

# Effectiveness of Psychological Interventions for Pain Management in Pediatric Sickle Cell Disease: A Meta-Analysis

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## Introduction

- Sickle Cell Disease (SCD) is a chronic, inherited blood disorder affecting both physical health and psychological well-being.
- Individuals with SCD experience frequent, recurrent pain, both during vaso-occlusive crises and daily life.
- Medical treatments are essential, but psychological interventions are increasingly recognized as valuable for pain management and improving health-related quality of life (HRQoL).
- Previous reviews identified limited research, highlighting a need for more targeted and scalable interventions for diverse populations like SCD (Anie & Greene 2015).
- A 2015 Cochrane systematic review examined psychological interventions in adult (n=1), pediatric (n=5), and mixed (n=1) samples, but did not have sufficient data for meta-analysis (Anie & Green, 2015).
- Given the high burden of pain in SCD, and limited pediatric SCD data, interventions targeting pain and psychosocial outcomes warrant updated systematic evaluation.

## Aims

- To systematically review psychological interventions for pain management in SCD.
- To examine effectiveness on pain outcomes and HRQoL in both pediatric and adult populations.
- To expand on current literature by addressing limitations of prior reviews, using a broader systematic approach.

## Methods

### Search Strategy

- Databases: APA PsychINFO, PubMed, Cochrane Library, & EBSCO
- Years: 2009-2024
- Focus: Psychological interventions targeting pain in SCD
  - Due to limited literature, we included randomized control trials (RCTs) and nonrandomized studies (non-RCTs)
- PRISMA guidelines followed. See Figure 1 for study flow chart

### Data Extraction

- Three reviewers independently screened and extracted data using Covidence software
- Extracted Variables:** study design, population demographics, location, intervention type + characteristics, pain outcomes, mental health outcomes, genotype consideration/reported

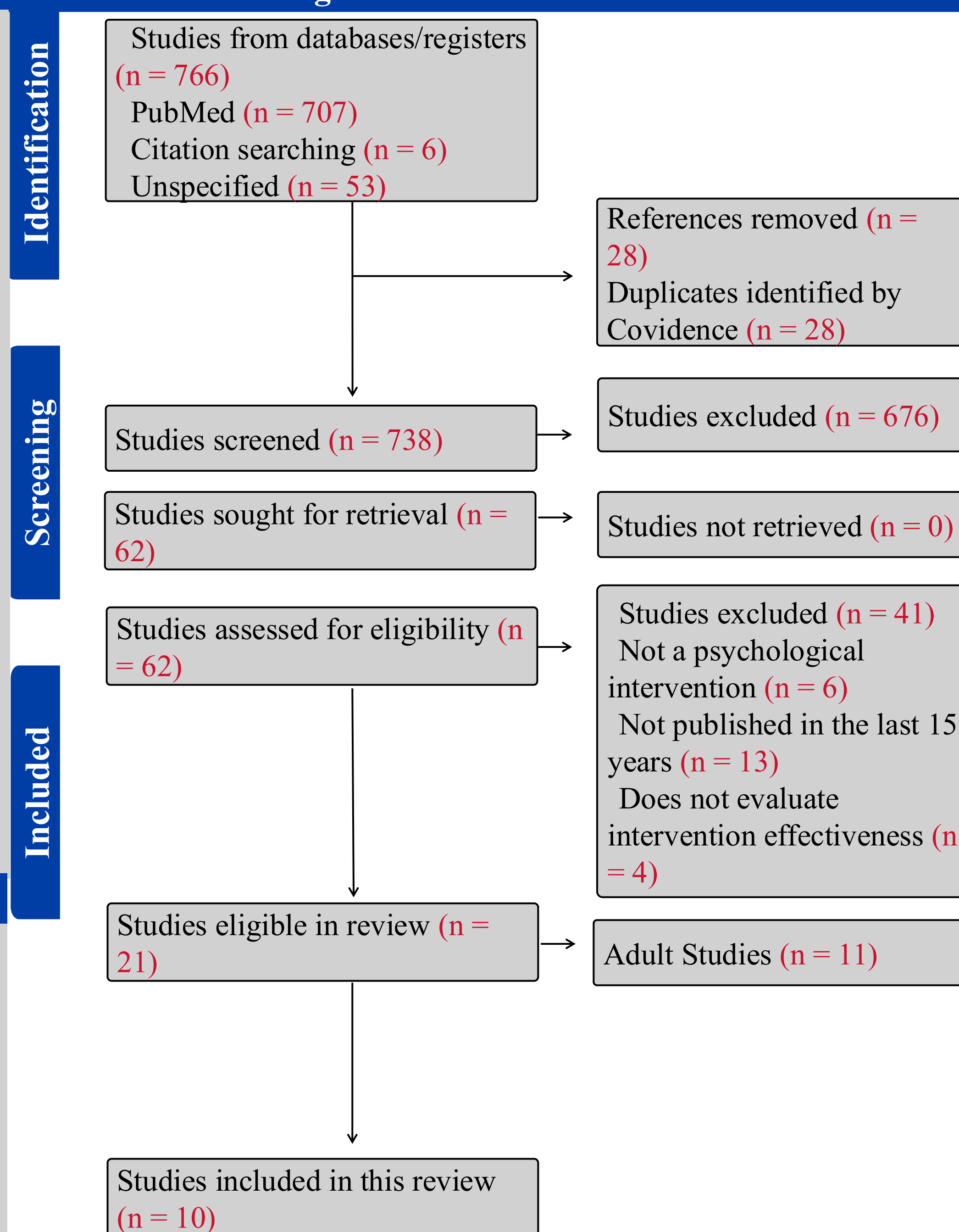
### Data Analysis

- Meta-analysis was performed in R using a random-effects model for five outcomes: **pain intensity, pain coping, anxiety, depression, and HRQoL**
- Sensitivity and subgroup analyses were conducted to examine potential sources of heterogeneity across studies.

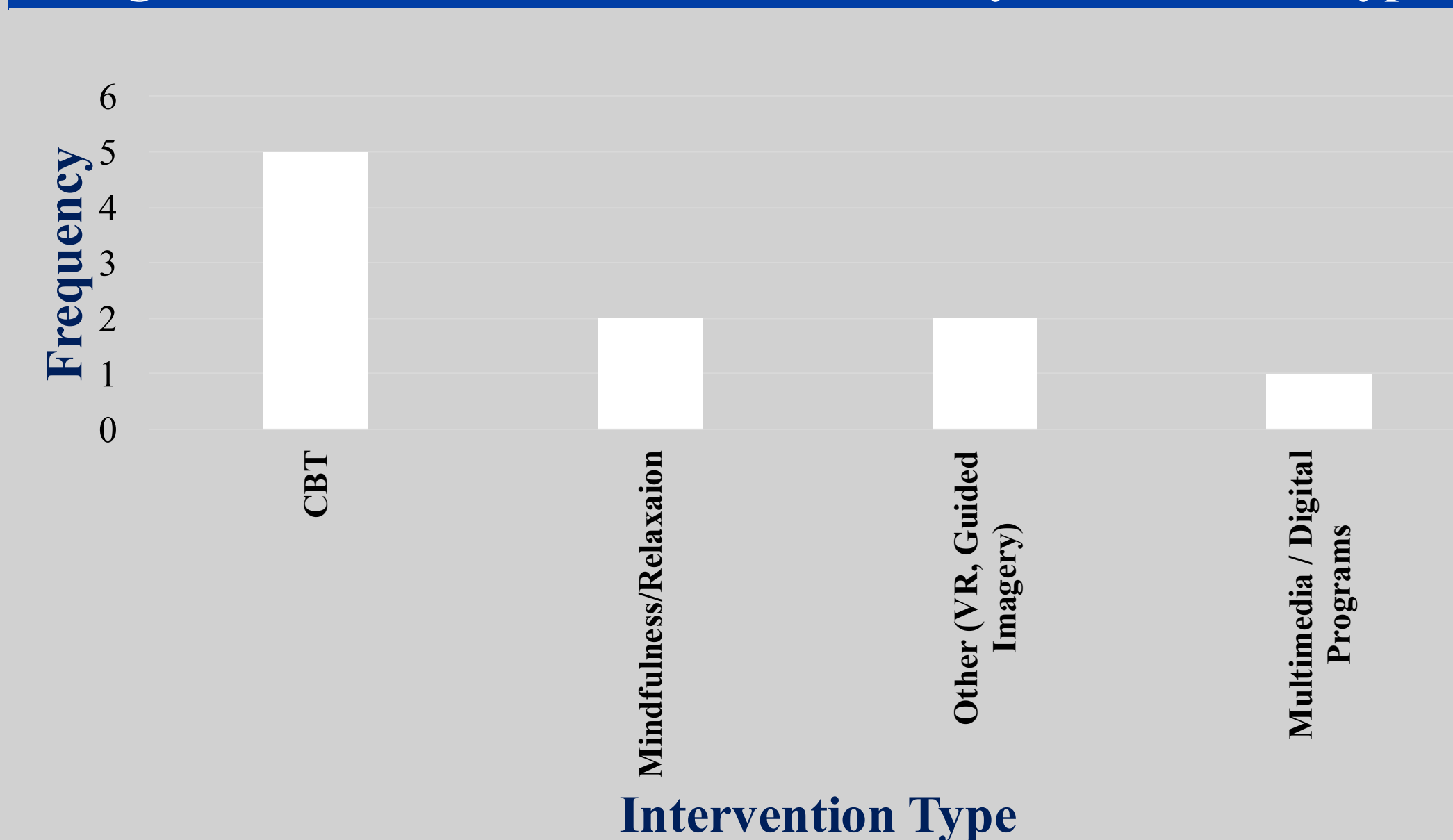
**Table 1: Reported Pediatric Participant Characteristics**

Characteristic	Studies Reporting (n ; %)	Key Information
Sex/Gender	10 ; 100%	~59% Female
Race/Ethnicity	10 ; 100%	~88% Black/African American
SCD Genotype	5 ; 50%	5 studies ; 50% reported on/included ≥ 3 genotypes

**Figure 1: PRISMA Flow Chart**



**Figure 2: Number of Pediatric Studies by Intervention Type**



## Systematic Results

### Study Characteristics

- Pediatric focused studies (n=10; total participants = 482) included 4 RCTs, with the remaining 6 using other designs (e.g., single-group pre-post, prospective pilot, retrospective cohort, etc.)

### Study Outcomes

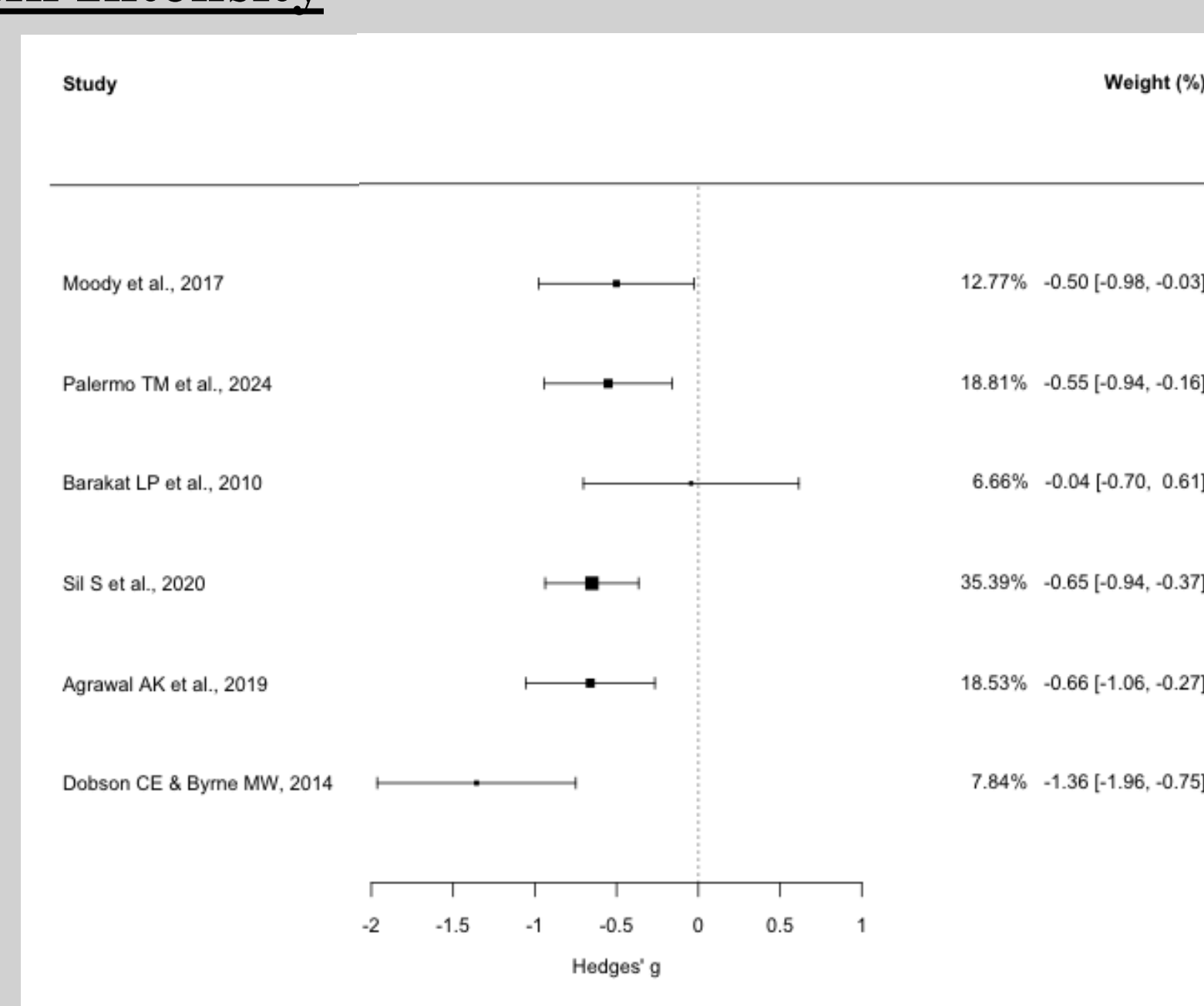
- The most frequently assessed outcomes across studies that we focused on were pain intensity, pain coping, anxiety, depression, and HRQoL.

**Table 2: Subgroup Comparisons**

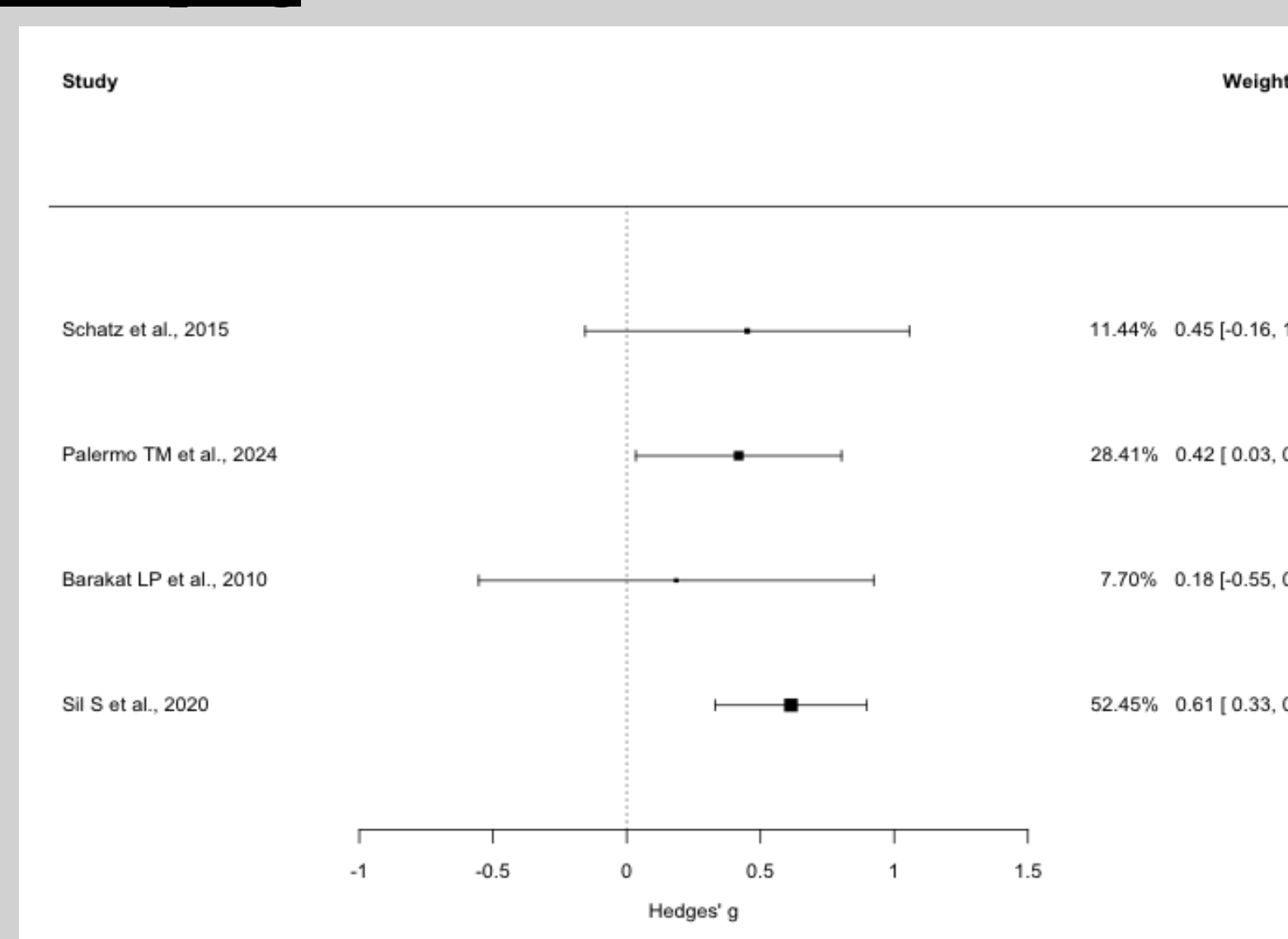
Variable and Group	Hedges' g	95% CI		# of Studies
		Lower	Upper	
Pain Intensity	-0.63	-0.80	-0.46	6
Pain Coping	0.51	0.30	0.71	4
Anxiety	-0.25	-0.54	0.05	2
Depression	-0.04	N/A	N/A	1
HRQoL	0.77	0.02	1.52	2

**Figures 3-7: Summary of Effect Sizes**

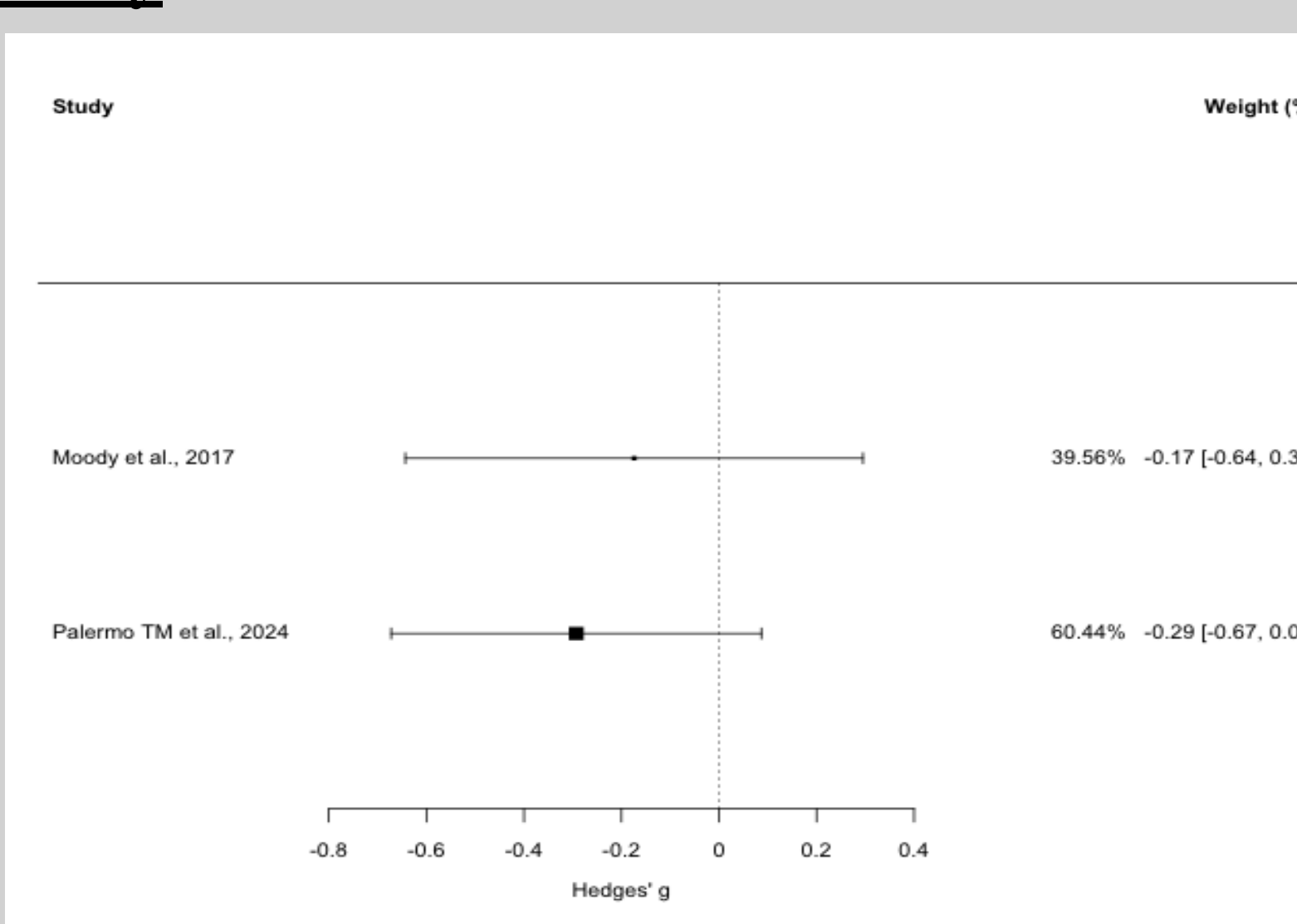
### Pain Intensity



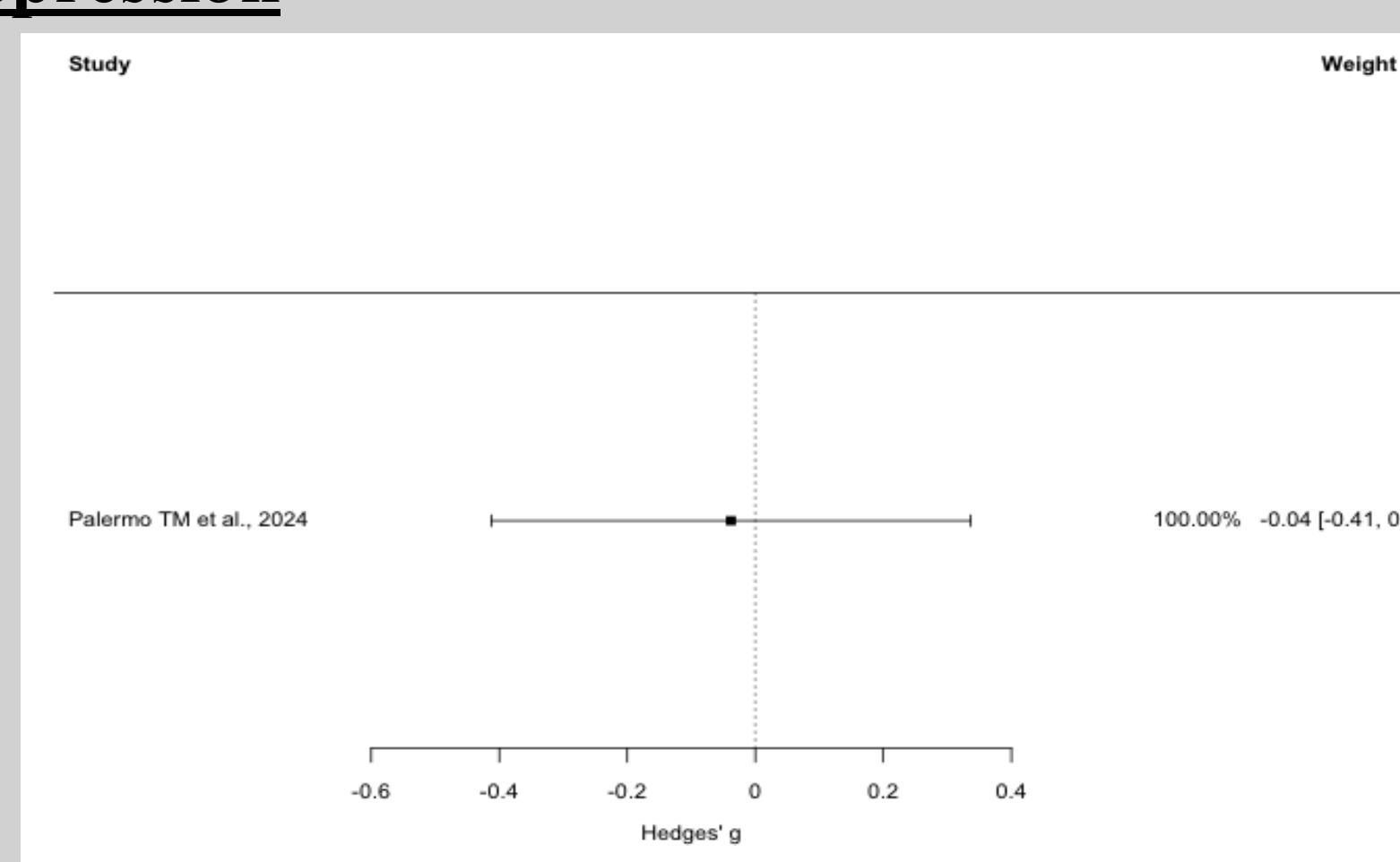
### Pain Coping



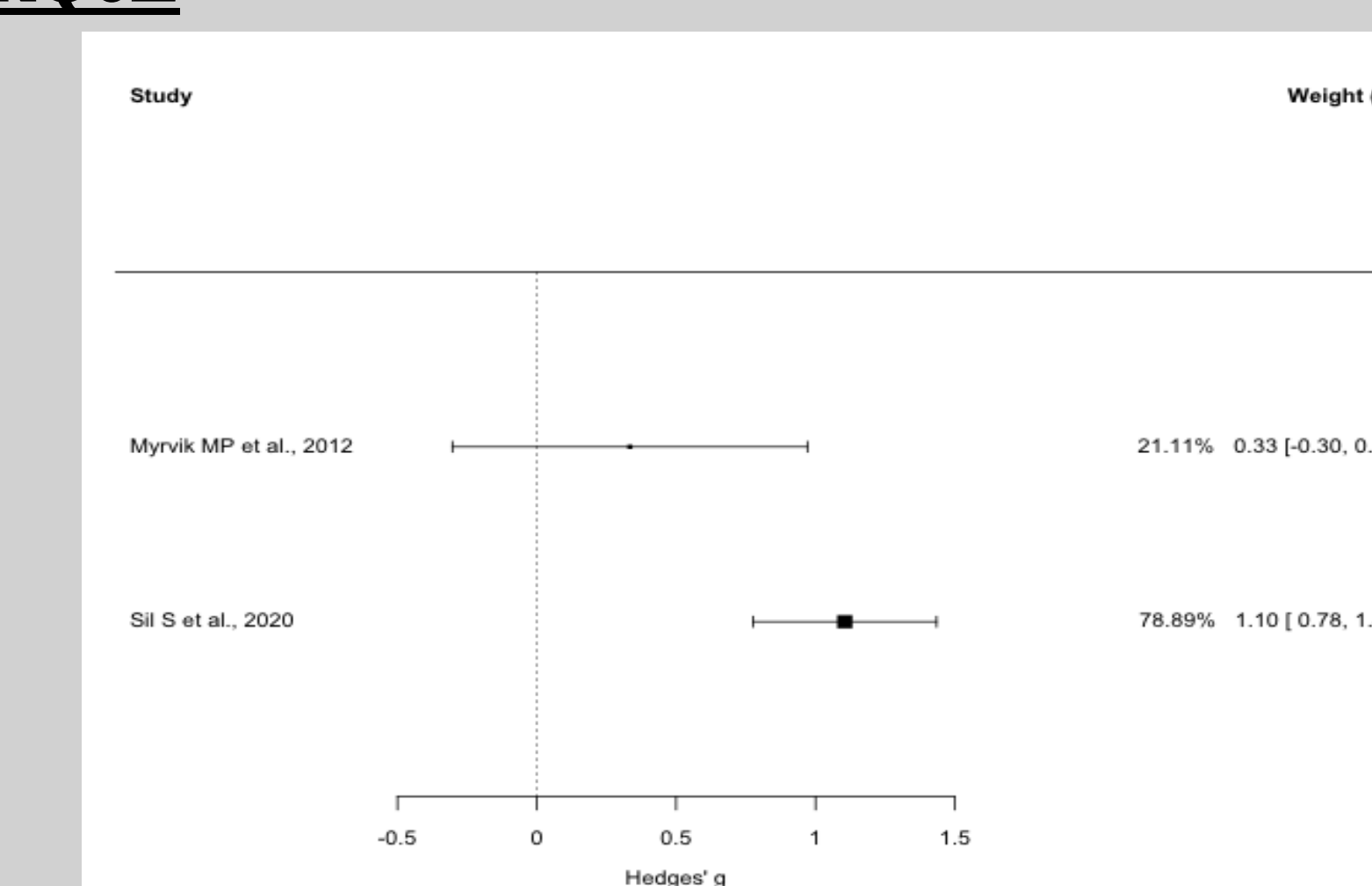
### Anxiety



### Depression



### HRQoL



## Meta Analysis Results

- Psychological interventions were associated with significant improvements in (see Table 2):
  - Pain Intensity** (g = -0.63, 95% CI [-0.80, -0.46], p < 0.001; medium to large effect)
  - Pain Coping** (g = 0.51, 95% CI [0.30, 0.71], p < 0.001; medium effect)
  - HRQoL** (g = 0.77, 95% CI [0.02, 1.52], p = 0.04; medium to large effect)
- Effects on **anxiety** were nonsignificant, and **depression** outcomes could not be pooled due to limited data.

## Conclusions

- Compared to the 2015 review (Anie & Greene 2015; 7 included studies), this review captures more participants, studies, and interventions, highlighting growth in the field.
- Psychological interventions improve pain intensity, pain coping, and HRQoL in pediatric SCD populations.
- Although pooled results for anxiety and depression were nonsignificant, the direction of effects for individual studies indicate many participants experienced benefits.
- Meaningful effects on mental health may emerge with a larger evidence base.
- Findings suggest that cognitive and behavioral interventions may be effective when introduced early in development.
- Findings reflect the broader limitation of research and outcome reporting in SCD and highlight the need for additional high quality pediatric studies, including emotional and HRQoL outcomes alongside pain outcomes to clarify the broader impact of these interventions.

## References

- Anie, K. A., & Green, J. (2015). Psychological therapies for sickle cell disease and pain. *The Cochrane database of systematic reviews*, 2015(5), CD001916. <https://doi.org/10.1002/14651858.CD001916.pub3>

For the full reference list, please scan the QR code:



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