



## Unpublished Report

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**Sheep CRC Report 12\_8**

## **Assessment of the Handle of Next-to-Skin Knitted Fabrics by Consumer and Experienced Commercial Judges**

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### **Background:**

Consumers were recruited to participate in trials for assessing the comfort of a series of garments during wear testing under stressful conditions (Stanton 2008). Following the trials each consumer was asked to rank and rate a series of next-to-skin knitted fabrics, including the fabrics used to construct the garments in the comfort wear trials, for various fabric handle attributes. The fabrics were also assessed by a panel of judges experienced in handling fabrics (Mahar 2010). Detailed analysis of the fabric handle assessments of the experienced judges on a large range of fabrics (Mahar 2010) has shown strong levels of overall agreement of individual judges to their average fabric rating. The variability amongst individual judges is also acknowledged.

This report discusses the agreement both amongst the consumer judges and also between the consumer and experienced judges.

### **Method and Materials:**

#### **Consumer judges**

In the consumer trial 25 judges were asked to rank a series of six fabrics for the following series of fabric handle attributes:

- Overall Handle Preference
- Soft – Hard;
- Smooth – Rough;
- Limp – Firm; and,
- Cool – Warm.

Following the ranking the judges were asked to rate the fabrics on a nine point scale with rank 1 having a score of 1 and rank 6 a score of 9, i.e., the softest, smoothest, limpest and coolest feeling fabrics were allocated the lowest score. Note that, for consistency with the experienced judge trial, this scale was inverted to make the most extreme sample, e.g., the smoothest, have the highest score (9) and the opposite extreme, e.g., the roughest, have the lowest score (1). Fourteen (14) of the judges were asked to rank and rate the fabrics on a second occasion.

#### **Experienced judges**

Twelve (12) experienced judges were asked to grade the same six fabrics amongst a set of 52 fabrics on a 1 – 10 scale for the following fabric attributes:

- Overall Handle;
- Soft – Hard;
- Smooth – Rough;
- Hairy - Clean;
- Light – Heavy;
- Greasy - Dry; and,
- Cool – warm.

Details of the methods used in the consumer and experienced judge trials have been reported elsewhere (Stanton 2008; Mahar 2010) and will not be repeated here.

Details of the six fabrics are shown in Table 1.

Table 1. Details of the six fabrics being assessed.

<b>Fabric number</b>	<b>Composition</b>	<b>Weight (gm<sup>-2</sup>)</b>	<b>Thickness (mm)</b>
1	100% 16.4µm Wool	153	0.677
2	100% 18.1µm Wool	177	0.742
3	100% 30.3µm Wool	166	0.688
4	Cotton	170	0.775
5	100% 17.1µm Wool	148	0.456
6	Wool/Elastane	215	0.772

## **Results and Discussion:**

### ***Repeatability of Consumer Judges***

Figure 1 compares the average Overall Handle Preference scores of the 14 judges for each fabric between the first and second trials. It can be seen that the average scores in each trial are in very strong agreement, although the 17.1µm wool fabric had an improved preference rating (5.1) in the second trial compared to the first (3.6).

It is interesting to note that the average assessments of the 14 judges agree extremely closely (coefficient of determination = 0.98) with the mean of the full set of 25 judges who assessed the fabrics in only the first of the trials.

While the average rating was relatively consistent between the two trials, Figure 2 shows the variation amongst the individual judges of their average (absolute) differences between the two trials. The average difference of all 14 judges was 2.1, but the variation for individual judges ranges from 0 to 4.3. Figure 2 highlights that two judges contribute strongly to the variation in handle ratings, with mean absolute differences of 4.2 and 4.3, while a different pair of judges showed very high levels of consistency with average variations of 0 and 0.5.

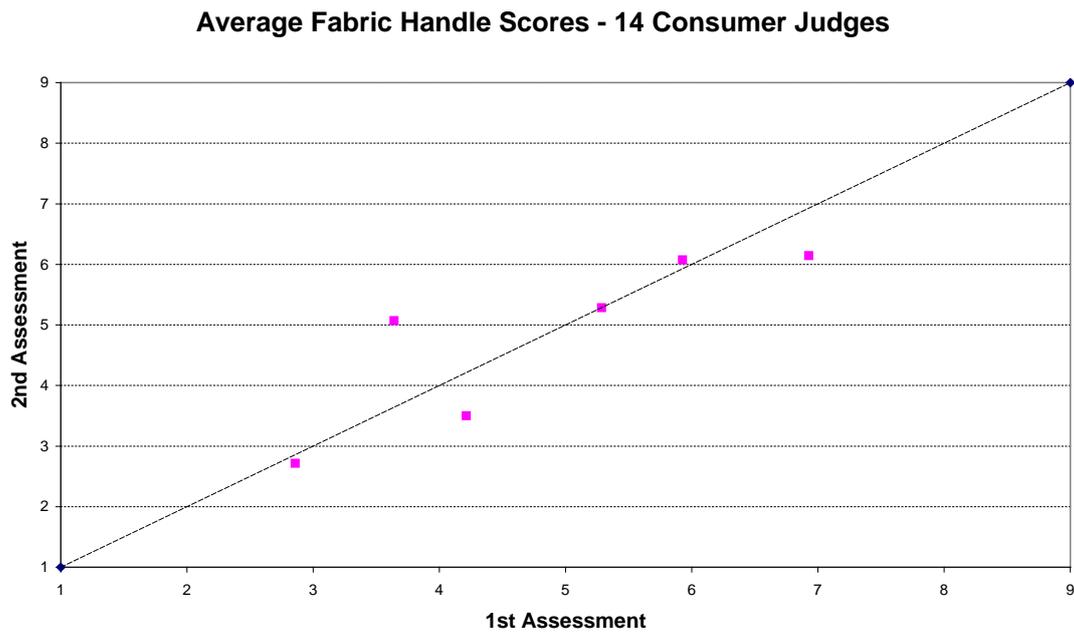


Figure 1. Comparison of the average scores of the 14 consumer judges for Overall Handle Preference in the first and second assessment trials.

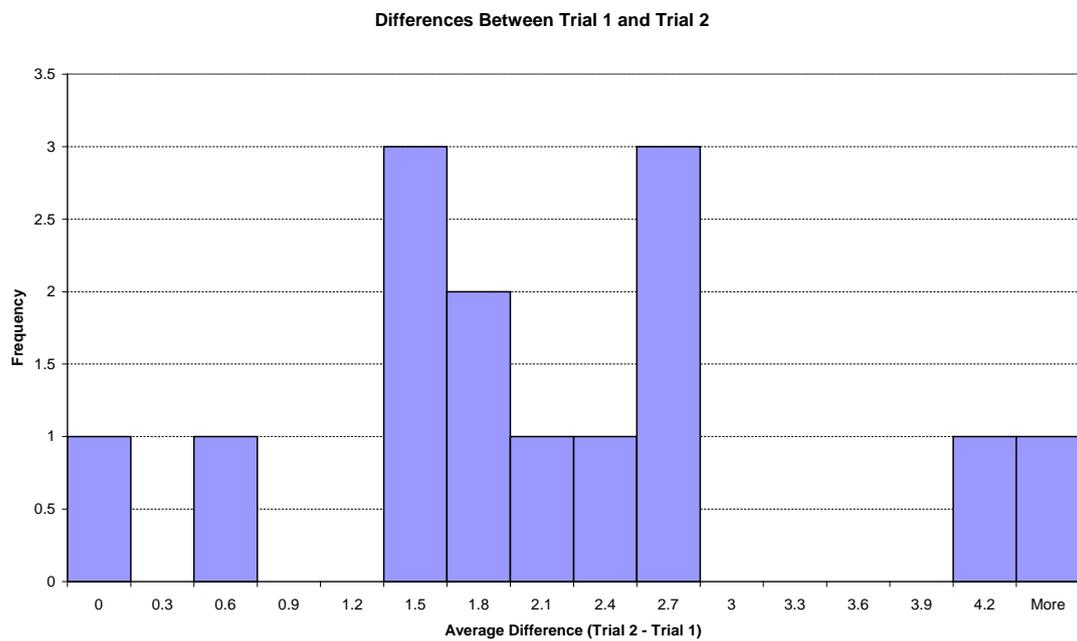


Figure 2. Histogram of the average differences between trials 1 and 2 for each of the 14 judges.

### **Agreement amongst judges**

The average rating of the judges for each fabric in trials 1 and 2 was calculated and used to determine the level of agreement amongst the judges on their overall handle preference. The average overall handle preference scores for each fabric are:

Fabric 1	7.2;
Fabric 2	6.1;
Fabric 3	4.0;
Fabric 4	4.7;
Fabric 5	5.6;
Fabric 6	3.5.

The correlation between each judge and the mean assessment of all judges was calculated and the correlation coefficients are shown in Table 2.

Table 2. Correlation coefficients between the assessments of each judge and the mean assessment of all judges.

Judge	Correlation with mean assessment		
	Trial 1	Trial 2	Average
1	0.26	0.00	0.13
2	0.14	0.49	0.32
3	0.83	0.73	0.78
4	0.43	0.90	0.66
5	0.70	-0.10	0.30
6	0.75	0.84	0.79
7	0.86	0.55	0.70
8	0.54	0.14	0.34
9	-0.46	-0.09	-0.28
10	0.70	0.55	0.62
11	0.75	0.68	0.71
12	0.36	0.75	0.55
13	0.19	0.41	0.30
14	0.99	0.59	0.79
Mean	0.50	0.46	0.48
Min	-0.46	-0.10	-0.28
Max	0.99	0.90	0.79

For the average of the two trials the average correlation between individual judges' assessments and their mean assessment is 0.48, ranging from a minimum of -0.28 to a maximum of 0.79. Comparative values for the experienced judges for a larger set of similar next-to-skin knitted fabrics, which incorporated the 6 fabrics under discussion, were a mean of 0.75, ranging from 0.53 to 0.89.

### **Relationship between overall handle and fabric attributes**

Figure 3 shows the relationships between overall handle and fabric smoothness, softness and firmness for the consumer judges. The results indicate that overall preference in fabric handle is associated with increased smoothness and softness and

reduced fabric firmness. But it is not the case that a very smooth fabric is necessarily highly desirable. The fabric rated as the smoothest was the cotton fabric which was also rated as the second firmest; whereas the three relatively smooth pure wool fabrics were also rated as relatively limp. These three fabrics were rated as significantly more preferable in overall handle than the smoother cotton fabric.

Although there is a very clear linear relationship between softness rating and overall fabric handle for the four pure wool fabrics amongst the full set of six fabrics these results also show that there is no simple relationship between overall fabric handle and any single fabric attribute.

## ***Consumer versus experienced judges***

### **Overall handle preference**

The average assessments of the consumer and experienced judges are plotted in Figure 4 for overall fabric handle preference (consumer judges) and overall fabric handle (experienced judges). There is a clear linear relationship between the two sets of assessments for the four pure wool fabrics which can be isolated in Figure 4 as the fabrics for which the experienced judges gave ratings of greater than 7.5. The experienced judges gave increasingly higher ratings than the consumer judges for these four fabrics as their wool fibre diameter increased. The ranking of these four fabrics is the same for each set of judges.

The consumer judges rated the cotton fabric significantly higher than the experienced judges. Both sets of judges rated the heavier wool/elastane fabric as the least desirable for next-to-skin wear.

### **Fabric attributes**

Figure 5 shows the relationships between:

- the consumer and experienced judges' assessments of fabric smoothness, softness; and,
- the consumer ratings of fabric firmness with fabric tightness and softness assessed by the experienced judges.

Though the two sets of judges rate the cotton fabric differently, there is very good agreement in smoothness rating between the two sets of judges. Similarly, there is very good agreement between the two sets of judges for fabric softness with the exception of the cotton fabric. It is also interesting to note that the consumer assessment of fabric firmness is more closely related to the softness ratings of the experienced judges than to their fabric tightness ratings.

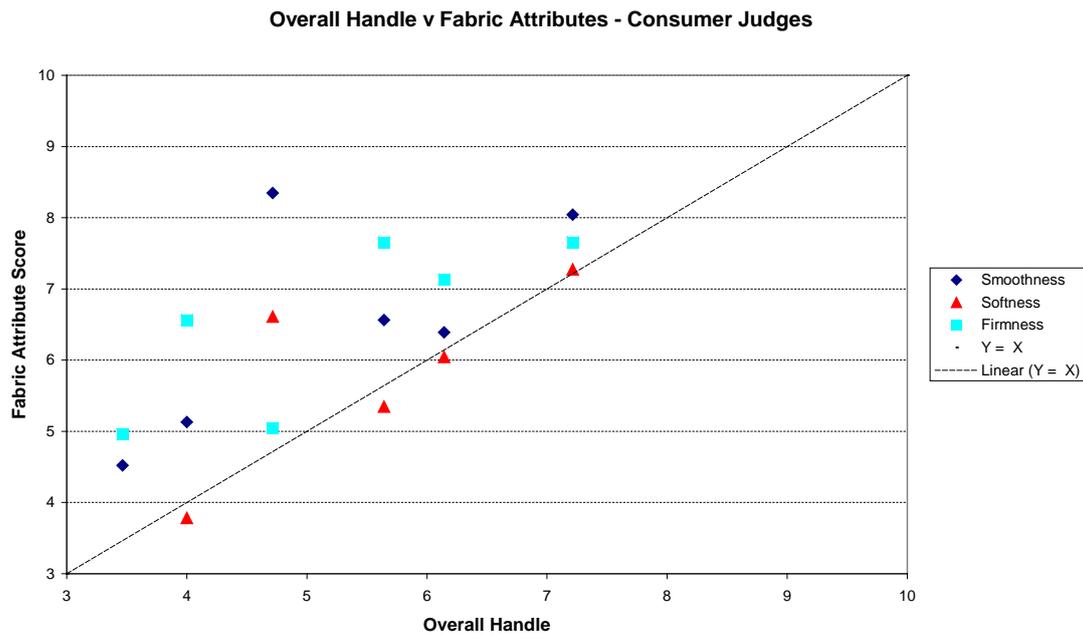


Figure 3. Relationships between (average) overall handle preference and (average) fabric smoothness, softness and firmness for the consumer judges.

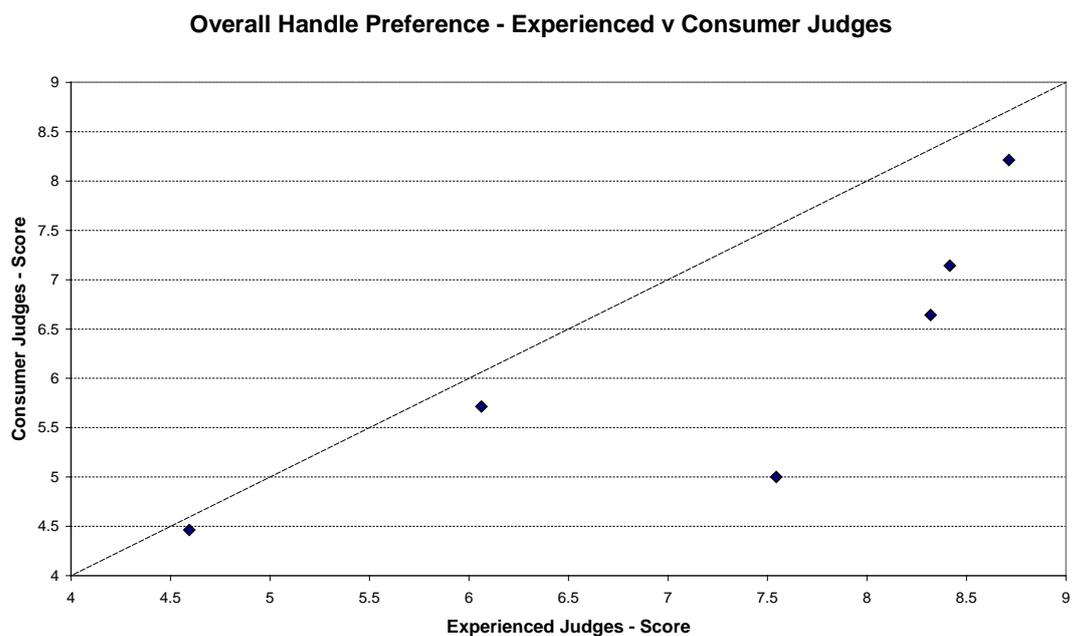


Figure 4. The relationship between the average assessments of consumer and experienced judges for overall handle preference.

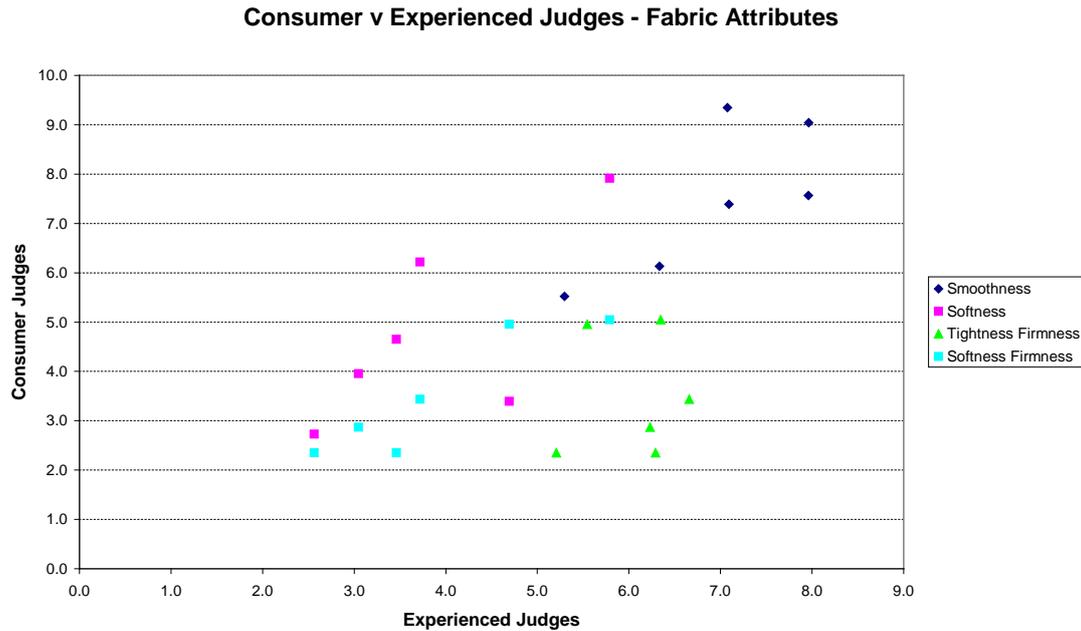


Figure 5. The relationships between consumer and experienced judges for fabric smoothness and softness, fabric firmness (consumer) and tightness (experienced judges), and fabric firmness (consumer) and softness (experienced judges).

## Summary

Consumer ratings of fabric handle attributes show an overall consistency and similar overall preferences as experienced judges, though there is considerable variation amongst individual consumers in their ratings.

## Acknowledgements

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## References

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