n.i.	N=81, dropouts n.i.	8	Computer-assisted remediation using Rehacom, 2 sessions/week of 40min each, N=41	Treatment as usual, N=40	38	Global Cognition Processing Speed Working Memory Executive Functions
Man 2012	Hong Kong, single center Inpatients	Gender: 36,6% female Age: 36,9 years Illness duration, onset and education: n.i. IQ: 89,1 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=90, 11% attrition rate	n.i.	Errorless learning training, either computer-assisted, N=30, or therapist-assisted, 12 sessions, N=26	Treatment as usual, N=34	57	Global Cognition Working Memory Verbal Memory Executive Functions
Maroño Souto 2018	Spain, multi-center Outpatients	Gender: 13% female Age: 39,2 years	N=61, 2% attrition rate	12	e-Motional training, 1h/week, N=30	Treatment as usual including psychotherapy, N=31	60	Global Cognition Social Cognition Positive Symptoms

		Illness duration, onset and education: n.i. IQ: 98,5 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 600,4 mg/day						Negative Symptoms
Matsuda 2018	Japan, multi-center Outpatients	Gender: 43,5% female Age: 37,1 years Illness duration: 13,5 years Onset: 23,6 years Education: 13,4 years IQ: 101,5 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=62, 5% attrition rate	12	Japanese Cognitive Rehabilitation Program for Schizophrenia (JCORES), 3 sessions/week of 1h each, N=31	Treatment as usual, N=31	69	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Matsui 2009	Japan, single center Outpatients	Gender: n.i. Age: 32,3 years Illness duration: 8,3 years Onset: 24 years Education: 12,7 years IQ: 99,9 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 182,5 mg/day	N=20, no dropouts	12	Own program, 1session/week of 40min, N=11	Treatment as usual (maintenance medication only), N=9	47	Global Cognition Working Memory Executive Functions Social Cognition Positive Symptoms Negative Symptoms
McGurk 2005	USA, multi-center Outpatients	Gender: 45,5% female Age: 35,6 years Illness duration: 12,9 years Onset: 22,7 years Education: 11,3 years IQ: n.i. Diagnosis: any psychotic disorder (affective psychosis included, 73% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=48, dropouts n.i.	12	Computer-assisted remediation using Cogpack, 2-3 sessions/week of 1h each, + Supported employment, N=25	Treatment as usual consisting of supported employment, N=23	62	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
McGurk 2016	USA, single center	Gender: 30% female	N=54, 5,5%	12	Thinking Skills for Work + Vocational	Enhanced Vocational	79	Global Cognition Processing Speed

	Outpatients, non-responsive to vocational rehabilitation	Age: 37,7 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: psychotic disorder (affective included, 81% schizophrenia) Baseline PANSS: 70,3 Daily drug dose (CPZeq): n.i.	attrition rate		Rehabilitation, 1-2 sessions/week of 45-60min each, N=28	Rehabilitation, N=26		Working Memory Verbal Memory Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
Medalia 1998	USA, single center Inpatients	Gender: 22,5% female Age: 32,5 years Illness duration and onset: n.i. Education: 10,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 61,1 Daily drug dose (CPZeq): n.i.	N=54, no dropouts	6	Attention Training, 3 sessions/week of 20min each, N=27	Video watching, N=27	43	Global Cognition Attention/Vigilance Global Symptoms
Medalia 2000	USA, single center Inpatients	Gender: 44,4% female Age: 36,3 years Illness duration: 15 years Onset: 21,3 years Education: 10,5 years IQ: n.i. Diagnosis: schizophrenia (75%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=54, dropouts n.i.	5	Memory remediation program, N=18 Or Processing Speed remediation program, N=18 In both cases: 2 sessions/week of 25min each	Treatment as usual, N=18	54	Global Cognition Verbal Memory Global Functioning
Meichenbaum 1973	Canada, single center Outpatients 50% acute phase	Gender: 100% male Age: 36 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=10, no dropouts	3	Self-instructional training group, own program, 8 sessions of 45 min each, N=5	Yoked practice group, N=5	65	Global Cognition Working Memory Executive Functions Positive Symptoms
Mendella 2015	Canada, single center Outpatients	Gender: 25,9% female Age: 24,9 years	N=31, 13% attrition rate	12	Compensatory Cognitive Training (CCT), 2	Treatment as usual consisting of OnTrack (multidisciplina	52	Global Cognition All cognitive domains

	First-episode	Illness duration and onset: n.i. Education: 13,2 years IQ: 99,4 Diagnosis: first-episode schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.			sessions/week of 1h each, N=16	ry program for first-episode patients), N=15		Global Functioning Positive Symptoms Negative Symptoms
Morimoto 2018	Japan, single center Outpatients	Gender: 39% female Age: 36,7 years Illness duration: 13 years Onset: 23,8 years Education: 13,7 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 75,6 Daily drug dose (CPZeq): 556,4 mg/day	N=31, no dropouts	12	Vocational and Cognitive Abilities Training (VCAT-J), 2 sessions/week of 1h each, N=16	Treatment as usual, waiting list, N=15	64	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Moritz 2011	Germany, single center In- and outpatients In remission at study start	Gender: 22,2% female Age: 32,8 years Illness duration and onset: n.i. Education: 10,6 years IQ: 100,8 Diagnosis: non-affective psychosis Baseline PANSS: 48,7 Daily drug dose (CPZeq): n.i.	N=37, no dropouts	8	Metacognitive Training (MCT), 1 session/week of 45-60min, N=18	Treatment as usual, Waiting List, N=18	67	Global Cognition Verbal Memory Visual Memory Positive Symptoms
Moritz 2015	Germany, multi-center In- and outpatients	Gender: 63,3% female Age: 39,3 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=90, 23% attrition rate	6	Home-based computer-assisted remediation using MyBrainTraining, flexible schedule, N=30, or Same program but metacognition-augmented, N=30	Treatment as usual, Waiting list, N=30	50	Negative Symptoms
Müller 2015	Germany, Austria and Switzerland, multi-center Outpatients	Gender: 31% female Age: 34,2 years Illness duration: 10,1 years	N=156, 10% attrition rate	15	Integrated Neurocognitive Therapy (INT), 2 sessions/week of 90 min each, N=81	Treatment as usual, N=75	87	Global Cognition All cognitive domains Global Functioning Global Symptoms

		Onset: 24,2 years Education: 11 years IQ: 104 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): 438,5 mg/day						Positive Symptoms Negative Symptoms
Müller 2017	Switzerland, Single center Outpatients Severe negative symptoms	Gender: 22,9% female Age: 35,5 years Illness duration: 10,8 years Onset: 24,7 years Education: 10,8 years IQ: 101,4 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 78 Daily drug dose (CPZeq): 405,4 mg/day	N=61, 10% attrition rate	15	Integrated Neurocognitive Therapy (INT), 2 sessions/week of 90 min each, N=28	Treatment as usual, N=33	71	Global Cognition Attention Processing Speed Verbal Memory Executive Functions Social Cognition Global Functioning Positive Symptoms Negative Symptoms
O'Reilly 2019	Ireland, single center Inpatients in a forensic setting (medium to high security)	Gender: 15,4% female Age: 41 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia (76%), schizoaffective disorder Baseline PANSS: 51,2 Daily drug dose (CPZeq): 488,5 mg/day	N=65, 11% attrition rate	14	Own program for forensic patients, 4 sessions/week, N=32	Treatment as usual, Waiting list, N=33	87	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Ochoa 2017	Spain, multi-center Outpatients Recent onset (< 5 years)	Gender: 30% female Age: 27,6 years Illness duration: 2,3 years Onset: 25,6 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia spectrum disorder Baseline PANSS: 54,3 Daily drug dose (CPZeq): 494,3 mg/d, typical and atypical	N=122; 27% attrition rate	8	Metacognitive Training (MCT), 1 session/week, N=65	Psychoeducation, N=57	71	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms

Ojeda 2012	Spain, single center Inpatients Study defined as treatment resistant	Gender: 21% female Age: 34,1 years Illness duration: 13 years Onset: 22,4 years Education: 9,2 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 99,3 Daily drug dose (CPZeq): 886,7 mg/day	N=93, 10% attrition rate	12	REHACOP, 3 sessions/week of 90 min each, N=47	Occupational group therapy, N= 46	64	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Omiya 2016	Japan, single center In- and outpatients	Gender: 59% female Age: 41 years Illness duration and onset: n.i. Education: 13,4 years IQ: 79,1 Diagnosis: schizophrenia Baseline PANSS: 78,6 Daily drug dose (CPZeq): 906,7 mg/day	N=17, no dropouts	26	Frontal/executive Program (FEP-J), 2 sessions/week of 1h each, N=8	Treatment as usual including psychotherapy, N=9	41	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms
Østergaard Christensen 2014	Denmark, multi-center Inpatients First-episode	Gender: 46,2% female Age: 24,9 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: first-episode of psychosis (schizophrenia 84%) Baseline PANSS: 54,2 Daily drug dose (CPZeq): n.i.	N=117, 16% attrition rate	16	Computer-assisted remediation, 2 sessions/week of 1h each, integrated with OPUS program, N=60	Treatment as usual consisting of a tailored comprehensive psychosocial program (OPUS), N=57	84	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Peña 2016	Spain, single center In- and outpatients	Gender: 28% female Age: 39 years Illness duration: 15,8 years Onset: 23,2 years Education: 10,4 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 488,9 mg/day	N=104, 3% attrition rate	17	REHACOP, 3 sessions/week of 90 min each, N=52	Occupational group activities, N=52	76	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Penades 2006	Spain, single center Outpatients	Gender: 42,5% female Age: 35,1 years	N=40, 17,5% attrition rate	17	Frontal/Executive Program, 2-3 sessions/week of 1h each, N=20	Cognitive Behavioral Therapy for	67	Global Cognition Processing Speed Working Memory

	Predominantly negative symptoms	Illness duration: 13,8 years Onset: 21,3 years Education: 11,6 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 67 Daily drug dose (CPZeq): 361,3 mg/day				psychosis (CBTp), N=20		Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Penades 2013	Spain, single center Outpatients Predominantly negative symptoms	Gender: 22,9% female Age: 37 years Illness duration: 12,9 years Onset: 24 years Education: 11,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 64,7 Daily drug dose (CPZeq): 269,4 mg/day	N=35, dropouts n.i.	17	Frontal/Executive Program, 2-3 sessions/week of 1h each, N=17	Social Skills Training, N=18	72	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions
Penades 2018	Spain, single center Outpatients	Gender: 31,4% female Age: 40,1 years Illness duration: 15,9 years Onset: 24,2 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 100,4 Daily drug dose (CPZeq): 371,8 mg/day	N=70, 7,1% attrition rate	17	Frontal/Executive Program, 2-3 sessions/week of 1h each, N=35	Social Skills Training, N=35	76	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms
Pijnenborg 2019	The Nederlands, multi-center In- and outpatients	Gender: 21,5% female Age: 39,7 years Illness duration: 12,7 years Onset: 27 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 62,6 Daily drug dose (CPZeq): n.i.	N=121, 13% attrition rate	6	Cognitive Remediation Therapy (CRT), 2 sessions/week of 1h each, N=62	REFLEX program, N=59	72	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Pontes 2013	Brazil, single center Outpatients	Gender: 18% female Age: 38,1 years Illness duration: 15,2 years	N=17, 6% attrition rate	20	Cognitive Attention and Memory Training, 1 session/week of 40-60min, N=9	Newspaper reading groups, N=8	72	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory

		Onset: 23 years Education: 10,3 years IQ: 93,7 Diagnosis: schizophrenia Baseline PANSS: 48 Daily drug dose (CPZeq): n.i.						Executive Functions Global Symptoms Positive Symptoms Negative Symptoms
Popova 2014	Germany, single center Inpatients	Gender: 33,8% female Age: 37,3 years Illness duration and onset: n.i. Education: 11,2 years IQ: 106,3 Diagnosis: schizophrenia Baseline PANSS: 70,3 Daily drug dose (CPZeq): 601,4 mg/day	N=80, 24% attrition rate	4	Computer-assisted Facial affect and working memory training, N=29 or Auditory discrimination and working memory training, N=27 In both cases 5 sessions/week of 1h each	Treatment as usual, N=24	58	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Puig 2014	Spain, single center Outpatients Adolescents	Gender: 48% female Age: 16,7 years Illness duration: 1,4 years Onset: 15,3 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia (88%), schizoaffective disorder Baseline PANSS: 60,1 Daily drug dose (CPZeq): 451,8 mg/day	N=51, 43% attrition rate	20	Cognitive Remediation Therapy (CRT), 2 sessions/week, N=25	Treatment as usual (including psychoeducation), N=26	62	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Global Functioning Global Symptoms
Rakitzi 2016	Greece, single center Outpatients	Gender: 33% female Age: 32,6 years Illness duration: 5,7 years Onset: 26,9 years Education: n.i. IQ: 89,8 Diagnosis: schizophrenia Baseline PANSS: 118,4 Daily drug dose (CPZeq): 527,1 mg/day	N=48, 25% attrition rate	10	Integrate Psychological Therapy (IPT), cognitive subprograms, 2 sessions/week of 1h each, N=24	Treatment as usual, N=24	65	Global Cognition Attention/Vigilance Working Memory Verbal Memory Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Ramsay 2017	USA, single center Outpatients	Gender: n.i. Age: 44,2 years Illness duration: 19,9 years Onset: 24,3 years	N=27, 4% attrition rate	16	Computer-assisted remediation, 3 sessions/week of 1h each, N=15	Computer skills training, N=12	57	Global Cognition Working Memory Global Functioning

		Education: 13 years IQ: 102,8 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: 59,3 Daily drug dose (CPZeq): 449,1 mg/day						
Rass 2012	USA, single center Outpatients	Gender: 33,3% female Age: 41,5 years Illness duration: 18,1 years Onset: 23,4 years Education: n.i. IQ: 95,1 Diagnosis: schizophrenia (50%), schizoaffective disorder Baseline PANSS: 56,9 Daily drug dose (CPZeq): n.i.	N=48, 6% attrition rate	10	Computer-assisted remediation using Posit Science tasks, 2 sessions/week of 2h each, N=21	TV watching, N=17, or Treatment as usual, N=10	65	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory
Reeder 2017	Great Britain, single center In- and outpatients	Gender: 35,5% female Age: 38,3 years Illness duration and onset: n.i. Education: 13,2 years IQ: 93,5 Diagnosis: schizophrenia, schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): 333,3 mg/day	N=93, 6,5% attrition rate	12	Computer-assisted remediation using CIRCuiTS, 3 sessions/week of 1h each, N=46	Multidisciplinary treatment as usual, N=47	80	Global Cognition Working Memory Visual Memory Global Functioning Positive Symptoms Negative Symptoms
Roberts 2014	USA, single center Outpatients	Gender: 33% female Age: 39,7 years Illness duration: 16,8 years Onset: 23 years Education: n.i. IQ: 99,2 Diagnosis: schizophrenia spectrum disorder (42% schizophrenia) Baseline PANSS: 65,3 Daily drug dose (CPZeq): 632,6 mg/day	N=66, 9% attrition rate	26	Social Cognition and Interaction Training (SCIT), 1h/week, N=33	Treatment as usual, N=33	64	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Roncone 2004	Italy, single center	Gender: 35% female	N=20, no	22	Instrumental Enrichment program,	Treatment as usual, N=10	51	Global Cognition Processing Speed

	Inpatients	Age: 33,7 years Illness duration: 14 years Onset: 19,7 years Education: 11,5 years IQ: 84,2 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	dropouts		modified version, 1h/week, N=10			Executive Functions Social Cognition Negative Symptoms
Royer 2012	France, single center Outpatients	Gender: n.i. Age: 32,8 years Illness duration: 11,1 years Onset: 21,7 years Education: 11,4 years IQ: 99,5 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=58, 21% attrition rate	26	Computer-assisted remediation using Rehacom + paper-and-pencil exercises, 6h/week, N=31	Treatment as usual, N=27	47	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Executive Functions
Sachs 2012	Austria, single center In- and outpatients Recent onset (<5 years)	Gender: 47% female Age: 29,3 years Illness duration: 5 years Onset: 24,3 years Education: 14,2 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=40, 5% attrition rate	6	Training of Affect Recognition (TAR), 2 sessions/week of 45min each, N=20	Treatment as usual, N=20	39	Global Cognition Attention/Vigilance Processing Speed Working Memory Executive Functions Social Cognition Global Functioning Negative Symptoms
Sanchez 2014	Spain, single center Inpatients	Gender: 24% female Age: 35,5 years Illness duration: 13,4 years Onset: 22,1 years Education: 9,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 90,9 Daily drug dose (CPZeq): 718,3 mg/day	N=92, 9% attrition rate	12	REHACOP, 3 sessions/week of 90 min each, N=38	Group activities, N=54	67	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Sartory 2005	Germany, single center	Gender: 33,3% female	N=42, no	3	Computer-assisted remediation using	Treatment as usual, Waiting list N=21	60	Global Cognition Processing Speed

	Outpatients	Age: 31,9 years Illness duration: 6,2 years Onset: 25,8 years Education: 10,3 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 567,9 mg/day	dropouts		Cogpack, 5 sessions/week of 45min each, N=21			Working Memory Verbal Memory
Sevos 2018	France, single center In- and outpatients	Gender: 26% female Age: 41,2 years Illness duration: 15,1 years Onset: 26,1 years Education: 10,8 years IQ: 96,7 Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=31, no dropouts	10	CineMotion, 1 sessions/week of 90 min, N=16	Treatment as usual including psychotherapy and psychoeducation, N=15	44	Global Cognition Social Cognition
Silverstein 2005	USA, single center Inpatients Study defined as treatment resistant	Gender: 12,9% female Age: 39,3 years Illness duration and onset: n.i. Education: 10,5 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=31, dropouts n.i.	6	Attentional Processing Training and Shaping + UCLA Skills Training, unspecified schedule, N=18	Manipulated treatment as usual + UCLA Skills Training, N=13	54	Global Cognition Attention/Vigilance Working Memory Verbal Memory Global Functioning Positive Symptoms Negative Symptoms
Silverstein 2009	USA, multi-center In- and outpatients Non responsive to vocational rehabilitation	Gender: 39% female Age: 39 years Illness duration and onset: n.i. Education: 11,4 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): 1035,3 mg/day	N=82, 22% attrition rate	34	Attentional Processing Shaping, 2 sessions/week of 1h each, + UCLA Basic Conversation Skills Training, N=47	UCLA Basic Conversation Skills Training, N=35	56	Global Functioning
So 2015	Hong Kong, single center Outpatients	Gender: 45,5% female Age: 33,9 years	N=44, 36% attrition rate	4	Metacognitive Training for delusions (MCTd), 1h/week, N=23	Treatment as usual, Waiting list N=21	65	Positive Symptoms

	Chronic, with active positive symptoms	Illness duration and onset: n.i. Education: 12,2 years IQ: n.i. Diagnosis: any psychotic disorder (61% schizophrenia) Baseline PANSS: 75,1 Daily drug dose (CPZeq): 274,4 mg/day						
Spaulding 1999	USA, single center Inpatients Severe functional impairment	Gender: 38,5% female Age: 35,7 years Illness duration: 11,9 years Onset: 23,8 years Education: 11,9 years IQ: n.i. Diagnosis: any psychotic disorder (affective psychosis included, 75% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): 1609,7 mg/day	N=91, 1% attrition rate	26	Integrated Psychological Therapy (IPT), cognitive subprograms, 2-3 sessions/week of 1h each, N=49	Manualized supportive therapy; treatment as usual including Social skills training, N=42	79	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Tan 2013	China, single center Outpatients	Gender: 43% female Age: 34,7 years Illness duration: 10,6 years Onset: 24,1 years Education: 11,1 years IQ: n.i. Diagnosis: schizophrenia (96%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=70, 34% attrition rate	12	Computer-assisted remediation, 3 sessions/week (5h/week), N=36	Physical exercise, N=34	79	Global Cognition Processing Speed Working Memory Verbal Memory
Tan 2016	China, single center Inpatients	Gender: 35% female Age: 46,4 years Illness duration: 22,7 years Onset: 23,7 years Education: 9,9 years IQ: 79,9 Diagnosis: schizophrenia	N=104, 13,5% attrition rate	10	Cognitive Remediation Treatment (CRT), 40 sessions total, 1h each, N=52	Music and Dance therapy, N=52	67	Global Cognition Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms

		Baseline PANSS: 66,4 Daily drug dose (CPZeq): 277,7 mg/day						Negative Symptoms
Tan 2019	China, multi-center Inpatients	Gender: 38,6% female Age: 45,1 years Illness duration: 20,4 years Onset: 24,5 years Education: 11,8 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 60,5 Daily drug dose (CPZeq): 391,3 mg/day	N=311, 14% attrition rate	12	Computer-assisted remediation, 4-5 sessions/week of 45min each, N=196	Leisure activities, N=115	83	Global Cognition All cognitive domains Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Tao 2015	China, single center Inpatients	Gender: 45% female Age: 29,3 years Illness duration and onset: n.i. Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 93,2 Daily drug dose (CPZeq): n.i.	N=86, no dropouts	12	Own program, 2 sessions/week of 30min each, N=44	Treatment as usual (maintenance medication only), N=42	26	Global Cognition Processing Speed Working Memory Executive Functions Global Symptoms
Tas 2012	Turkey, single center Outpatients	Gender: 49% female Age: 35,2 years Illness duration: 12,2 years Onset: 23 years Education: 11,1 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 58,9 Daily drug dose (CPZeq): 489,6 mg/day	N=49, 8% attrition rate	14	Social Cognition and Interaction Training, Family version (F-SCIT), 1 session/week of 80min, N=22	Social Stimulation, N=27	52	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Thomas 2018	USA, single center Inpatients in forensic setting Post-acute phase	Gender: 52% female Age: 35,1 years Illness duration: 15,7 years Onset: 19,4 years Education: 11,8 years IQ: n.i. Diagnosis: schizophrenia, schizoaffective disorder	N=46, 24% attrition rate	13	Targeted computer-assisted remediation using BrainHQ, 3-5 sessions/week of 1h each, N=24	Treatment as usual including psychotherapy, N=22	48	Global Cognition Attention/Vigilance Processing Speed Working Memory Verbal Memory Visual Memory Executive Functions Positive Symptoms Negative Symptoms

		Baseline PANSS: n.i. Daily drug dose (CPZeq): 1163,5 mg/day						
Twamley 2008-2012	USA, multi-center Outpatients	Gender: 35% female Age: 46,3 years Illness duration: 23,3 years Onset: 23,1 years Education: 12,9 years IQ: 106,9 Diagnosis: any psychotic disorder (affective psychosis included, 54% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): 383,8 mg/day	N=69, 26% attrition rate	12	Compensatory Cognitive Training (CCT), 2h sessions, unclear frequency, N=38	Treatment as usual (maintenance medication only), N=31	55	Global Cognition Processing Speed Working Memory Verbal Memory Global Functioning Negative Symptoms
Ueland 2004	Norway, single center Inpatients Adolescents	Gender: 46,2% female Age: 15,3 years Illness duration, onset and education: n.i. IQ: 88,6 Diagnosis: any psychotic disorder (affective included, 62% schizophrenia) Baseline PANSS: 73,2 Daily drug dose (CPZeq): n.i.	N=26, dropouts n.i.	12	Own program, with 2 out of 4 subprograms derived from IPT, 30h total, + Psychoeducation, N=14	Psychoeducation, N=12	50	Global Cognition Attention/Vigilance Processing Speed Working Memory Visual Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Van Oosterhout 2014	The Nederlands, multi-center In- and outpatients Chronic, with active positive symptoms	Gender: 28,6% female Age: 37,5 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: any psychotic disorder (64% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=154, 28% attrition rate	8	Metacognitive Training (MCT), 1h/week, N=75	Treatment as usual, N=79	84	Global Cognition Social Cognition Positive Symptoms
Vaskinn 2019	Norway, single center Outpatients	Gender: 33,3% female Age: 30,4 years Illness duration: 7,9 years	N=48, 17% attrition rate	8	Training of Affect Recognition (TAR), 2 sessions/week, N=24	Treatment as usual including psychoeducation and CBT, N=24	62	Global Cognition Social Cognition Global Functioning Global Symptoms Positive Symptoms

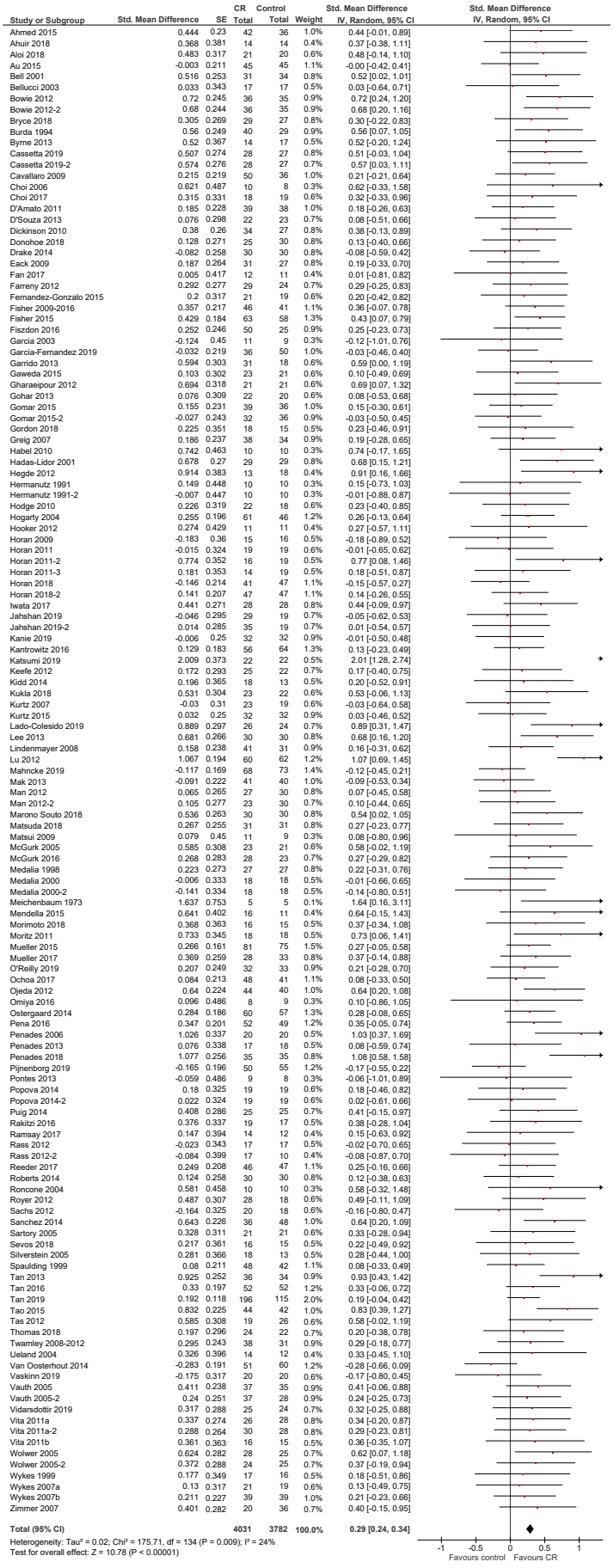
		Onset: 22,5 years Education: 12,2 years IQ: 101,9 Diagnosis: schizophrenia (81%), schizoaffective disorder Baseline PANSS: 43,7 Daily drug dose (CPZeq): n.i.						Negative Symptoms
Vauth 2005	Germany, single center Inpatients	Gender: 31,9% female Age: 28,8 years Illness duration: 6,1 years Onset: 22,7 years Education: 12,6 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=138, 27,5% attrition rate	8	Integrative remediation (CAT + Cogpack + non-computerized training), 2 sessions/week of 90 min each, + Vocational rehabilitation, N=47	Self-management training for negative symptoms + Vocational rehabilitation, N=45, or Vocational rehabilitation only, N=46	66	Global Cognition Processing Speed Verbal Memory Executive Functions Negative Symptoms
Ventura 2019	USA, single center Outpatients Recent onset (<2 years)	Gender: 22% female Age: 21,5 years Illness duration: 0,7 years Onset: 20,8 years Education: 12,4 years IQ: n.i. Diagnosis: non-affective psychosis (56% schizophrenia) Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=80, attrition rate n.i.	52	Neurocognitive Enhancement Therapy (NET) + Neuropsychological and Educational Approach to Remediation (NEAR), flexible schedule over time (from 3h/week to 2h/week every 2 weeks), N=39	Healthy Behavior training, N=41	54	Global Functioning Negative Symptoms
Vidarsdottir 2019	Iceland, single center Outpatients Recent onset	Gender: 12,3% female Age: 24,2 years Illness duration: 1,9 years Onset: 22,3 years Education: 11,3 years IQ: n.i. Diagnosis: any psychotic disorder (69% schizophrenia) Baseline PANSS: n.i.	N=49, 6% attrition rate	12	Integrative program including elements from SCIT and NEAR and computerized tasks, 2 sessions/week of 2h each, N=25	Treatment as usual, N=24	74	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Social Cognition Global Functioning Positive Symptoms Negative Symptoms

		Daily drug dose (CPZeq): n.i.						
Vita 2011 a	Italy, multi-center Inpatients	Gender: 30,9% female Age: 39 years Illness duration: 15,9 years Onset: 23,1 years Education: 10,5 years IQ: 86,7 Diagnosis: schizophrenia Baseline PANSS: 88,1 Daily drug dose (CPZeq): 660,1 mg/day	N=84, 2% attrition rate	24	Integrated Psychological Therapy (IPT), cognitive subprograms, N=26 Computer-assisted remediation using Cogpack, N=30 In both cases: 2 sessions/week of 45min each	Non-cognitive oriented rehabilitation adjunctive on treatment as usual, N=28	72	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Vita 2011 b	Italy, single center In- and outpatients	Gender: 16% female Age: 37,2 years Illness duration: 13,7 years Onset: 23,5 years Education: 10,4 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 94,9 Daily drug dose (CPZeq): 847,6 mg/day	N=32, 3% attrition rate	24	Integrated Psychological Therapy (IPT), cognitive subprograms, 2 sessions/week of 45 min each, N=16	Psychosocial rehabilitation adjunctive on treatment as usual, N=16	68	Global Cognition Processing Speed Working Memory Verbal Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Wölwer 2005	Germany, single center In- and outpatients	Gender: 22,1% female Age: 34,3 years Illness duration, onset and education: n.i. IQ: 106,4 Diagnosis: schizophrenia Baseline PANSS: 64,2 Daily drug dose (CPZeq): n.i.	N=77, 31% attrition rate	6	Training of Affect Recognition (TAR), N=28, or Computer-assisted remediation using Cogpack, N=24 In both cases: 2 sessions/week of 45min each	Treatment as usual, N=25	64	Global Cognition Working Memory Verbal Memory Social Cognition Global Symptoms Positive Symptoms Negative Symptoms
Wykes 1999	Great Britain, multi-center Outpatients	Gender: 24,2% female Age: 38,4 years Illness duration and onset: n.i. Education: 12,3 years IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 59,3 Daily drug dose (CPZeq): n.i.	N=33, 12% attrition rate	12	Cognitive Remediation Therapy (CRT), at least 3 sessions/week of 1h each, N=17	Occupational therapy, N=16	68	Global Cognition Processing Speed Working Memory Executive Functions Global Functioning Global Symptoms
Wykes 2007 a	Great Britain, single center	Gender: 35% female	N=40, 22,5%	14	Cognitive Remediation Therapy (CRT), 3	Treatment as usual, N=19	60	Global Cognition Working Memory

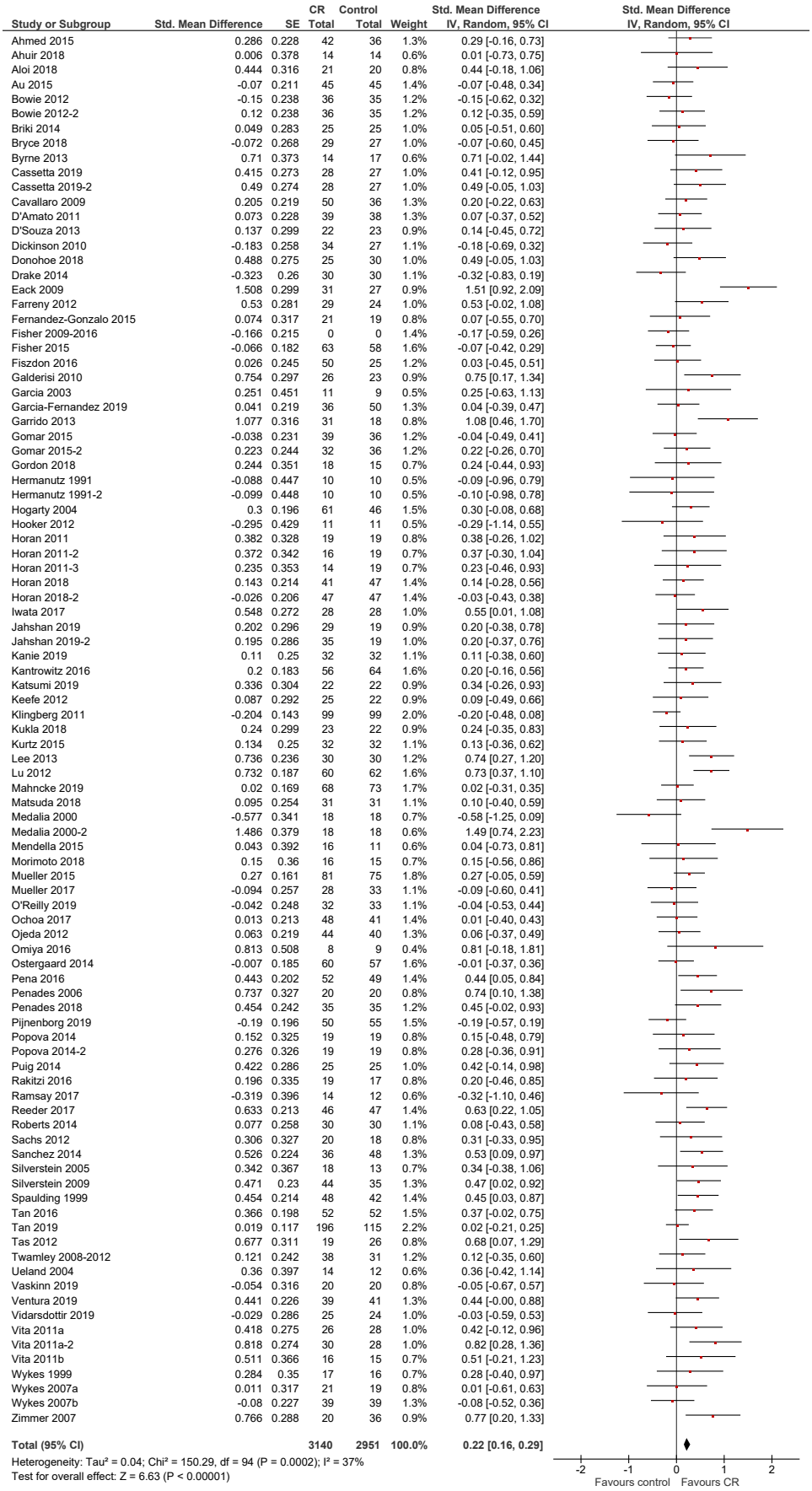
	Inpatients Adolescents and recent onset (<5 years)	Age: 18,2 years Illness duration: 1,2 years Onset: 17 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 67,9 Daily drug dose (CPZeq): n.i.	attrition rate		sessions/week of 1h each, N=21			Executive Functions Global Functioning Global Symptoms
Wykes 2007 b	Great Britain, multi-center Outpatients Severe functional impairment	Gender: 27% female Age: 36 years Illness duration, onset and education: n.i. IQ: n.i. Diagnosis: schizophrenia Baseline PANSS: 59,9 Daily drug dose (CPZeq): 334,4 mg/day	N=85, 8% attrition rate	12	Cognitive Remediation Therapy (CRT), 3 sessions/week, N=43	Treatment as usual, N=42	87	Global Cognition Working Memory Executive Functions Global Functioning Global Symptoms Positive Symptoms Negative Symptoms
Zimmer 2007	Brazil, single center Outpatients	Gender: 28% female Age: 38,2 years Illness duration: 16,5 years Onset: 21,7 years Education: n.i. IQ: n.i. Diagnosis: schizophrenia (95%), schizoaffective disorder Baseline PANSS: n.i. Daily drug dose (CPZeq): n.i.	N=66, 21% attrition rate	12	Integrated Psychological Therapy (IPT), 12week version, 1 session/week of 40min, N=23	Treatment as usual, N=43	66	Global Cognition Global Functioning

CTAM: Clinical Trials Assessment Measure
IQ: Intelligence quotient
PANSS: Positive And Negative Syndrome Scale
CPZeq: Chlorpromazine equivalents

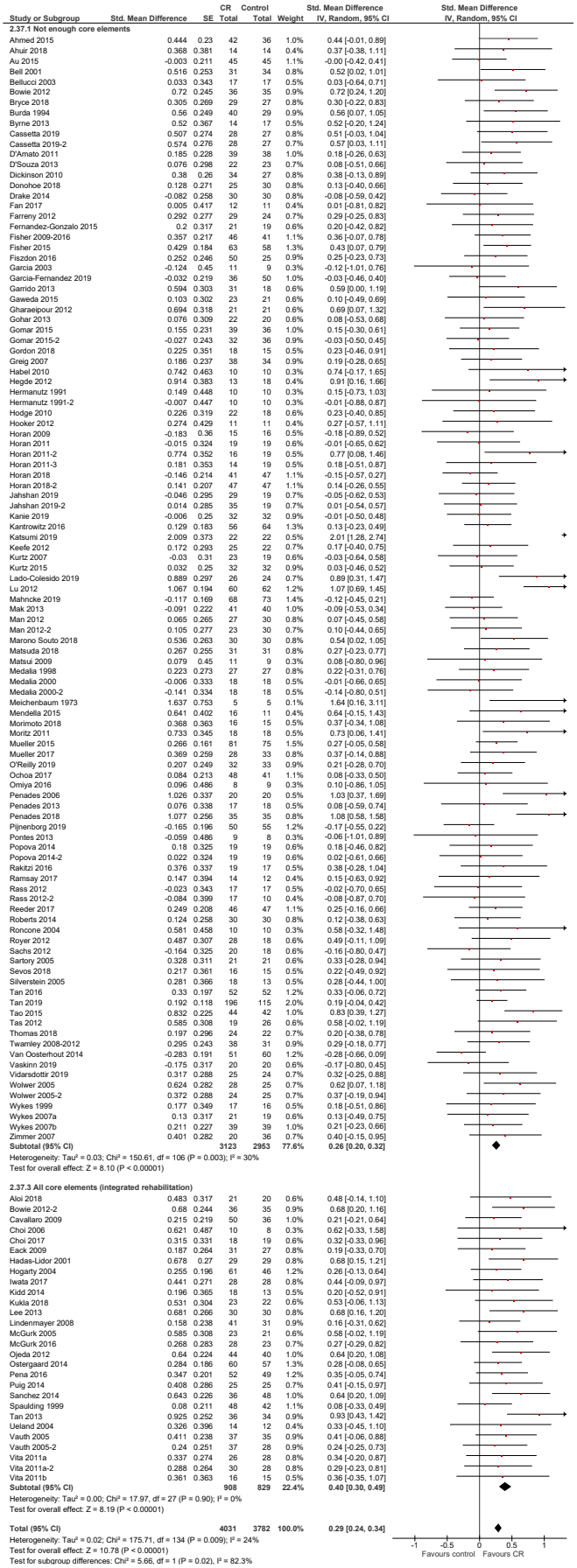
eFigure 1. Forest plot for the effects of cognitive remediation (CR) on global cognition



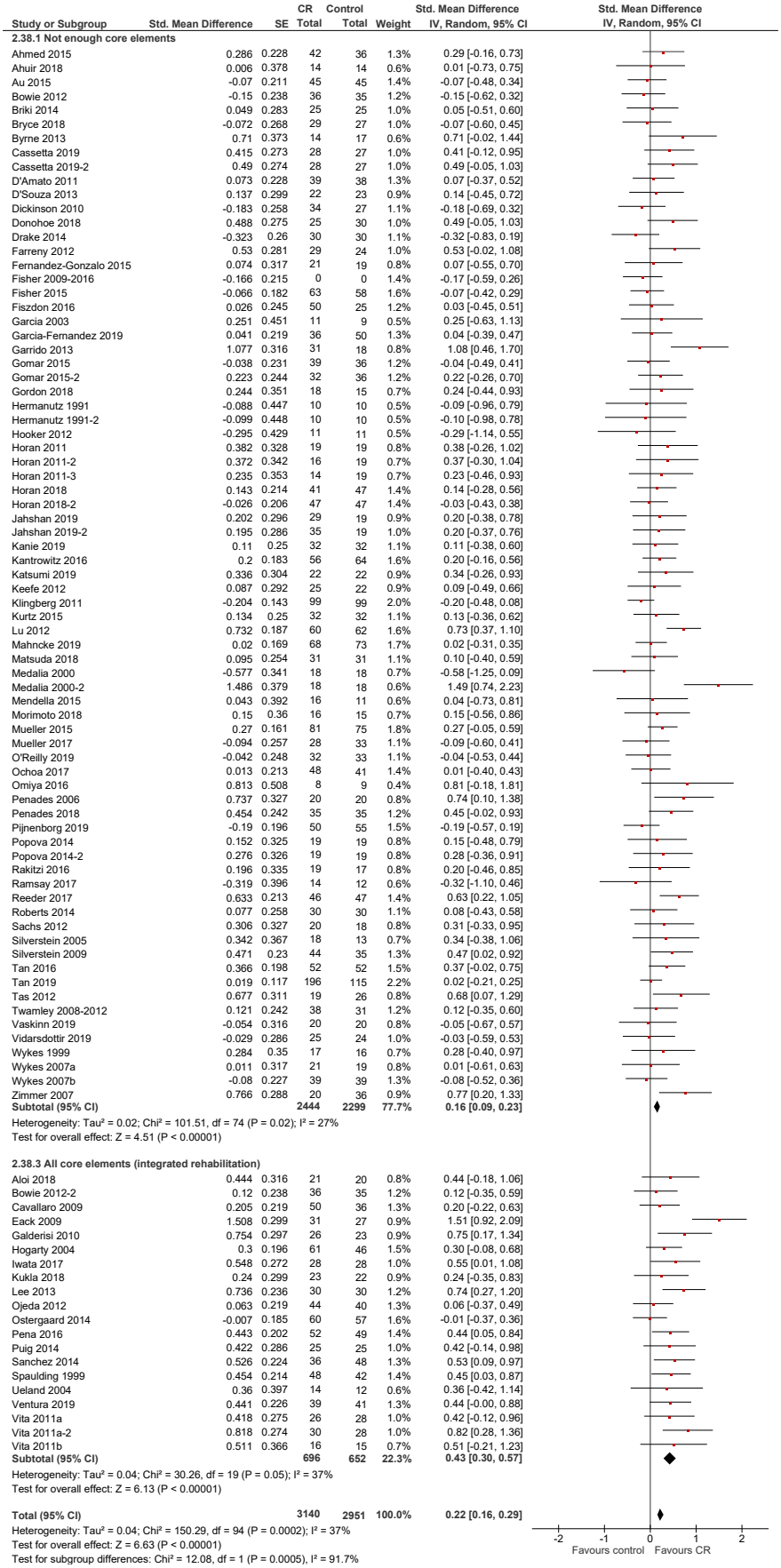
eFigure 2. Forest plot for the effects of cognitive remediation (CR) on global functioning



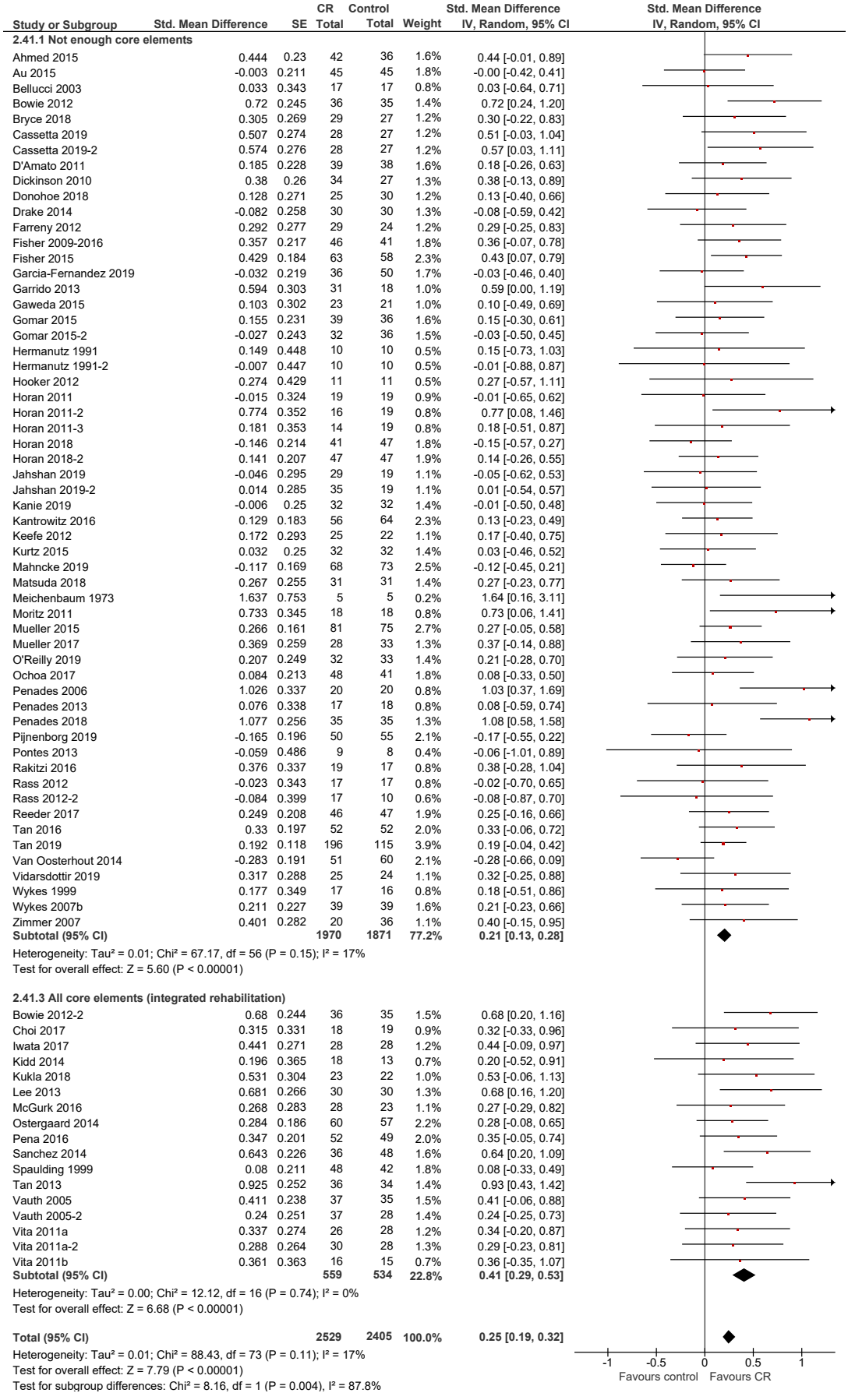
eFigure 3. Subgroup analysis for the effects of interventions including all core elements of cognitive remediation (global cognition)



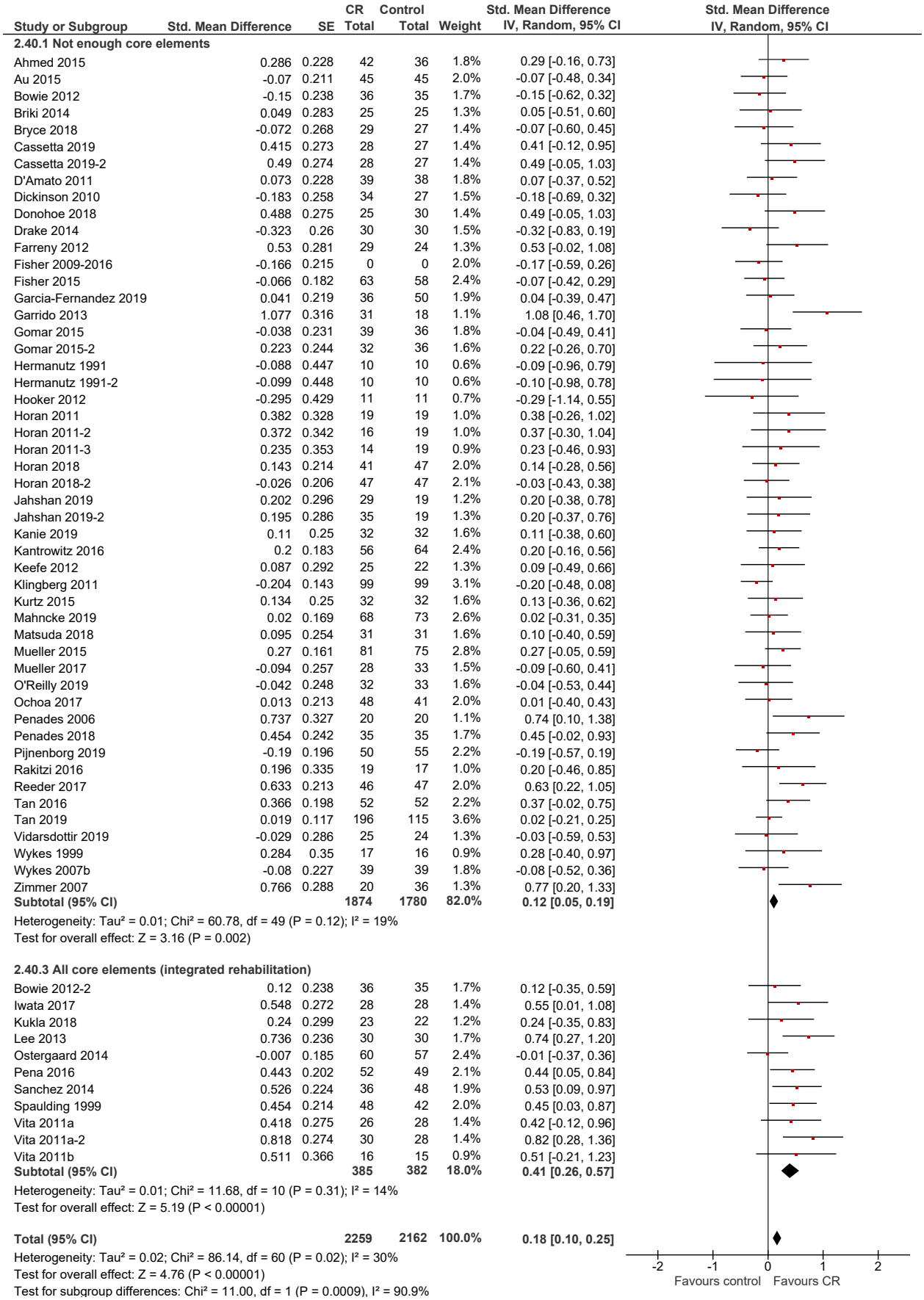
eFigure 4. Subgroup analysis for the effects of interventions including all core elements of cognitive remediation (global functioning)



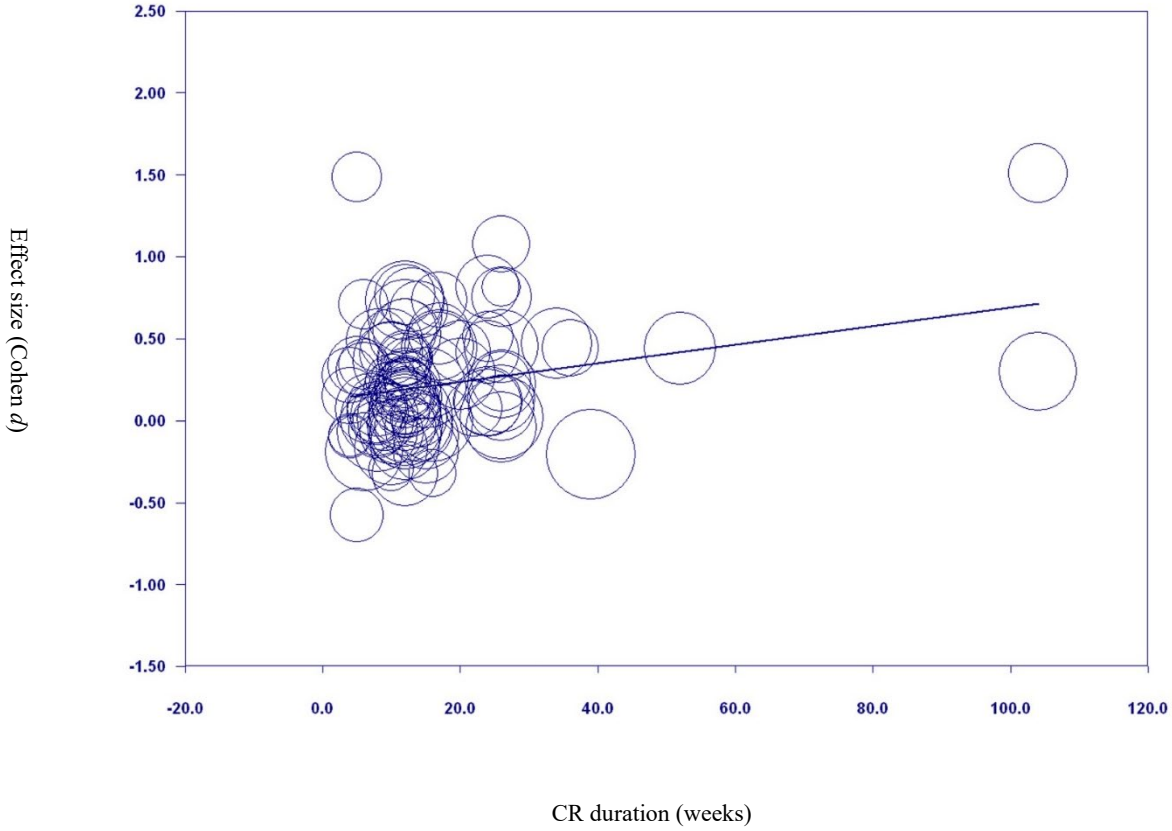
eFigure 5. Sensitivity analysis: subgroup analysis in eFigure 3 including only methodological adequate studies (global cognition)



eFigure 6. Sensitivity analysis: subgroup analysis in eFigure 4 including only methodological adequate studies (global functioning)



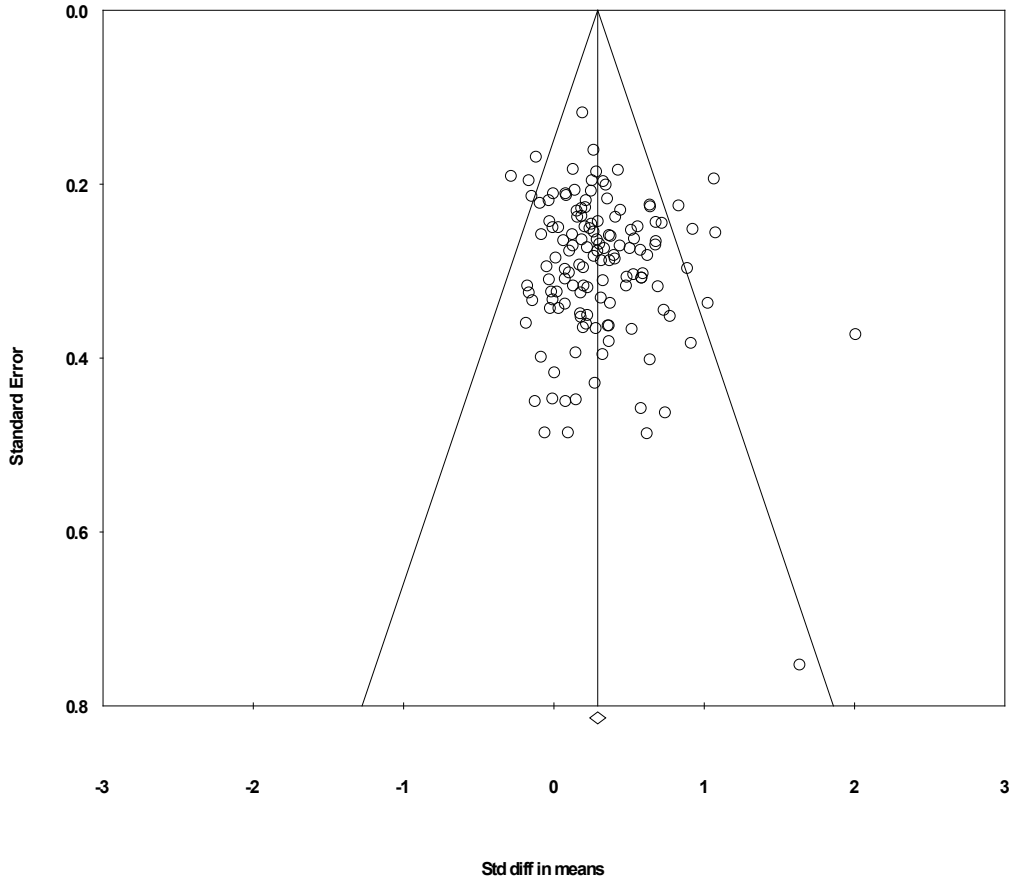
eFigure 7. Meta-analytic scatter plot for global functioning (expressed as Cohen *d*) and duration of cognitive remediation (CR) programs (in weeks).



The figure shows the direction of effect size for global functioning as a function of CR duration. Circles are proportionate to study weight in the analysis.

	N	Coefficient	SE	z-test	95% CI (lower limit)	95% CI (upper limit)	p value
Slope	95	0.006	0.002	2.76	0.002	0.010	0.006
Intercept		0.122	0.049	2.50	0.026	0.218	0.013

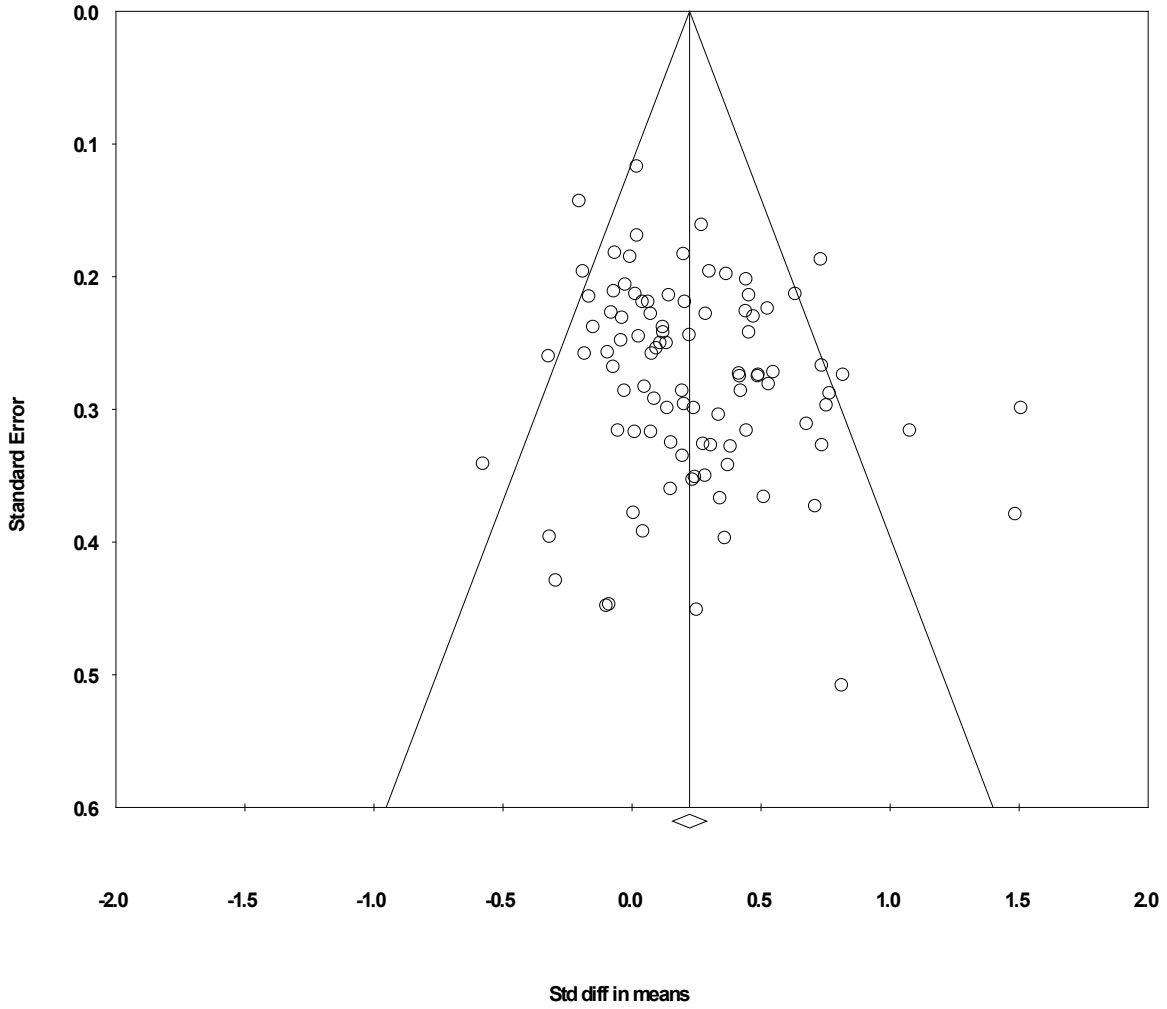
eFigure 8. Analysis of publication bias - Funnel plot for global cognition.



Test for asymmetry of funnel plot (linear regression of effect estimates on their standard errors weighted by their inverse variance – Egger test):

	N	Coefficient	SE	95% CI (lower limit)	95% CI (upper limit)	p value
Intercept	135	0.620	0.375	-0.121	1.362	0.100

eFigure 9. Analysis of publication bias – Funnel plot for global functioning.



Test for asymmetry of funnel plot (linear regression of effect estimates on their standard errors weighted by their inverse variance – Egger test):

	N	Coefficient	SE	95% CI (lower limit)	95% CI (upper limit)	p value
Intercept	95	1.211	0.468	0.281	2.140	0.011

Adjustment of effect estimates using the Duval and Tweedie trim and fill method (studies missing to the left of the mean; random-random effects model):

	N	Point Estimate	95% CI (lower limit)	95% CI (upper limit)
Observed	95	0.223	0.157	0.289
Adjusted	+0	0.223	0.157	0.289

Adjustment of effect estimates using the Duval and Tweedie trim and fill method (studies missing to the left of the mean; fixed-random effects model):

	N	Point Estimate	95% CI (lower limit)	95% CI (upper limit)
Observed	95	0.223	0.157	0.289
Adjusted	+20	0.104	0.028	0.180

A significant funnel plot asymmetry was observed at visual inspection and confirmed with the Egger test.
The trim and fill method, when applied with a random-random effect model, produced no adjustment of the effect estimate for studies missing on the left of the mean, while an adjustment comprising 20 studies was produced when using a fixed-random effect model.
The investigation of publication bias in the present work is complicated by the presence of heterogeneity between studies that is related to differences in methodological quality, in clinical settings and samples, in the implementation of interventions and in outcome measurement. Heterogeneity could represent a consistent explanation for the funnel plot asymmetry; this interpretation is also supported by the fact that subgroup analyses and meta-regressions based on methodological and clinical parameters (such as methodological quality, blinding of outcome assessment, intervention duration and implementation of CR with other psychosocial interventions) were found to be significant for functioning in particular. Furthermore, the investigation of functional outcome is intrinsically more prone to bias due to the assessment method (lack of standardized batteries, frequent use of self-report measures, investigation of different domains) and, in the studies included in the present work, it was more often evaluated by non—blind personnel, compared to cognition.
Small studies and feasibility trials represent a substantial proportion of the included studies, and it should be noted that the meta-regression on sample size revealed that this element was inversely related to the dimension of the effect detected on functioning. However, it is also true that in the field of psychosocial interventions large controlled trials are often hard to conduct, and small studies or pilot trials represent a typical situation for research on CR, which is implemented heterogeneously and inconsistently in clinical practice.
In this context, publication bias could represent one of the possible reasons for funnel plot asymmetry, but it is unlikely to be most prominent. Results of the trim-and-fill adjustment should therefore be interpreted cautiously and considered as one among the sensitivity analyses rather than as the “true” unbiased effect estimate.