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Paper 2: Placebo Effect of Using “Own” Pillow as a Comparator in an Experimental Study

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ABSTRACT

Objectives: To establish whether use of a specific type of “own” pillow influences responses to experimental pillows.

Methods: Eighty-one subjects participated in two concurrent experimental studies [Studies 2 and 3 in Figure 1, Paper 1]. Both studies compared subjects’ responses to five experimental pillows [polyester, foam regular and contour, feather, latex] with subjects’ “own” pillow. Study 2 collected prospective information on sleep disruption, waking cervico-thoracic symptoms, sleep quality and pillow comfort over a week on each of the trial pillows, and Study 3 explored differences in dimensions and cervical posture in sidelying on these same trial pillows.

Results: The biggest differences between depths of “own” pillow and similar trial pillow types were for foam and feather pillows, followed by latex pillows. Correlations between depth differences and waking symptoms on “own” pillow were not significant, suggesting that pillow compression [with age] was not a predictor of waking symptoms. Usual foam contour and latex pillow users were strongly negatively sensitized to the effects of any other trial pillow, in that they preferred the trial version of their “own” pillow type. They most disliked the feather pillow. Feather pillow users, however, were strongly positively sensitized to the effect of all other trial pillows, preferring them over their “own”.

Conclusions: There is a clear sensitization / placebo effect most relevant to latex, foam contour, and feather pillows.

KEY WORDS: “Own” pillow use, sensitization, placebo response, sleep quality, pillow comfort, waking cervico-thoracic symptoms

INTRODUCTION

Pillow use is significantly related to cervico-thoracic posture and cervico-thoracic waking symptoms (1-6). Paper 1 in this series reported that people who usually slept on a foam or feather pillow complained of consistent waking symptoms and generally discontinued that pillow use within two years (7). On the other hand, polyester and latex pillows produced consistently fewer complaints of waking symptoms and these pillows were used without complaint by some people for years (7). This paper highlighted that “own” pillows produced different types and frequencies of waking symptoms, and different reports of sleep quality and pillow comfort. In Study 2 [experimental field trial, Figure 1, Paper 1], we reported that trial latex, polyester, and foam contour pillows performed better in terms of waking cervical pain production than feather and foam regular pillows, when compared with subjects’ “own” pillow (8).

Pillows respond to regular use by content compression. Some pillow content fibers retain a “memory” of depth and shape better than others (9,10), and this may explain why pillows with better “memory” fibers [such as latex and polyester] appear to produce fewer symptoms than pillows which compress readily or change shape over time. The use of subjects’ “own” pillow as the control in our experimental studies [Studies 2 and 3, Figure 1, Paper 1] was based on the assumption that subjects would chose to sleep on the best performing pillow they had found (7,8). However, we found that subjects continued to sleep on pillows that produced significant waking symptoms (7,8), and this provided the opportunity to explore patterns of subject response to different types of experimental pillows based on their response to their “own” pillow.

METHODS

Study Purpose

This is the second paper in the series. It reports findings from a subset of 81 subjects who participated in two concurrent experimental studies [Studies 2 and 3 (8,11); see Figure 1 (7)].

In Study 2, subjects could drop out of any trial pillow week if their sleep was significantly constrained by the pillow, and a percentage did for each trial pillow. The only pillow for which all 106 subjects provided seven nights' information was their "own". One hundred subjects completed all seven nights' trial of the polyester pillow, 98 subjects completed the latex pillow week, 96 subjects completed the foam regular and foam contour week, and 81 subjects completed the feather pillow week (8). Based on these findings, we hypothesized that there may be an "own" pillow placebo effect in the experimental pillow field trial which would be detected by matching information on subjects' "own" pillow type to the experimental pillow. The aims of this analysis reported in this paper were to explore whether:

1. subjects who slept on the same "own" pillow type as an experimental pillow would report similar symptoms on both pillows, despite attempts to blind subjects to the trial pillow type, and
2. subjects' use of "own" pillow would influence their responses to the remaining different types of trial pillows.

Data

Data for the 81 common subjects was extracted from Study 2 for the prospective week sleeping on the trial pillows ["own" pillow type and five experimental pillows] with respect to waking cervical pain, disrupted sleep and drop-outs, and Study 3 regarding "own" pillow depth.

Analysis

Depth of subjects' "own" pillow was compared with the depth of the trial pillows and the within-subject pillow differences were considered in terms of cervical symptom production. The correlation between the waking symptom score and the difference in depth between subjects' "own" pillow and the same type of trial pillow was calculated as the r^2 from linear regression models.

Combining the “own” pillow information from both studies allowed investigation of the placebo effect of usually sleeping on a particular pillow type, and trialing a newer version of that pillow type. It also allowed comparison of data from subjects who usually slept on one of the trial pillow types, with their responses to the other experimental pillow types. Analysis thus consisted of a comparison of “own” pillow performance over seven nights compared with subjects’ responses to the same type of trial pillow, and the other trial pillows.

Differences between “own” pillow and any trial pillow were calculated as the number of reported disrupted nights’ sleep, drop-outs from each trial week, and subjects’ reports of waking cervical pain. Patterns of response were sought for each “own” pillow type to each of the other trial pillow types to test whether sleeping on one pillow type sensitized subjects to other experimental pillow types.

A scoring system was developed to assess the potential sensitization effect of sleeping on one type of pillow and trialing another. We hypothesized that negative sensitization would manifest in subjects being critical of a new pillow in light of the expected performance of their “own” pillow. A positive sensitization might occur for subjects who expected less of their “own” pillow and may be open to better performance of a trial pillow, than subjects who were happy with their own pillow performance. The scoring system had three components. Dropouts from each trial pillow week were scored as 0 percent = 2, one to 20 percent=1, and greater than 20 percent=0 [with 10 percent being the median]. Disrupted sleep was scored as 100 percent=0, 70 to 99 percent=1, and less than 70 percent=2 [as 75 percent was also the median]. Maintenance of reported waking cervical pain-free status [compared with “own” pillow] was scored as 100 percent=2, 70 to 99 percent=1, and less than 70 percent = 0 [with 75 percent being the median]. Negative sensitization reflected lower scores, while positive sensitization reflected higher scores. Subjects who were positively sensitized to another type

of pillow would score 5 to 6, while subjects who were negatively sensitized to another type of pillow would score 0 to 1.

RESULTS

Sample Description

The percentage of the sample in gender and age groupings is provided in Table 1. There was no gender difference in this sample, however there were significantly more men and women in the 40 to 59 year age group than the younger or older groups.

<<Table 1 about here>>

Own Pillow Descriptors

Polyester pillows were by far the most commonly used pillow by the 81 subjects [see Figure 1]. Foam contour pillows outnumbered the foam regular [rectangular] approximately 4:1. All other pillows were rectangular shaped. The average millimeter depth of subjects' own pillows [standard deviation, minimum, maximum] is reported in Table 2. The wool pillow was excluded from analysis as it was infrequently used [N=2] and there was comparable experimental pillow.

<<Figure 1 and Table 2 about here>>

Differences Between Depth of “Own” Pillows and Trial Pillows

There were marked differences between the trial pillow type depth and similar “own” pillow depth, highlighting the potential for age and use to influence pillow performance, and hence waking symptom reports. The average difference [standard deviation [SD], minimum, maximum] is reported in Table 3. The biggest differences between depths of “own” pillow and similar trial pillow types were for foam and feather pillows, followed by latex pillows. However the correlations between depth difference and waking pain scores on “own” pillow were small, and not significant for any pillow type [polyester $r^2=0.0007$, foam [regular and

contour] $r^2=0.012$, and latex $r^2=0.049$]. The correlation between depth difference and waking symptom scores for the feather pillow could not be calculated on small subject numbers. This provided no evidence to support pillow age or use [compression] as a predictor of waking symptoms for any pillow type.

<<Table 3 about here>>

Performance of Own Pillow versus Similar Experimental Pillow

Table 4 reports the performance of subjects whose “own” pillow type was the same as one of the trial pillows. The two subjects who usually slept on feather pillows dropped out at the beginning of the feather pillow trial week, hence no data was available on their response to this pillow. Considering the percentage of subjects reporting disrupted sleep, this was consistent across the trial weeks, despite the pillow type. This suggests that the reasons provided for disrupted sleep were not contingent on the type of pillow being trialed.

<<Table 4 about here>>

The percentage of subjects reporting no cervical waking pain on their “own”, and the similar trial pillow was also consistently high, with the latex pillow being the only one to show a decrease in waking pain reports. Of note however, was that all subjects who normally reported no waking cervical pain on their own latex pillow reported disrupted sleep, rather than waking symptoms, on the trial latex pillow. When the subjects reporting disrupted sleep were removed from the analysis, the percent agreement between waking symptoms on the same “own” and trial pillows was subsequently adjusted to 90 percent for polyester pillows, 100 percent for foam regular pillows, 66.7 percent for foam contour pillows, and 100 percent for latex pillows.

Does Sleeping on One Type of Pillow Sensitize Subjects to Others?

This question was considered in several ways, in terms of 1. drop outs, 2. the percentage of subjects who continued to wake neck-pain-free on the trial pillow [compared with their

“own” pillow]; and 3. the percentage who continued to report disrupted sleep [compared with their “own” pillow]. Tables 5-7 provide each set of information in a matrix comparing own pillow responses with responses to the other trial pillows. The percentage of drop outs was greatest for usual latex pillow sleepers [40 percent], and usual foam contour pillow sleepers [37.5 percent], when trialing the feather pillows. Approximately one-fifth of foam contour pillow sleepers also dropped out when trialing the feather regular pillow [28.6 percent; see Table 5].

<<Table 5 about here>>

Maintenance of a state of no waking symptoms was consistent for all type pillow sleepers when sleeping on a latex pillow. The feather pillow on the other hand was poorest at maintaining usual pain-free waking, with reduced frequency of waking with no cervical pain for usual foam, polyester, and latex pillow sleepers. The other usual pillow sleepers had variable responses to the trial pillows [see Table 6].

<<Table 6 about here>>

Disrupted sleep can result from a range of factors. We previously reported on these as including wakeful children, nocturnal toileting needs, stress, poor sleep of partner, pets, shift work, noise, dreams, and temperature (2,8). In Study 2, disrupted sleep may also have been reported as a result of unfamiliarity and/or dissatisfaction with the trial pillow. The trial polyester, foam regular and latex trial pillows reduced the frequency of disrupted sleep for all other “own” pillow type users, whereas the foam contour and feather trial pillows maintained subjects’ reports of disrupted sleep for the foam regular and foam contour “own” pillow sleepers [see Table 7].

<<Table 7 about here>

Our scoring system identified that usual foam contour and latex pillow users were negatively sensitized to the effects of any other trial pillow. This was particularly noticeable for these users when trialing the feather pillow. Feather pillow users were positively sensitized to the effect of all trial pillows [scoring them positively in all instances, with foam regular and contour pillows being scored most poorly]. Polyester, followed by foam regular pillow users, were moderately positively sensitized to all other pillow types [see Table 8].

<<Table 8 about here>>

DISCUSSION

This paper provides useful information for researchers when comparing trial pillow performance with subjects' "own" pillow. The findings suggests that the age of subjects' "own" pillow should not influence reports of waking pain when compared with a newer trial pillow of the same type. It also indicates that there is a sensitization effect which should be taken into account in order to adjust for a possible placebo effect when trialing a new pillow type similar to one's own, and different to one's own.

The difference in depth between subjects' "own" pillow and the trial pillow of the same type was not correlated with reports of waking neck pain. This further validates the findings of Paper 1, in which "own" pillow age varied and appeared to have little influence on symptom reports. It was of note however, that the pillows for which there were greatest reports of waking pain were those with the largest average difference between "own" pillow and the same trial pillow type. This requires further research in a larger sample of "own" pillow users.

Subjects' reports of disrupted sleep and waking symptoms were consistent when sleeping on a trial pillow similar to the one on which they usually sleep. Subjects who slept on a latex, polyester, or foam contour pillow largely reported greater occurrences of disrupted sleep and waking symptoms when trialing other new pillow types than subjects who slept on feather or regular foam pillows. This concurs with the findings reported in Paper 1. Subjects who sleep on foam regular or feather pillows are most likely to change their pillows to another type, than subjects who sleep on latex, foam contour, or polyester pillows.

When considering the effect of sleeping on a pillow with which subjects are satisfied, we found that subjects who sleep on a latex or a foam contour pillow are least likely to rate another type of experimental pillow well, whereas subjects who sleep on a feather or foam regular pillow are more open to the better performance of another pillow type. These findings suggest that in future experimental trials of pillow performance, the effect of sleeping on subjects' "own" pillow should be given greater consideration when examining the differences between 'usual' pillow as the control and a trial pillow.

CONCLUSION

Researchers should consider a possible placebo effect when using subjects' "own" pillow as the comparison in an experimental study of the effects of different pillow types. Regular users of latex and foam contour pillows may not rate different types of trial pillows better than their own, while regular users of feather pillows may rate any other trial type pillow better. There is a need for further research into pillow preference, and to better understand the reasons why individuals choose to use one type of pillow over another.

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Table 1. Demographic Information

	Age < 40 years	Age 40-59 years	Age 60+ years
Male	22.8%	54.4%	22.8%
Female	20.8%	54.2%	25%

Table 2. “ Own” Pillow Depth Details

Pillow type	N	Av depth [mms]	SD	Minimum	Maximum
Polyester	47	102.3	27.6	70.0	190.0
Foam regular	3	135.0	13.2	125.0	150.0
Foam contour	13	111.2	13.4	95.0	140.0
Feather	2	95.0	21.2	80.0	110.0
Latex	14	120.6	15.5	95.0	145.0

Av = average

SD = Standard Deviation

Table 3. Difference Between “Own” Pillow and Similar Trial Pillow Depth

Pillow Type	Average difference [mms]	SD	Minimum	Maximum
Polyester	18.3	15.3	5	35
Foam Regular	45.1	47.7	-135	125
Foam Contour	15.0	13.2	0	25
Feather	37.3	13.2	10	55
Latex	21.8	14.7	0	50

SD = standard deviation

Table 4. Comparison of Own Pillow with Similar Trial Pillow

Key to table: Of the people who usually slept on xx pillow, the percentage who:

- completed the trial of the similar content experimental pillow
- reported disrupted sleep on trial pillow (did so on own pillow) [did so on both]
- usually woke with no cervical symptoms on their own pillow, and also did so on the trial pillow
- usually woke with cervical symptoms on their own pillow, but woke with none on the trial pillow [relieved]
- usually woke with occasional cervical symptoms on their own pillow, and also did on the trial pillow
- usually woke with regular cervical symptoms on their own pillow, and also did on the trial pillow
- agreed on their reports of waking symptoms and disrupted sleep on both pillows

	Completed trial	Disrupted sleep on trial pillow (own pillow) [both pillows]	No waking Cx pain on both pillows	Pain usually on own pillow but relieved on trial pillow	Occasional waking pain on both pillows	Regular waking pain on both pillows	% agreement on overall findings
Polyester	90%	37.8% (50%) [28.9%]	33.3%	-6.7% [worsened on trial pillow]	0%	2.2%	64.5%
Foam regular	100%	66.7% (66.7%) [100%]	100%	0%	NA	NA	100%
Foam contour	76.9%	7.7% (38.5%) [7.7%]	30.8%	0%	NA	7.7%	46.1%
Feather	0%						
Latex	100%	25% (43.8%) [6.3%]	37.5%	25%	0%	NA	43.7%

NA = not reported in this sample on usual pillow

Table 5. Drop Outs Considering Subjects' Own Pillow Compared with the Trial Pillows

Own pillow	Trial pillow				
	polyester	foam regular	foam contour	feather	latex
polyester		2.1%	9.0%	22.9%	2.0%
foam regular	0.0%		0.0%	33.3%	0.0%
foam contour	15.3%	30.1%		61.5%	23.1%
feather	0.0%	0.0%	0.0%		0.0%
latex	6.2%	6.2%	6.2%	37.5%	

Table 6. Percent Continuing to Wake Neck-Pain Free, Considering Subjects' "Own" Pillow Compared with the Trial Pillows

Own pillow	Trial pillow				
	polyester	foam regular	foam contour	feather	latex
polyester		63.16%	94.0%	81.3%	84.2%
foam regular	33.3%		100.0%	0.0%	100.0%
foam contour	75.0%	100.0%		50.0%	100.0%
feather	100.0%	100.0%	50.0%		100.0%
latex	87.5%	62.5%	100.0%	60.0%	

Table 7. Percent Continuing to Experience Disrupted Sleep, Considering Subjects' "Own" Pillow Compared with the Trial Pillows

Own pillow	Trial pillow				
	polyester	foam regular	foam contour	feather	latex
polyester		50.0%	34.8%	21.1%	29.2%
foam regular	50.0%		50.0%	0.0%	0.0%
foam contour	20.0%	20.0%		50.0%	50.0%
feather	0.0%	0.0%	50.0%		0.0%
latex	50.0%	16.7%	16.7%	25.0%	

Table 8. Sensitization scores

Own pillow	Trial pillow					total
	polyester	foam regular	foam contour	feather	latex	
polyester		3	4	5	4	16
foam regular	4		6	2	6	18
foam contour	4	4		2	3	14
feather	6	6	4		6	22
latex	4	3	5	2		14

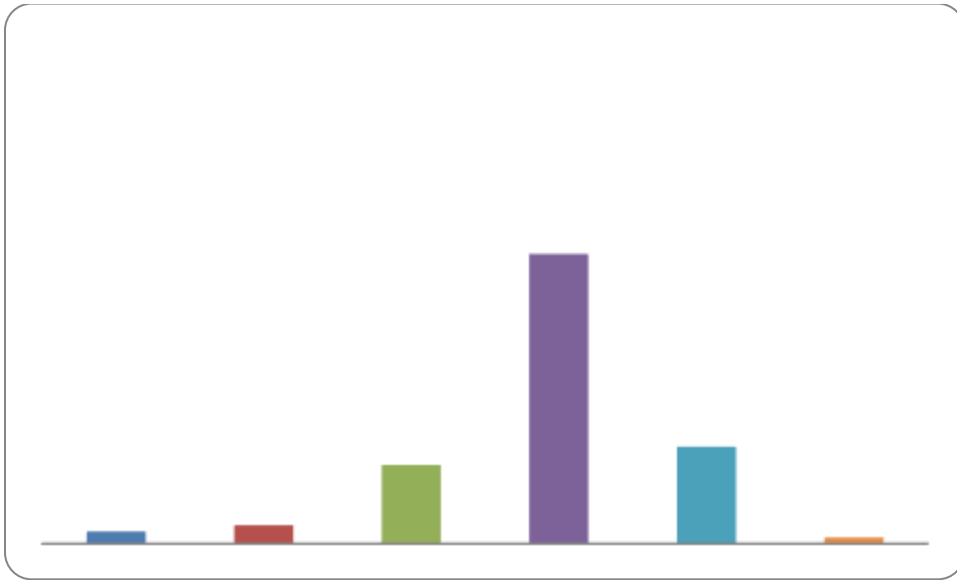


Figure 1. Frequency of use of “own” pillows with different content