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## Abstract

**Objectives:** To evaluate the effects of post-procedure physical therapy on measures of shoulder pain and disability, quality of life, and shoulder mobility of patients that underwent neck dissection as part of treatment for head and neck cancer.

**Study Design:** Systematic review and meta-analysis of continuous measures.

**Methods:** Literature search was performed by two independent authors. Studies assessing the effects of physical therapy for head and neck cancer patients treated with neck dissection were evaluated.

**Results:** A total of three studies, representing 108 patients, met inclusion criteria. The effectiveness of physical therapy on shoulder pain and disability, quality of life, and shoulder mobility were evaluated through measurements by Shoulder Pain and Disability Index in 108 patients, Neck Dissection Impairment Index in 91 patients, and active shoulder abduction in 56 patients, respectively. Pooled analyses of intervention (structured physical therapy program) versus control (standard, self-directed PT exercises) groups for shoulder pain and disability index (mean difference: -8.13, 95% CI [-14.06,-2.12], p=0.007) and active shoulder abduction degree (mean difference: 24.74, 95% CI [6.71,42.76], p=0.007) favored intervention, while Neck Dissection Impairment Index (mean difference: 6.74, 95% CI [-2.55,16.03], p=0.16) favored neither.

**Conclusion:** Few studies have been performed evaluating the role, rigor, timing, and duration of physical therapy for head and neck cancer patients following neck dissection. More rigorous therapy programs appear to demonstrate greater benefits in regards to shoulder pain, disability, and mobility. Additional studies are warranted to further characterize programs that offer maximal support for this cohort of patients.

## Introduction

### Head and neck cancer (HNC):

- Accounts for about 3% of all malignancies<sup>1</sup>
- Often originate in the upper aerodigestive tract and metastasize to the neck with enlarged lymph nodes
- May require treatment with radiation, chemoradiation, and/or surgery

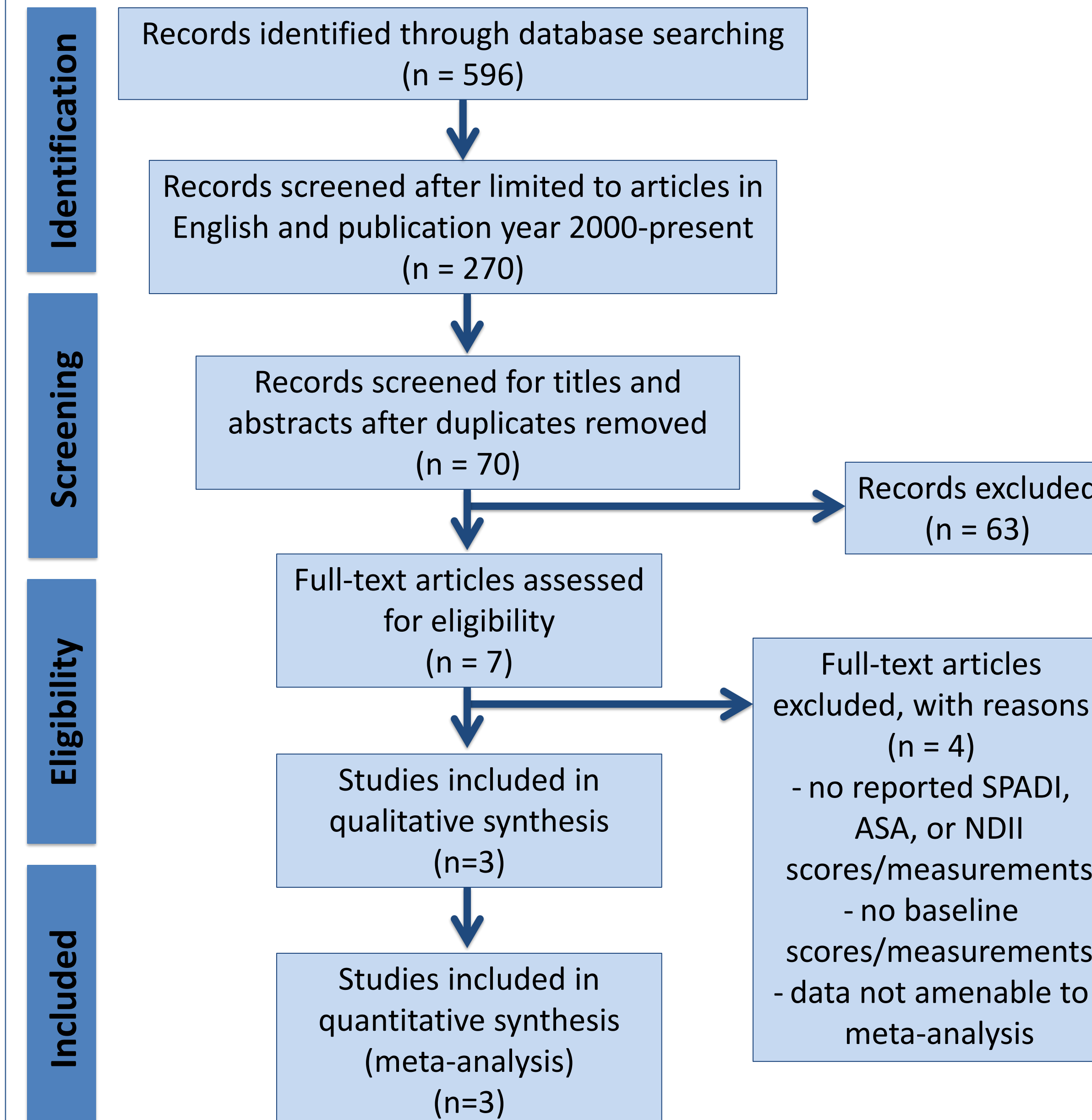
### Neck dissection (ND):

- Surgical procedure utilized for removal of neck lymph nodes
- May cause post-operative morbidity such as neck and shoulder stiffness, numbness, fibrosis, discomfort with and reduction in range of motion, and weakness
- Shoulder morbidity (pain and decreased range of motion) impacts patients' quality of life<sup>2,3</sup>
- Shoulder complaints are still prevalent in 18-77% of modified radical and 29-39% of selective ND patients, and shoulder dysfunction in around 22% of spinal accessory nerve sparing ND patients<sup>4-6</sup>
- Shoulder dysfunction could lead to adhesive capsulitis and shoulder contractures if left untreated<sup>6,7</sup>

### Physical therapy (PT):

- Crucial post-operative treatment for HNC patients following ND
- Potential to decrease shoulder pain, maintain and improve range of motion, and prevent secondary disorders<sup>6,8</sup>
- Currently not standardized and can range from standard, self-directed exercises to structured sessions or programs.

## Materials and Methods



**Figure 1:** PRISMA study flow diagram outlining search strategy. SPADI, Shoulder Pain and Disability Index; NDII, Neck Dissection Impairment Index; ASA, active shoulder abduction.

## Results

### Meta-Analysis Articles:

1. McGarvey et al. 2015<sup>9</sup>
2. McNeely et al. 2008<sup>10</sup>
3. McNeely et al. 2004<sup>11</sup>

### Inclusion/Exclusion Criteria:

- HNC patients that underwent ND and subsequent PT for diagnosed shoulder dysfunction

**Table 1.** Patient Demographics and Follow-up.

n	Average Age (years) [range]	% Male	Follow-up (months)
108	55.7 [18-80]	73.5	3

### Shoulder Pain and Disability Index (SPADI):

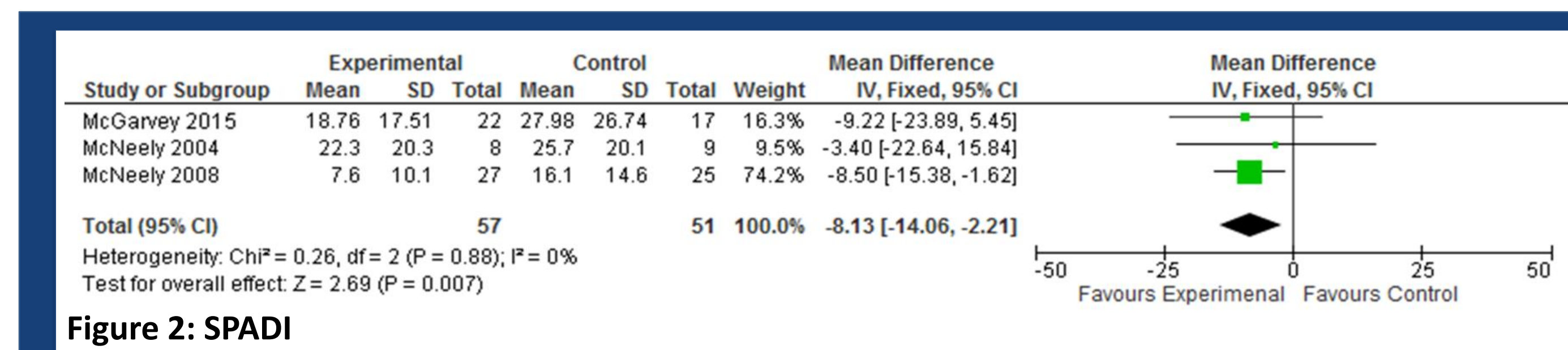
- 100-point scoring system
- Valid and reliable questionnaire used to assess for shoulder pain and disability<sup>12,13</sup>
- Higher the score, the greater the degree of shoulder impairment

### Neck Dissection Impairment Index (NDII):

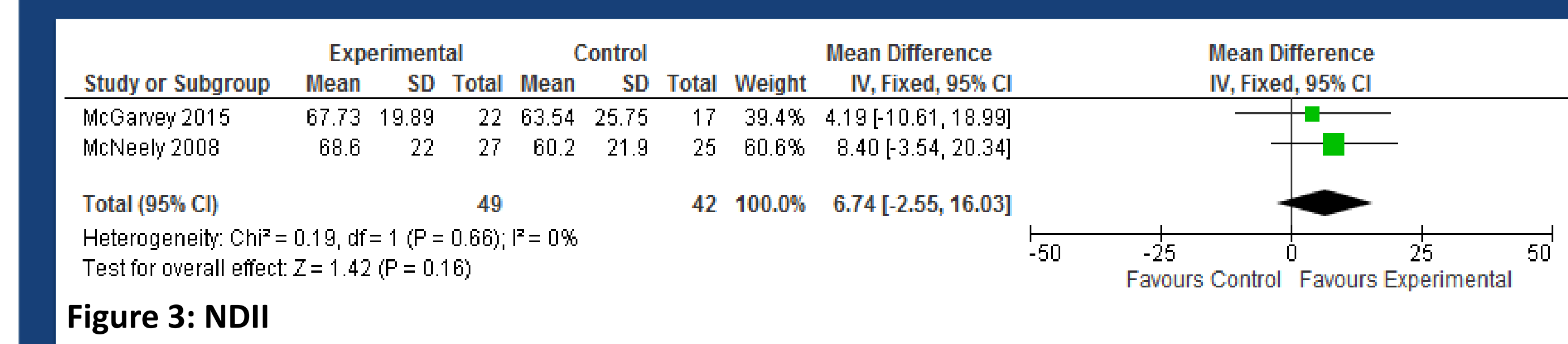
- Reliable 10-question tool, scored from 1 ("a lot") to 5 ("not at all"), then scaled to a 100-point cumulative score
- Marker to assess quality of life and validated for assessing impairment following ND<sup>14</sup>
- Higher the score, the lesser the impairment to quality of life

### Active Shoulder Abduction (ASA):

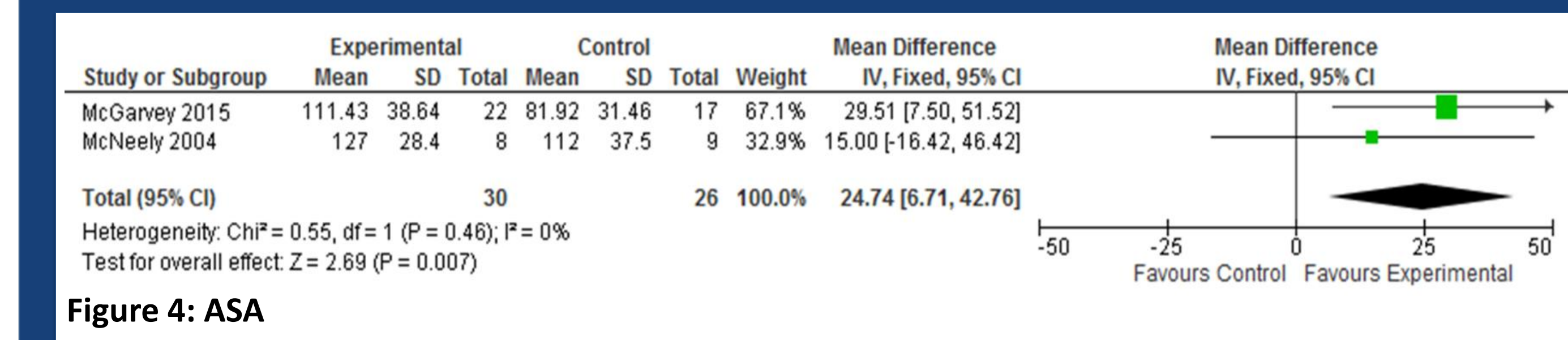
- Marker for shoulder mobility
- Higher the value, the greater the shoulder mobility



**Figure 2:** SPADI



**Figure 3:** NDII



**Figure 4:** ASA

**Table 2.** Measured Outcomes and Analysis

Measured Outcome	n (treatment, control)	MD	95% CI	p	I <sup>2</sup>
SPADI	108 (57, 51)	-8.13	-14.06,-2.12	0.007	0%
NDII	91 (49, 42)	6.74	-2.55,16.03	0.16	0%
ASA	56 (30, 26)	24.74	6.71,42.76	0.007	0%

MD = mean difference; CI = confidence interval;

## Discussion

- Limited evidence and studies in the medical literature on the effectiveness of post-operative PT in HNC patients treated with ND
- Largest and most recent meta-analysis

### Implications:

- Structured PT regimens provide significantly greater benefits in regards to shoulder pain, disability, and mobility compared to standard, self-directed PT
- Improvements can be achieved earlier with more structured PT programs
- Structured PT regimens seem to provide improvements in quality of life, but was not significantly different from standard, self-directed PT

### Limitations:

- Sample size
- Follow-up period
- Differences between structured PT regimens

## Conclusion

- Shoulder pain, dysfunction, and impairment are pervasive in HNC patients who have undergone ND
- Post-operative PT modalities have promising benefits with more rigorous and structured PT programs leading to greater improvement in shoulder pain, disability, and mobility when compared to self-directed exercises.
- Due to the small number of studies, limited sample size, differing PT regimens, and heterogeneity in PT outcome measurements, additional studies are needed to further characterize PT regimens in order to expand upon their potential impact on the recovery of HNC patients.
- More studies are necessary to further characterize the varying PT modalities, as well as regimens, according to their differential impact on functional outcomes and quality of life in HNC patients treated with ND.

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