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A Systematic Review of the Efficacy of Cognitive Stimulation Therapy (CST) on Quality of Life in Persons with Dementia

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INTRODUCTION

Dementia has become one of the most significant health challenges across the globe affecting about 35.6 million people and estimated to reach 115.4 million by 2050[1]. Dementia results in the deterioration of memory, thinking, behaviour and ability to complete adult activities[2].

Cognitive stimulation therapy (CST) is an overarching term that emcompasses all types of cognitive stimulating treatments. CST is typically provided in a group or individually as it creates an environment that is designed for a patient to have fun, learn or strengthen their relationships with others by preserving their cognitive skills for as long as possible. CST is based on implicit learning, stimulating language, and executive functioning[3]. CST includes activities focusing on orientation, reminiscence, new ideas, thoughts, and associations to promote continuity between treatment sessions[3].

Quality of life (QoL) is an established outcome measure of patients with dementia and is strongly influenced by an individual's environment and mood[4].

While there are many outcomes that can be examined with CST interventions, this systematic review focused on quality of life.

Terminology

Cognitive Stimulation Therapy (CST): non pharmacological and psychosocial intervention[5]

Quality of Life (QoL): physical, social, and psychological domains of health that are seen as areas that are influenced by a person's beliefs, expectations, experiences, and perceptions[6] .

Dementia: progressive neurodegenerative brain disorder characterized as intellectual deterioration and erosion of mental and physical function, resulting in disability[7].

Quality of Evidence (QoE): An evaluation of the quality process or methods by which the study was conducted. GRADE offers four levels of evidence quality: high, moderate, low, and very low[8].

Level of Evidence (LoE): An indication of possible validity of a study. LoE is based on study design. The Sackett, Rosenburg, Muir, Gray, Haynes, and Richardson (1996) Level of Evidence Pyramid was used [9].

Statistical Significance: relates to how likely the effect is due to the result of the intervention and not by chance [10].

Clinical Significance: measurable way to determine if the effect is big enough to make a meaningful change [10].

METHODS

A priori protocol was developed prior to conducting this systematic review for validity. The protocol is an outline which includes the PICO question, search strategies for each electronic database used, inclusion and exclusion criteria, and the search methodology

(Appendix A). The protocol was created by five reviewers who collaborated and closely followed the outline to identify, appraise, and synthesize all relevant studies.

Identification of Relevant Studies

A systematic search was conducted to locate all relevant studies in February and March 2020 using the following databases: PsychINFO Medical, CINAHL, ProQuest Health and Medical, and PubMed. All of these electronic databases were searched manually.

Two reviewers independently searched each database and applied the inclusion/exclusion criteria to each study retrieved in the search. The inclusion criteria were first applied to the title and abstract of each study. However, if the inclusion criteria of the article was uncertain, the inclusion criteria were applied to the full text of the article to determine relevance. The flowchart summarizes the results of the systematic search and the application of the inclusion/exclusion criteria (Figure 1). Each reviewer created a list of the applicable articles from their assigned l databases. These articles were then compared through a consensus process where discrepancies were resolved. A third reviewer was involved in this consensus if needed. A final list of included articles across databases was produced when all authors came to a consensus.

Inclusion and Exclusion Criteria

To be included in this systematic review, the studies retrieved during the search had to meet the following inclusion criteria: (1) Adults 18+, (2) male and female, (3) mild to moderate dementia, (4) all types of dementia, (5) the intervention delivered was CST, (5) outcomes for the study included quality of life, life satisfaction, or mental well-being, (6) studies in English, and (7) peer-reviewed scholarly articles (Table 5).

Articles were excluded if they met the following criteria: (1) severe stages of dementia, (2) studies not in English, and (3) CST combined with another intervention where the results cannot be independently extracted (Table 5).

Twenty articles fit the inclusion criteria and 11 were previously appraised in existing systematic reviews [11-19]. Therefore, the 11 were not appraised by the reviewers; however, data from those articles were extracted to contribute to the results. Nine articles remained to be appraised by the reviewers.

Appraisal of Included Studies

As depicted in the flowchart, 20 articles remained after inclusion/exclusion criteria, with 9 being appraised by the reviewers. Following the protocol, two reviewers independently appraised the quality of evidence in each article using predetermined criteria relevant for the study design. Two reviewers then compared their ratings of the quality of evidence to resolve discrepancies and reach consensus. A third reviewer was included to resolve discrepancies if needed. The quality of evidence table summarizes the quality of methodology ratings for each included study (Table 6). Two reviewers worked independently to summarize crucial information in each study to create a description table to reach a consensus, the two reviewers compared their independent study description tables. The final study description table included information regarding the data's population, clinical and statistical significance, intervention, relevant

outcomes, and results (Table 7). If there was no measure of clinical significance included in the data, the minimally detectable difference (MDD) was calculated.

RESULTS

A total of 723 articles were retrieved through the database searches, 20 of which met the predetermined inclusion criteria (Figure 1). Out of the 20 articles, 11 were previously appraised in existing systematic reviews [11-19], and therefore, were not appraised by the reviewers; however, data from the 11 articles were extracted to contribute to the results. Nine articles remained to be appraised by the reviewers.

As noted in the study description table, the included studies used a mix of designs with a level of evidence ranging from I to III (Table 6). Of the nine included articles, six were randomized control trials (RCT; data collected on an experimental group and control group that are randomly assigned), one was a single-case design (SCD; data collected at multiple points of the study on a single, small group of subjects), one was a quasi-experimental design (data collected on an experimental and control group that are not randomly assigned), and one was a one-group pretest/posttest design (data collected before and after an intervention on one group of subjects).

Of the nine studies, four were classified on predetermined criteria[9] as high quality (70%+)[20-23], four were classified as moderate quality (40%-69%)[24-27] and one was classified as low quality (>40%)[28]. Detailed information on the level and quality of evidence of each included study, is found in the Quality of Evidence Table (Table 6). Results of the nine appraised by the authors studies varied for the primary outcome (1) quality of life; four of the studies were found to be statistically significant for quality of life.

Of the 11 articles that were previously appraised in existing systematic reviews, six were Level I [1, 3, 28-31], one was Level II [32], and four were Level III [5,33-35] Results of the 11 studies varied for one primary outcome (1) quality of life; two of the 11 studies were found to be statistically significant for quality of life.

When examining the articles for the results of the quality of life outcomes, the reviewers recognized that quality of life was referred to using variating terms such as mental-well being. Mental well-being was integrated under the quality of life outcome as both were defined in similar terms, resulting in quality of life being the umbrella term for the primary outcome.

Quality of life

The level of evidence for the quality of life outcome was mostly high; 12 out of 20 studies were Level I, 1 out of 20 were Level II, and 7 out of 20 were Level III. The quality of evidence for this outcome was moderate as the majority of appraised articles indicated a moderate quality level; 3 studies were found to be of high quality, 5 were found to be of moderate quality, and 1 was found to be of low quality. The remaining studies quality of evidence could not be determined, given that they were not appraised by the reviewers. The degree of clinical significance for this outcome was determined to be low; only 6

out of 20 studies were found to be clinically significant.

PRACTICE RECOMMENDATIONS

Out of the 20 articles that measured quality of life as the primary outcome, there was a preponderance of randomized control trials (level I) studies. By applying the GRADES classification system, reviewers determined a Grade A classification. Despite the Grade A classification, the burden/cost for this outcome demonstrated moderate quality. The potential burden and cost on families, caregivers, and individuals with dementia do not exceed the expected amount of benefits of this intervention. The clinical significance for QoL is also low however, this could be due to other reasons that took place during this study and how the study was performed. The quality of life outcome depicts a moderate quality. This means that further research is likely to have an impact on our confidence in the estimate of effect or may change the estimate, therefore results should be applied to patients cautiously. While study limitations exist, CST has potential to impact quality of life.

CLINICAL IMPLICATIONS

The 20 included studies within this systematic review evaluated the efficacy of Cognitive Stimulation Therapy (CST) on one primary outcome quality of life. Quality of life was classified as moderate quality using the modified GRADES system. Further research is warranted as the results demonstrated low

CLINICAL TIPS

Cognitive Stimulation Therapy (CST) is a moderate quality recommended intervention option for occupational therapy practitioners when addressing quality of life in persons with dementia. Additional research should be conducted to further determine the efficacy of CST in improving quality of life in persons with dementia. Additionally, occupational therapists would require specific training in the use of certain CST interventions in order to deliver such interventions with fidelity.

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Appendix A. "A Priori Protocol"

Table 1. **PICO Question**

PICO question			
P - Persons with Dementia	**I -** Cognitive Stimulation	**C -** Any Therapy (not included in search)	**O –** Quality of Life

Table 2**. Lists of Databases Searched**

Databases Included in SR Search	**Planned the Search**		**Will conduct the Search**	
	Person 1	**Person 2**	**Person 1**	**Person 2**
PsychINFO (medical)	Sondrea	Brooke	Jaid	Riley
CINAHL	Jaid	Lynn	Sondrea	Brooke
ProQuest (Health and Medical)	Sondrea	Brooke	Jaid	Lynn
PubMed	Sondrea	Riley	Lynn	Brooke

***Table 3*. List of Search Terms**

	Construct 1		Construct 2		Limits (if any)
Database	**Subject Headings**	**Keywords**	**Subject Headings**	**Keywords**	
PsychINFO (medical)	Dementia Alzheimer's Disease	**"**Dementia" "Alzheimer*"	Cognitive Rehabilitation Brain training	"cognitive stimulation" "brain training" "mental exercise"	
CINAHL	Dementia Alzheimer's Disease	"Dementia" "Alzheimer's"	**None**	"cognitive stimulation" "cognitive rehabilitation"	
ProQuest (Health and Medical)	Dementia Alzheimer's Disease	**"**Dementia" "Alzheimer*"	**None**	"cognitive stimulation" "brain training" "mental exercise"	
PubMed	Dementia Alzheimer Disease	**"**Dementia" "Alzheimer*"	**None**	"cognitive stimulation" "cognitive remediation"	

Note:
PsychINFO→ is listed under PsychNet on our databases on the Gutman Library. APA thesaurus holds the subject headings
ProQuest→ use the proquest health and medical (there are different versions of this database), there is an advanced search option
CINAHL→ SH are searched under "MH Exact Subject Heading" (this is found under the drop down menu which has you select a field.
Keywords: "TX all text" (same place where "MH Exact Subject Heading" is found)

Table 4. **Boolean Sentence for Each Database**

Database Name	Boolean Sentence
PsychINFO (medical)	(**Dementia** OR **Alzheimer Disease** OR "**Dementia**" OR "**Alzheimer***") AND (**cognitive rehabilitation** OR **brain training** OR "**cognitive stimulation**" OR "**brain training**" OR "**mental exercise**")
CINAHL	(**Dementia** OR **Alzheimer's Disease** OR "**Dementia**" OR "**Alzheimer's**") AND ("**cognitive stimulation**" OR "**cognitive rehabilitation**")
ProQuest (Health and Medical)	(**Dementia** OR **Alzheimer's Disease** OR "**Dementia**" OR "**Alzheimer***") AND ("**cognitive stimulation**" OR "**brain training**" OR "**mental exercise**")
PubMed	(**Dementia** OR **Alzheimer Disease** OR "**Dementia**" OR "**Alzheimer***") AND ("**cognitive stimulation**" OR "**cognitive remediation**")

Table 5. **Inclusion and Exclusion Criteria**

Inclusion Criteria			
Population	Intervention and Comparison	Outcome	Other
- All Adults (18+) - Male and Female - Mild to moderate dementia (in reference to the stages or degree of cognitive decline) - All types of dementia (i.e: Alzheimer's Disease, vascular dementia, etc.)	- Cognitive stimulation - Cognitive stimulation therapy - Individual and group therapy - Cognitive rehabilitation - Cognitive training - Brain stimulation - Online programs - Mental exercises	- Quality of life - Well-being - Life satisfaction	- Studies in English - Defined controlled studies, group studies, SCDs - Peer reviewed scholarly articles - Intervention
Exclusion Criteria			
Population	Intervention and Comparison	Outcome	Other
- Severe stages of dementia	- Interventions cannot be combined with another intervention (unless given distinguishable outcomes for each intervention)		- Studies not in English

Figure 1. **Flow Chart**

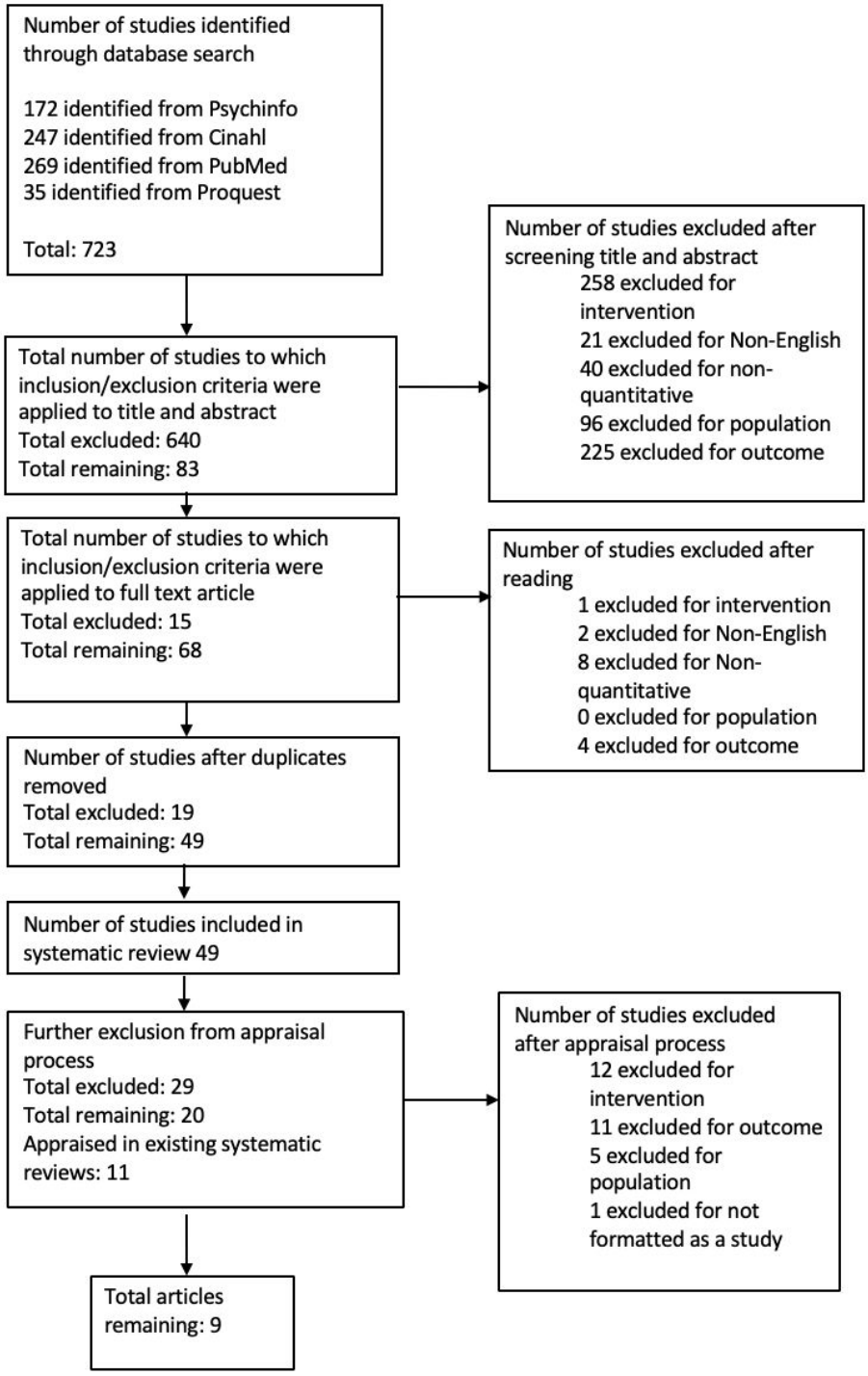

Table 6. **Quality and Level of Evidence Table**

		Quality Criteria											
Citation	Type of design	1	2	3	4	5	6	7	8	9	10	Quality Level	Evidence Level
(Allward et. al, 2020)	6	1	1	0	1	1	1	0	1	-	-	6 (high)	3
(Brueggen et al, 2017)	3	0	0	1	1	0	0	0	1	0	0	3 (low)	1
(Kallio et. al, 2018)	3	1	1	1	1	1	0	0	1	0	0	6 (moderate)	1
(Kelly et. al, 2017)	6	1	1	0	0	1	0	1	1	-	-	5 (moderate)	3
(Middelstadt et. al, 2016)	3	1	1	1	1	1	1	0	1	0	0	7 (high)	1
(Olakehinde et al, 2019)	6	1	1	0	0	1	1	1	1	-	-	6 (6/8 high)	3
(Orrell et. al 2017)	2	1	1	1	1	1	1	0	1	0	1	8 (high)	1
(Orgeta et al., 2015)	2	1	1	1	1	0	1	0	0	0	1	6 (moderate)	1
(Silva et al., 2017)	3	1	0	1	1	0	0	1	1	0	0	5 (moderate)	1

Table 7. Study Description Table

Study	Design Type	Number of Criteria Met and Quality Level	Population	Intervention(s)	Comparison(s)	N in each group	Outcome(s)	Measurements	Point estimates and direction of differences	sd, se, or CI for the estimate	Statistical significance	Clinical significance
(Allward et. al, 2020)	Quasi-experimental	6 (mod)	Diagnosis: Mild to moderate Dementia/Alzheimer's Age: 63-97 years of age Gender: Male and Female	CST	n/a	n=60	Mental well-being	SWEMWBS (higher score indicates state of positive mental well-being)	Pre-Test M=-24.89 Post-test M=-25.87	Pre-Test SD=-4.26 Post-test SD=-5.20	Pre and Post-Test difference: p = -0.085	MDD= Not C.S.
(Bruggen et al., 2017)	RCT	3(low)	Diagnosis: Mild to moderate dementia (or mixed) Age: M=70.06 Gender: Not specified	Cognitive Rehabilitation program based on the CORDIAL program presented by Werheid and Thone–Otto in 2010	Control group received standardized Cognitive training in the form of homework performed indepe	n=16	QoL	DEMQoL (1-4 Likert Scale, higher scores indicating better HQRL)	Baseline EG: M=30.00 CG: M=34.75 Baseline to Post-Intervention EG: MD= 3.1	Baseline EG: SD=7.76 CG: SD= 6.16 Baseline to Post-intervention EG: SD=5.79	Baseline to post intervention differences and interaction effect: p= 0.013	MDD= C.S.

									CG: MD=-4.4	CG: SD= 5.40		
(Capotoso, et al, 2016)	RCT	Appraised by: (Lobbia et al. 2019)	Diagnosis: Mild to moderate dementia Age: EG: M=88.25 CG: M=86.52 Gender: Not specified	CST-IT	Active control group	n=39	QoL	QoL-AD (score: 13-52, higher score equals better functioning)	Pre-Test EG: M= 22.10 CG: M=19.32 Post-Test EG: M=23.35 CG: M= 19.37	Pre-Test: EG: SD= 8.17 CG: SD=7.23 Post-Test: EG: SD= 8.10 CG: SD=6.78	Between subjects: p= 0.17 Pre vs Post test repeated measures: p=0.05	MDD= Not C.S.
(Davis, et al, 2001)	RCT	Appraised by: (Cooper et al., 2012), (Fukushima et al., 2016), (Olazaran et al., 2010)	Diagnosis: Probable Alzheimer's Disease Age: EG M= 68.67 CG M= 72.56 Gender: Male and Female	Cognitive intervention	Placebo Condition (Mock Intervention)	n=37	QoL	QLA-P (scale 0-50, higher scores reflect higher QoL)	Time 1 EG: M=269.17 CG: M=269.94 Time 2 EG: M=244.41 CG: M=269.71	Time 1 EG: SD=51.28 CG: SD=67.94 Time 2 EG: SD=62.11 CG: SD=51.64	Group x Time F Ratio: p= 2.10	MDD= Not C.S.
(Kallio et al, 2018)	Single Blind RCT	6 (Mod)	Diagnosis: Established dementia	Cognitive training	Routine day care	n= 147	QoL	HQRL instrument (15D) (0-1 scale, a higher	HQRL instrument (15D): Baseline	HQRL instrument (15D) Baseline	HQRL instrument (15): Change over time	MDD cannot be calculated

			Age: 65 years+ Gender: Not specified					score indicates a higher HRQL)	EG: M= 0.740 CG: M= 0.741	EG: SD= 0.086 CG: SD=0.083 <u>Baseline to 3 months:</u> EG: CI= -0.058 to -0.021 CG: CI= -0.056 to -0.018 <u>No reported changes baseline to 9 months</u>	EG p= 0.61	
(Kelly, et. al., 2017)	Single-case design	5 (Mod)	Diagnosis: People with dementia Age: 53-86 Gender: Male and Female	CST	N/A	n=20	QoL	QoL-AD (score: 13-52, higher score equals better functioning)	<u>Baseline</u> M= 35.25 <u>Post-CST</u> M= 35.80	<u>Baseline</u> SD= 7.89 <u>Post-CST</u> SD=5.78	QoL self-rated p = 0.763	MDD = Not C.S.
(Kim, et al, 2016	RCT	Appraised by: (Fukusima et	Diagnosis: patients with Alzhei	Cognitive Programming	Control Group	n= 53	QoL	QoL-AD (score: 13-52, higher score	<u>Baseline</u> EG: M=28.25	<u>Baseline</u> EG: SD= 6.72	<u>Baseline</u> for EG and CG	MDD= Not C.S.

		al, 2016)	mer's Disease Age: M= 48.48 ± 1.45 Gender: Women					equals better functioning)	CG: M= 27.35 6 months EG: M= 27.84 CG: M= 27.12 Change from Baseline to 6 months EG: M=0.40 CG: M=0.23	CG: SD= 7.23 6 months EG: SD= 5.30 CG: SD= 6.50 Change from Baseline to 6 months EG: SD=0.76 CG: SD=0.73	p= 0.65* EG and CG change: p=0.60 *	
(Lin, et al, 2018)	Quasi-experimental Design	Appraised by: (Chao et al., 2020)	Diagnosis: People with dementia Age: M=79.5 ± 7.7. Gender: Male and Female	CST	RT and control group	n= 105	QoL	QoL-AD (score: 13-52, higher score equals better functioning)	RT: M =26.7 CST: M= 22.5 CG: M= 23.0	RT: SD= 4.5 CST: SD= 4.6 CG SD= 4.9	Short term effects between pre and post test scores among the groups on QoL: p<0.001	MDD = C.S.
(Middelstadt et al, 2016)	RCT	7 (High)	Diagnosis: mild to moderate dementia	CST	CG: routine care at nursing facility	n= 71	QoL	QoL-AD (score: 13-52, higher score equals better	EG: M=34.17 CG:	EG: SD=4.77 CG:	QoL-AD: EG p=0.65	Moderate effect size (0.11) = C.S.

			Age: EG: M=: 86.25 CG: M=86.49 Gender: Male and Female					functioning)	M=33.66	SD= 4.49		
(Olakehinde et al, 2019)	One group. Pre/Post test	6 (high)	Diagnosis: Dementia. Age 65+ Gender: Male and Female	CST	N/A	n=9	QoL (4 sub) categories: physical, psychosocial, social, and environmental)	WHOQoL-Bref (Scores scaled in a positive direction, higher scores indicates higher QoL)	WHOQoL-Bref: Median: <u>Physical</u>: Pre: 10.3 Post: 14.9 <u>Psychosocial</u>: Pre: 10.7 Post: 12.7 <u>Social</u>: Pre: 14.0 Post: 16.0 <u>Environment</u> Pre: 10.0	WHOQoL-Bref: IQR: <u>Physical</u>: Pre: (9.4–12.9) Post: (12.3–16.0) <u>Psychosocial</u>: Pre: (10.0–12.7) Post: (14.0-14.7) <u>Social</u>: Pre (12.0-16.7) Post: (13.7-17.0) <u>Environment:</u> Pre: (9.5-12.0)	<u>Physical</u>: p<0.05 r=0.587 <u>Psychosocial</u>: p<0.05 r=0.596 <u>Social</u>: p>0.05 r=0.232 <u>Environment</u>: p<0.01 r=0.630 **Physical, Psycho	Article stated: MD = C.S

									Post: 13.5	Post: (11.5-14.8)	social, and environment ARE statistically significant. Social is NOT statistically significant	
(Orrell et. al, 2017)	RCT	8 (high)	Diagnosis: Mild to Moderate Dementia Age: Not specified Gender: Female	CST	Treatment as usual (TAU)	n= 356	QoL	QoL-AD (score: 13-52, higher score equals better functioning) DEMQoL (1-4 Likert Scale, higher scores indicating better HQRL)	QoL-AD 13 week MD= -0.14 26 week MD= -0.02 DEMQoL 13 week MD= -0.33 26 week MD= 0.31	QoL-AD 13 week CI= (−1.12-0.84) 26 week CI= (−1.04-1.00) DEMQoL 13 week CI= (-2.31-1.65) 26 week CI= (-1.62-2.22)	QoL-AD 13 week p= 0.78 26 week p= 0.97 DEMQoL 13 week p= 0.74	QoL-AD MDD= Not C.S DEMQoL MDD= Not C.S.
(Orgeta et al., 2015)	RCT	6 (mod)	Diagnosis: mild to moderate dementia Age: EG: M= 78.40	iCST (Individual stimulation therapy)	Control group:received treatment as usual (TAU)	n= 356	QoL	QoL-AD (score: 13-52, higher score equals better QoL)	QoL-AD Baseline: EG: M=32.88 CG: M=33.09	QoL-AD Baseline: EG: SD=6.83 CG: SD=6.22	QoL-AD	Small effect size= Not C.S.

			CG: M= 78.00 Gender: not specified						Week 13 EG: M=37.90 CG: M=38.09 Week 26 EG: M= 37.86 CG: M=37.71	Week 13 EG: SD= 5.52 CI=-1.12 to 0.84 CG: SD=5.63 Week 13 EG and CG groups: CI:-1.12 -0.84 Week 26 EG: SD=5.13 CG: SD=5.91 Week 26 EG and CG groups: CI= -1.04 to 1.00	Week 13 Comparison of EG and CG groups: p= 0.78 Week 26 Comparison of EG and CG groups: p= 0.97	

(Paddick, et al, 2017)	Pre and post intervention	Appraised by: (Chao et a.l, 2020) and (Lobbia et al, 2019)	Diagnosis: Mild to Moderate Dementia Age: 65+ Gender: Not specified	CST	N/A	n=34	QoL	WHOQOL-Bref (Scores scaled in a positive direction, higher scores indicates higher QoL)	WHOQOL-Bref: Medians: <u>Physical</u> Pre: 11.4 Immediate Post: 13.1 Eight-week Post: 13.7 <u>Psychological</u> Pre: 14.0 Immediate Post: 14.7 Eight-week Post: 15.0 <u>Social</u> Pre: 16 Immediate Post: 16.0 Eight-week	WHOQOL-Bref: IQR: <u>Physical</u> Pre: 9.7-14.3 Immediate Post: 10.3-14.9 Eight-week pst: 11.6-14.6 <u>Psychological</u> Pre: 12.7-15.3 Immediate Post: 12.7-16.0 Eight-week Post: 13.5-16.0 <u>Social</u> Pre: 12.0-8.0 Immediat Post: 12.0-20.0	<u>Physical</u> Change between pre and immediate post: p=0.041 <u>Psychological</u> Change between pre and Immediate post: p= 0.531 <u>Social</u> Change between pre and immediate post: p=0.829	Medium effect size (0.6) = C.S.

									Post: 16.0 Environmental Pre: 14.5 Immediate Post: 14.5 Eight-week Post: 13.5	Eight-week Post: 16.0-18.0 Environmental Pre: 12.5-16.0 ImmediatePost: 13.0-16.5 Eight-week Post: 12.5-15.0	Environment Change between pre and immediate post: p=0.194	
(Piras, et al, 2017)	Single blind RCT	Appraised by: (Chao et al., 2020)	Diagnosis: Mild to moderate Vascular Dementia Age: EG M=83.8 CG M=85.4 Gender: Male and Female	CST-IT	Control group	n= 35	QoL	QoL-AD (score: 13-52, higher score indicates a higher QoL)	Pre-test EG: M=25.05 CG: M= 28.43 Post-test EG: M=27.35 CG: M= 28.00	Pre-test EG: SD= 9.78 CG: SD=7.82 Post-test EG: SD= 9.41 CG: SD= 6.87	EG vs CG: p= 0.27	MDD = Not C.S.
(Silva, et al, 2017)	Single blind RCT	Number of criteria met: 5 Moderate Level Quality	Diagnosis: Alzheimer's Disease Age: 60-80 years old	SenseCam Memo+	Personal Diary	n= 67	QoL	WHOQOL-OLD (28 items on a 5 point scale covering 7	WHOQOL-OLD: Sensecam: Visit 1: M=109.33	WHOQOL-OLD: SensecamVisit 1: SD=15.64	WHOQOL_OLD: Main effect of EG: p< 0.01	WHOQOL-OLD Sensecam: MDD = C.S.

			Gender: not specified					domains, higher scores indicate higher QoL)	Visit 2: M=116.47 Visit 3: M=110.00 <u>Memo+:</u> Visit 1: M=103.75 Visit 2: M=107.19 Visit 3: M=103.38 <u>Diary:</u> Visit 1: M=100.27 Visit 2: M=99.20 Visit 3: M=91.27 GDS: <u>Sensecam:</u> Visit 1: M=12.64 Visit 2: M=6.79 Visit 3: M=7.57 <u>Memo+</u> Visit 1: M=11.44 Visit 2:	Visit 2: SD=12.71 Visit 3: SD=16.73 <u>Memo+</u> Visit 1: SD=12.86 Visit 2: SD=11.26 Visit 3: SD=10.28 <u>Diary:</u> Visit 1: SD=0.34 Visit 2: SD=9.66 Visit 3: SD=24.67 GDS: <u>Sensecam</u>Visit 1: SD=6.25 Visit 2: SD=3.66 Visit 3: SD=4.03 <u>Memo+</u> Visit 1: SD=4.62 Visit 2:		<u>Memo+:</u> MDD = C.S. GDS <u>Sensecam:</u> MDD = C.S. <u>Memo+:</u> MDD = Not C.S.

									M=10.31 Visit 3: M=11.06 <u>Diary:</u> Visit 1: M=13.00 Visit 2: M=13.40 Visit 3: M=14.60	SD=5.12 Visit 3: SD=4.50 <u>Diary:</u> Visit 1: SD=5.29 Visit 2: SD=5.22 Visit 3: SD=5.12		
(Spector, et al, 2003)	Single-blind RCT	Appraised by: (Aguirre et al., 2013), (Cooper et al., 2012), (Kurz et al., 2011), (Yuill & Hollice, 2011), (Chao et al., 2020), and (Lobbia et al., 2019)	Diagnosis: people with dementia Age: M= 85.3 Gender: Male and Female	CS	Control Group	n= 201	QoL	QoL-AD (score: 13-52, higher score indicates a higher QoL)	<u>Baseline</u> EG: M=33.2 CG: M=33.3 <u>Follow-up</u> EG: MD: 1.3 CG: MD: -0.8	<u>Baseline</u> EG: SD: 5.9 CG SD: 5.7 <u>Follow-up</u> EG: SD: 5.1 CG: SD: 5.6 Group difference-change from baseline: CI: 0.9 to 3.18	Between group differences p=0.028	MDD = Not C.S.
(Stewart, et al, 2017)	Observational, descriptive pre-test/post-test study design	Appraised by: (Lobbia et al., 2019)	Diagnosis: people with dementia Age:	CST	N/A	n= 40	QoL	QoL-AD (score: 13-52, higher score indicates a higher QoL)	<u>Baseline</u> M=34.98 <u>Pre-test</u> M=34.98	<u>Baseline</u> SD=6.20 <u>Pre-test</u> SD=6.20	Comparing pre and post test scores: p= 0.09	MDD = Not C.S.

			M=78.08 Gender: Male and Female						Post-test M=36.16	Post-test SD=5.80		
(Streater, et al, 2016)	Observational study design	Appraised by: (Chao et al., 2020)	Diagnosis: Alzheimer's and Dementia Age: M= 80.4 ± 7.2 Gender: Male and Female	CST	N/A	n=89	QoL	QoL-AD (score: 13-52, higher score indicates a higher QoL)	Baseline M=36.53 Follow-up 1 M=35.65 Baseline 2 M=36.34 Follow-up 2 M=36.73	Baseline SD= 7.32 Follow-up1 SD= 8.37 Baseline 2 SD= 7.64 Follow-up 2 SD= 5.30 Baseline 1 CI= -0.64, 2.40 Baseline 2 CI= -2.21, 1.43	Interaction between baseline and follow-up 1: p=0.13 Interaction between baseline 2 and follow-up 2: p=0.34	Follow Up 1: MDD= Not C.S. Follow up 2: MDD = Not C.S.
(Woods, et al, 2006)	RCT	Appraised by:	Diagnosis: Moderate to	CST	Control group	n=201	QoL	QoL-AD (score: 13-52, higher	EG: MD=1.3	EG: SD=5.1	Had a significant positive	MDD= Not C.S.

		(Yuill & Hollice, 2011), (Chao et al., 2020), and (Lobbia, 2019)	severe dementia Age: M=85.3 Gender: Male and Female					score indicates a higher QoL)	CG: MD=-0.8	CG: SD=5.6	effect on total QoL-AD score (F = 6.87, p < 0.05)	
(Yamanaka, et al, 2013)	Single-blind RCT	Appraised by: (Lobbia et al. 2019)	Diagnosis: mild to moderate dementia Age: M= 83.91 Gender: Male and Female	CST	Control group	n= 56	QoL	QoL-AD (score: 13-52, higher score indicates a higher QoL)	<u>Pre-Test</u> EG: M= 28.40 CG: M=28.62 <u>Post-Test</u> EG: M= 28.59 CG: M=28.19	<u>Pre-test</u> EG: SE= 1.19 CG: SE= 1.17 <u>Post-test</u> EG: SE= 1.19 CG: SE=1.20	Between group x within group interaction: p= 0.673	MDD = Not C.S.

M= mean, MD= mean difference, SE= standard error, n= total number, IQR= interquartile range, CST= cognitive stimulation therapy, CS= cognitive stimulation, RT= reminiscence therapy, QoL= quality of life, CI= confidence interval, EG= experimental (intervention group), CG= control group, MDD= minimal detectable change, C.S.= clinically significance, SWEMWBS=Short Warwick Edinburgh Mental Well-Being Scale, DEMQoL=Dimensions of Quality of Life Questionnaire, QoL-AD=Quality of Life-Alzheimer's Disease Scale, QLA-P=The Quality of Life Assessment-- Patient, HQRL=Dimensional Health Related Quality of Life Instrument, WHOQoL-Bref=World Health Organization Quality of Life Assessment- Bref Version, WHOQoL-OLD=World Health Organization Quality of Life Assessment-OLD Version, GDS-30=Geriatric Depression Scale-30