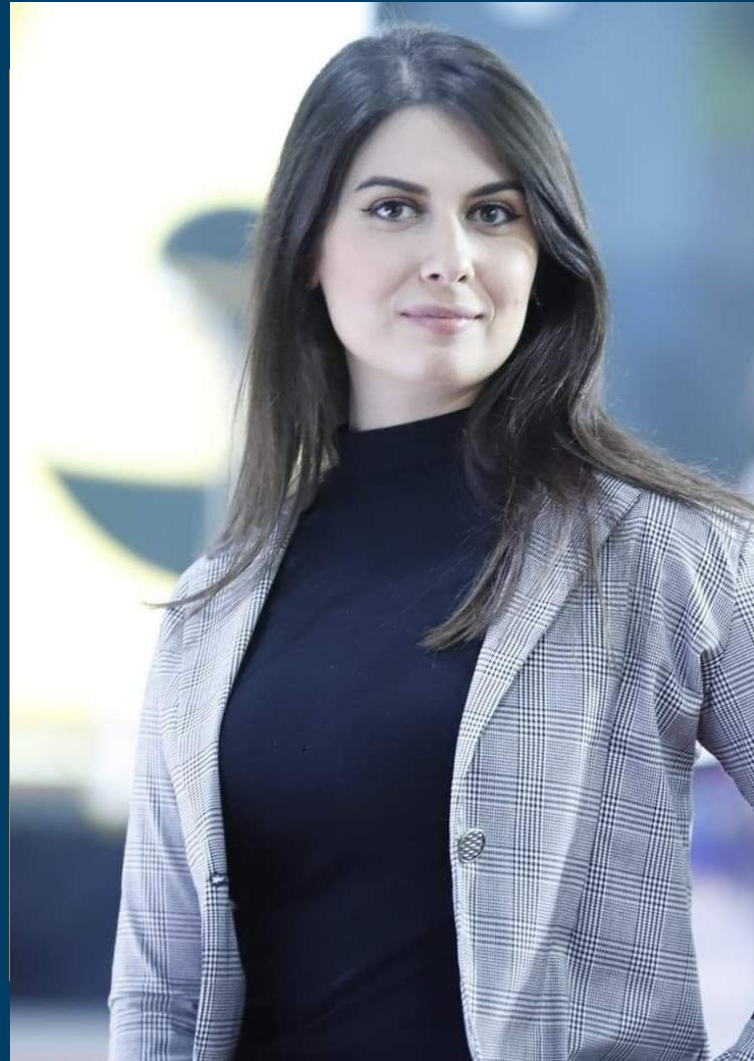




Comparing the Effect of Digital Health Interventions on *Anxiety and Depression* of Individuals Facing Cancer

SYSTEMATIC REVIEW AND META-ANALYSIS

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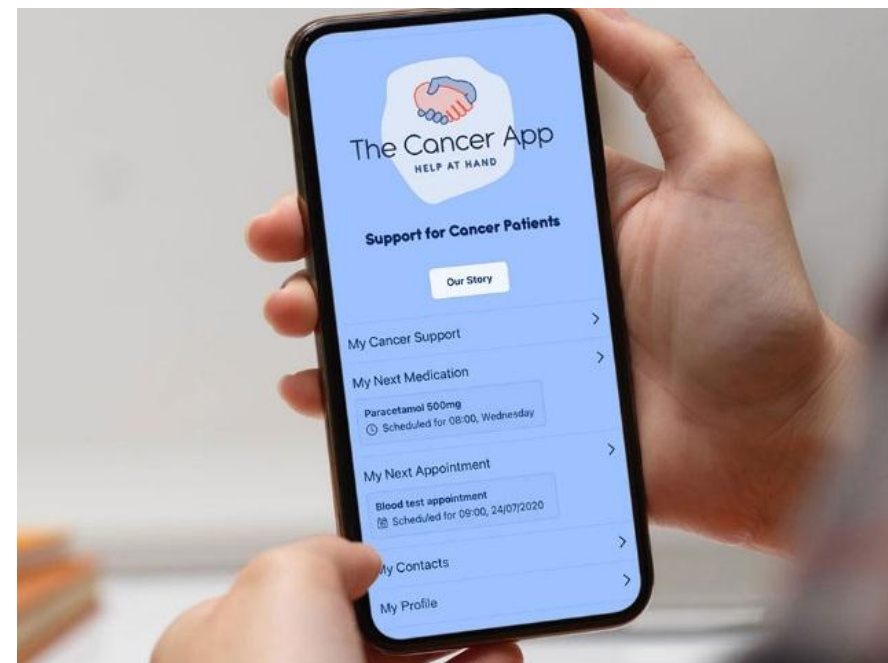
BACKGROUND

The impact of cancer on patient quality of life (QoL) [1]

Anxiety (35.2%), pain (44.5%) and fatigue (96%) among cancer patients [2,3,4]

- Current standard care [5,6]
- Adoption of technology is widespread among adolescents [7]
- Covid-19 pandemic accelerated the development and implementation of digital health [8]
- WHO Recommendations on Digital Interventions for Health System Strengthening (2019) [9]

- Digital health is expected to improve QoL [10]



CLINICAL QUESTION



Clinical question: Does **eHealth** and **mHealth** change the mental and physical health outcomes of Cancer Patients?

P Cancer Patients during therapy
I Digital health interventions: **eHealth** (e.g. Virtual reality and games),
mHealth (e.g. mobile apps)
C Conventional interventions
O Mental and Physical health outcomes:
Pain (Wong-Baker FACES Pain Rating Scale, PCS-C)
Anxiety (CAM-S, VAS, CASI)
Fear (CFS)
QoL (PedsQL, HRQoL, SF-36, PROMIS, EORTC QLQ-C30, etc.)
Satisfaction (PSQ-18, Likert-format surveys)

PedsQL: Pediatric Quality of Life Inventory
SF-36: 36-item Short-Form Survey
PROMIS: Patient-reported Outcome Measurement Information System
EORTC QLQ-C30: European Organisation for Research and Treatment of Cancer Core Quality of Life Questionnaire
PSQ-18: Patient Satisfactory Questionnaire
PCS-C: Pain Catastrophizing Scale for Children
CAM-S: The Children's Anxiety Meter-State
VAS: visual analogue scale
CASI: Childhood Anxiety Sensitivity Index
CSF: The Child Fear Scale

Hypothesis: Digital health interventions will improve the mental and physical health outcomes of cancer patients

SEARCH KEY, FLOWCHART SELECTION



("cancer" OR carcinom* OR tumo* OR malignan* OR oncolog* OR neoplas* OR metasta*)

AND

("digital health" OR "electronic health" OR "telemedicine" OR ehealth OR "mobile health" OR mhealth OR ("web-based" AND "intervention") OR ("web-based" AND "interventions") OR ("computer-based" AND "intervention") OR ("computer-based" AND "interventions") OR ("internet-based" AND "intervention") OR ("internet-based" AND "interventions") OR "Virtual reality" OR VR OR "virtual reality exposure therapy" OR ("active" AND "video game") OR ("active" AND "video games") OR exergam* OR videogame* OR ("mobile" AND "application") OR ("mobile" AND "applications") OR ("mobile" AND "app") OR ("mobile" AND "apps") OR ("smartphone" AND "application") OR ("smartphone" AND "applications") OR ("smartphone" AND "app") OR ("smartphone" AND "apps") OR ("mobile" AND "game") OR ("mobile" AND "games") OR ("smartphone" AND "game") OR ("smartphone" AND "games") OR "text messag*" OR "social media" OR "wearable*")

AND

("quality of life" OR "HRQoL" OR "compliance" OR "satisfaction" OR ("mental" AND "outcome") OR ("mental" AND "outcomes") OR ("physical" AND "outcome") OR ("physical" AND "outcomes") OR ("emotional" AND "distress") OR ("health" AND "behavior") OR ("health" AND "behaviors") OR "self efficacy" OR "depression" OR "anxiety" OR ("physical" AND "activity") OR "fear" OR "pain" OR ("symptoms" AND "management") OR "distraction")



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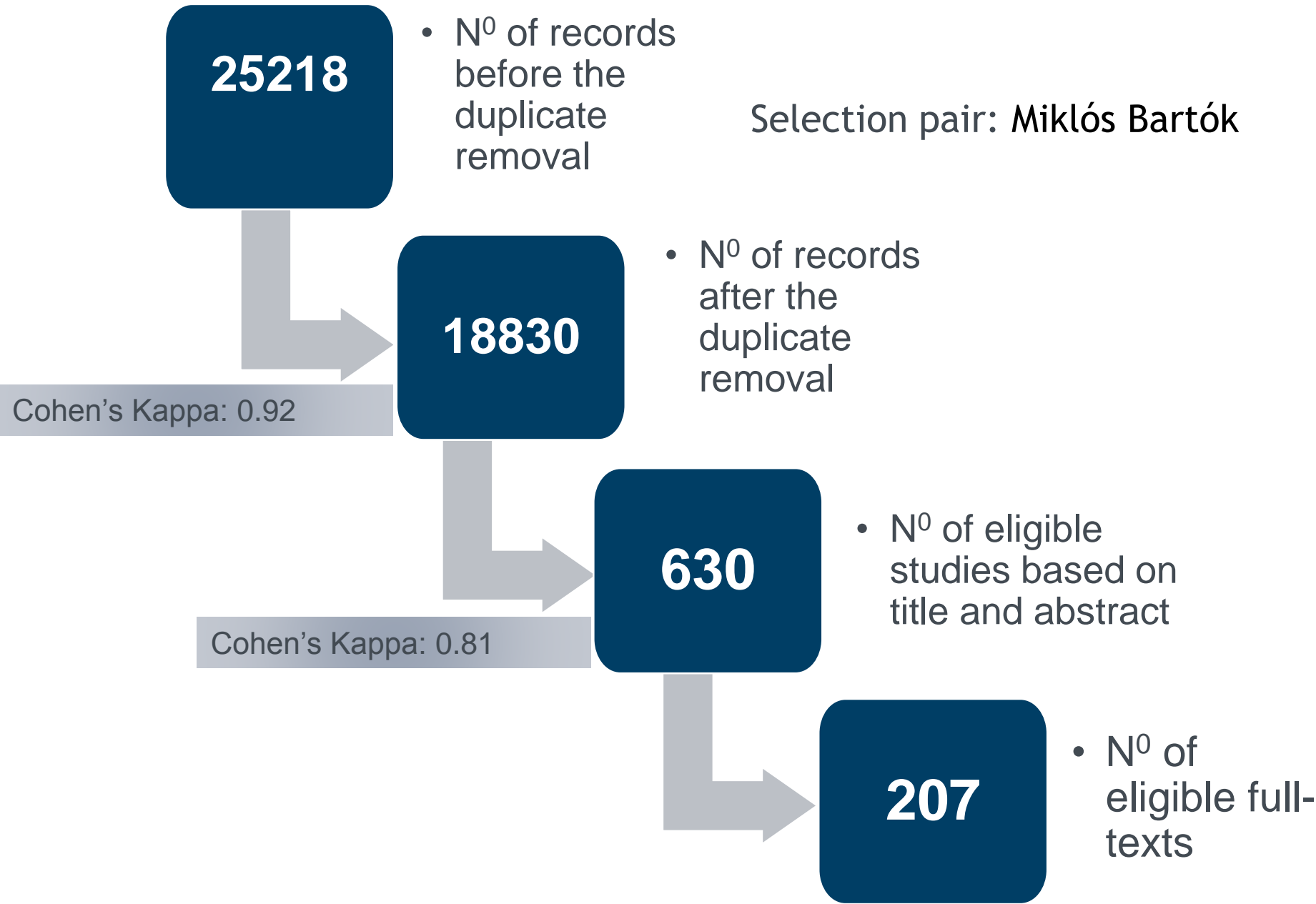
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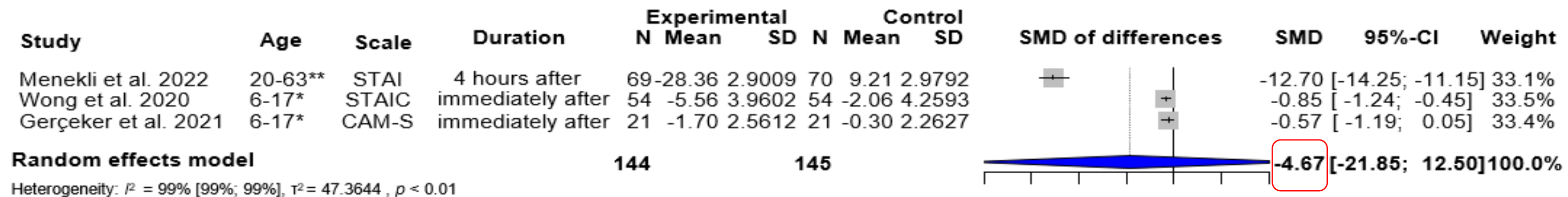
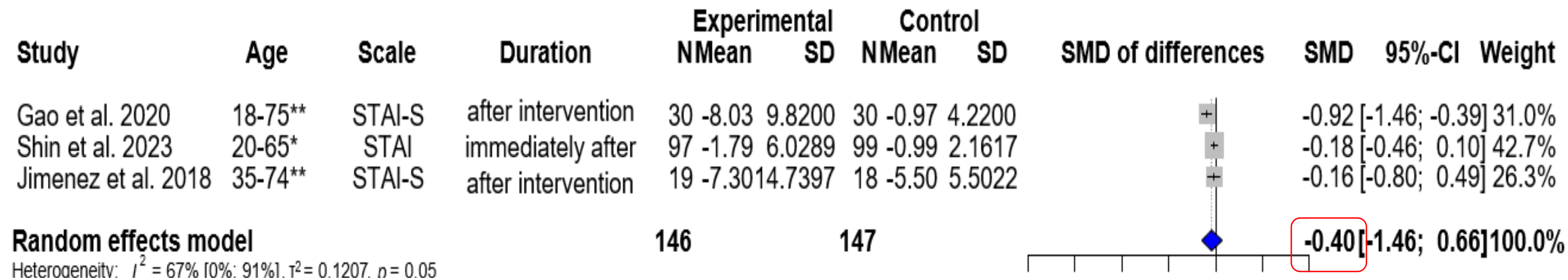
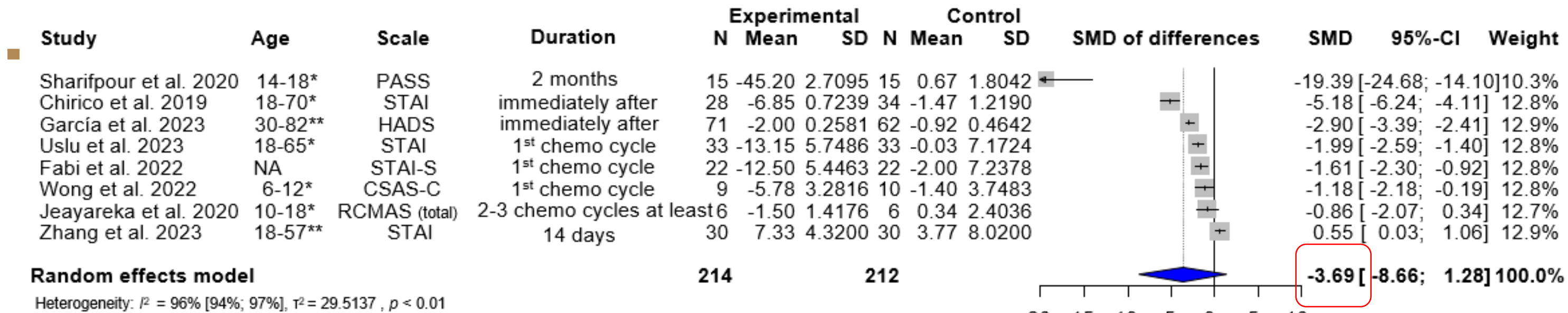
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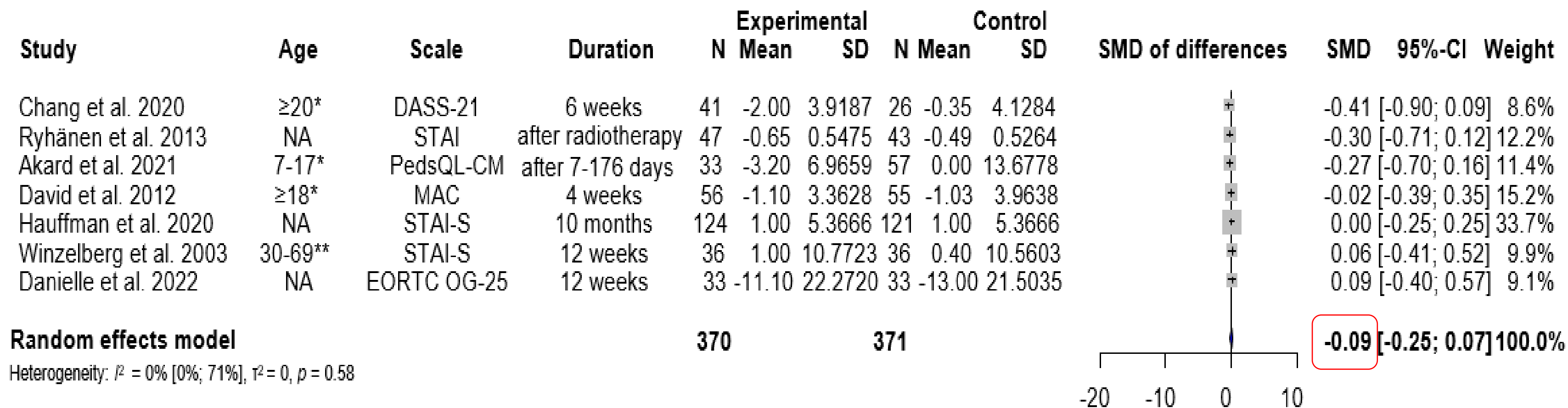


Anxiety

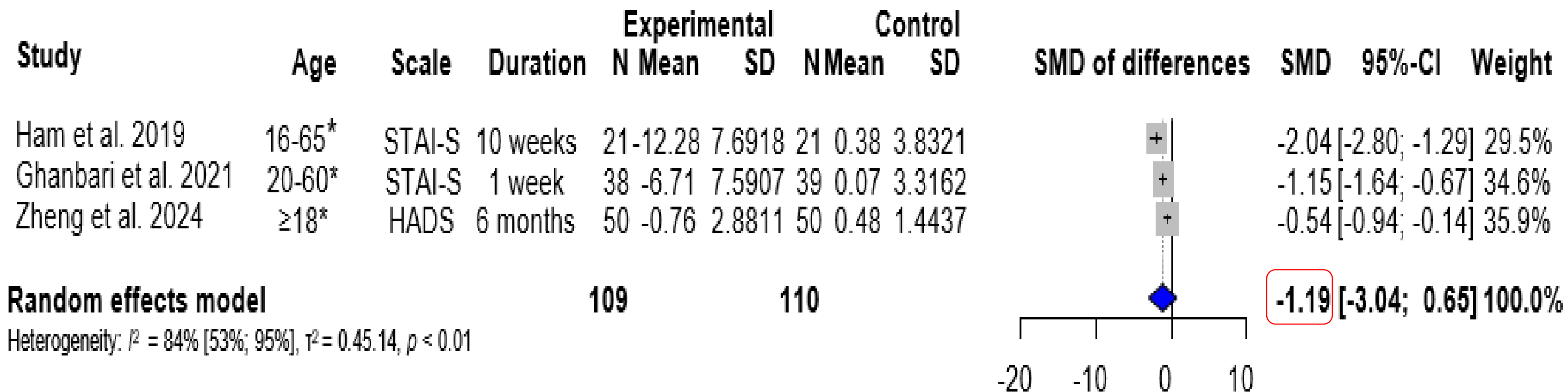
Anxiety change differences between *Virtual Reality (VR)* interventions and control groups



Anxiety change differences between web-based interventions and control groups



Anxiety *change* differences between *mobile app* interventions and control groups



Depression

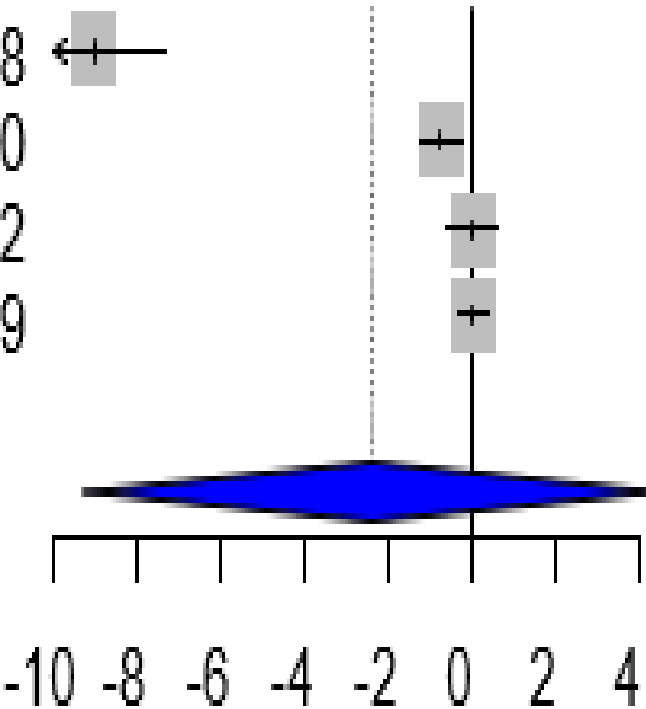


Depression *change* differences between *Virtual Reality (VR)* interventions and control groups

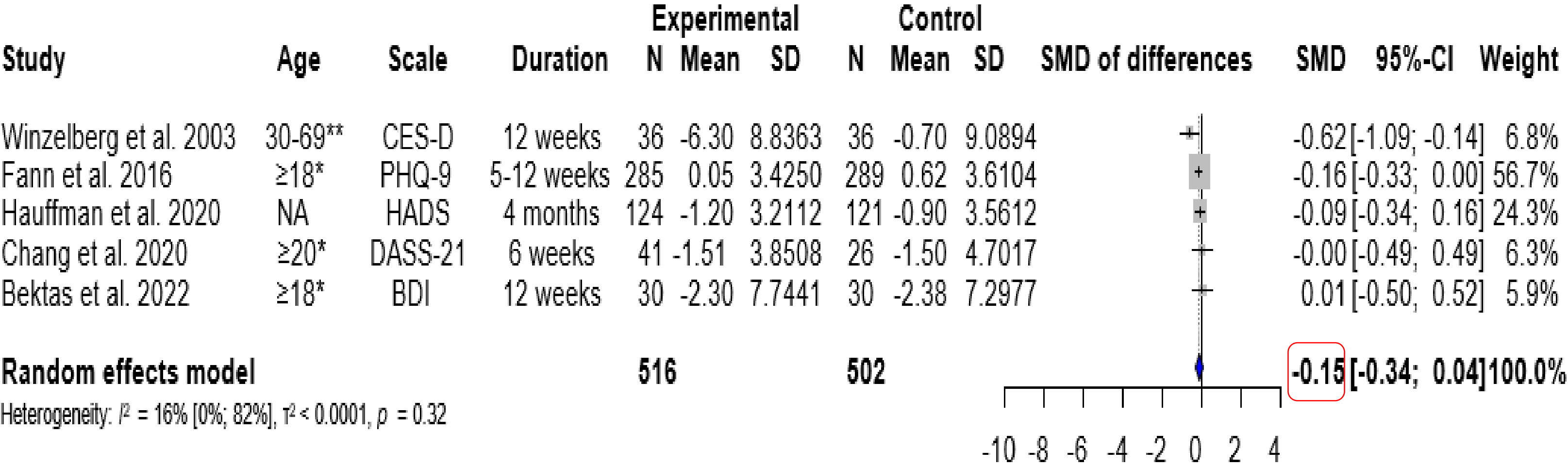


Study	Age	Scale	Duration	Experimental			Control			SMD of differences	SMD	95%-CI	Weight
				N	Mean	SD	N	Mean	SD				
Chirico et al. 2019	18-70*	SVPOMS	immediately after	28	-2.61	0.4672	34	1.21	0.3718	←+	-9.02	[-10.73; -7.31]	24.3%
Zhang et al. 2023	18-57**	CES-D	14 days	30	-3.10	4.4700	30	0.07	3.6900	+	-0.76	[-1.29; -0.24]	25.2%
Fabi et al. 2022	NA	HADS	1 st chemo cycle ⁺⁺	22	1.30	2.1219	22	1.30	1.6362	+	0.00	[-0.59; 0.59]	25.2%
García et al. 2023	30-82**	HADS	immediately after	71	-1.07	0.4628	62	-1.08	0.3369	+	0.02	[-0.33; 0.36]	25.3%
Random effects model				151			148				-2.38	[-9.32; 4.56]	100.0%

Heterogeneity: $I^2 = 97\%$ [95%; 98%], $\tau^2 = 18.4239$, $p < 0.01$
⁺⁺: within 48 hours after 1st chemo cycle



Depression *change* differences between *web-based* interventions and control groups



DISCUSSION

- ❑ Negative **SMD** values = symptom reduction vs. standard care
- ❑ **VR** shows a clinically relevant effect on **anxiety**
- ❑ Pooled effects of **VR, mobile apps, and web-based interventions:**
promising reductions in **anxiety**
- ❑ **Depression** results less conclusive → small samples, need larger trials
- ❑ Considerable **heterogeneity** observed across studies

STRENGTHS

1. Several high quality reports (RCTs)
2. Several measurement tools developed in this field

LIMITATIONS

1. Interviews and semi-interviews
2. Difficulties in comparison
3. Small sample size

CONCLUSION

VR intervention has the potential to reduce the anxiety among cancer patients

IMPLICATION FOR PRACTICE

Age-specific digital health interventions should be introduced to oncological care

IMPLICATION FOR RESEARCH

1. RCTs with high patient number should focus on more homogenous (age, cancer type) target populations
2. New age-, and disease-targeted digital health interventions should be developed



“Somewhere, something incredible is waiting to be known”

Carl Sagan
