

# Study for the age-dependent difference of trans-epidermal water loss (TEWL) response to dry environment in Korean

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## Summary

Our skin responds to changes in various environmental conditions to maintain internal homeostasis. Especially, the skin can be affected in big by environmental humidity, low humidity or high humidity. This study was designed to investigate the difference of skin's responding properties to dry environment (low humidity) in young and old skin.

A total of 267 healthy Korea women and men aged between 20 and 57 years participated in the study (20s: 32, 30s: 58, 40s: 101, 50s: 76). The test conditions were adjusted to provide 20±2°C of temperature and 20±5% of relative humidity(RH) for dry environment. The trans-epidermal water loss (TEWL) was measured on the ventral forearm before exposure and after exposure of 20 min to Low RH. The statistical significance was determined at p<0.05.

General TEWL (data of before exposure to low RH) increased by 20s to 50s, and there was significant difference between (20s and 30s) and (40s and 50s) (p<0.05). The difference between general TEWL and Low RH TEWL (ΔTEWL) decreased by 20s to 50s, and there was significant difference between 30s and 50s (p<0.05).

As results, TEWL showed significant increase in their 40s and older and ΔTEWL showed significant decrease in their 50s. This means that young skin (20s and 30s) can show more dynamic response to dry environment (low RH) than 40s and older. And ΔTEWL may be a useful parameter to evaluate the skin's adaptability to dry environment.

## Purpose and Methods

◆ This study was conducted to study the changes according to age when the skin was exposed to a dry environment, that is, relatively low humidity, in Korean.

◆ **Subjects:** A total of 267 healthy Korea women and men aged between 20 and 57 years participated in the study.

◆ **Experimental environment:** Dry environment conditions (low relative humidity; LRH) were adjusted to provide 20±2°C of temperature and below 20±5% of relative humidity(RH) for dry environment (low relative humidity; LRH).

◆ **Instrument measurements and Evaluating method:** The transepidermal water loss (TEWL) was measured with Tewameter (TM 300, Courage & Khazaka Electronic GmbH, Germany). The measurement site is the inner part of the forearm. Measurements were carried out before exposure to a low relative humidity (Low RH) and after exposure to a Low RH for 20 minutes. The evaluation was analyzed by age using the TEWL measurement value in the general relative humidity (General RH), the TEWL measurement value after exposure to the Low RH, and the amount of change in TEWL (ΔTEWL = TEWL in Low RH – TEWL in General RH).

In addition, using the overall average TEWL value in the General RH, the above-average and below-average levels were classified for each age group, and the comparative analysis performed above was performed again.

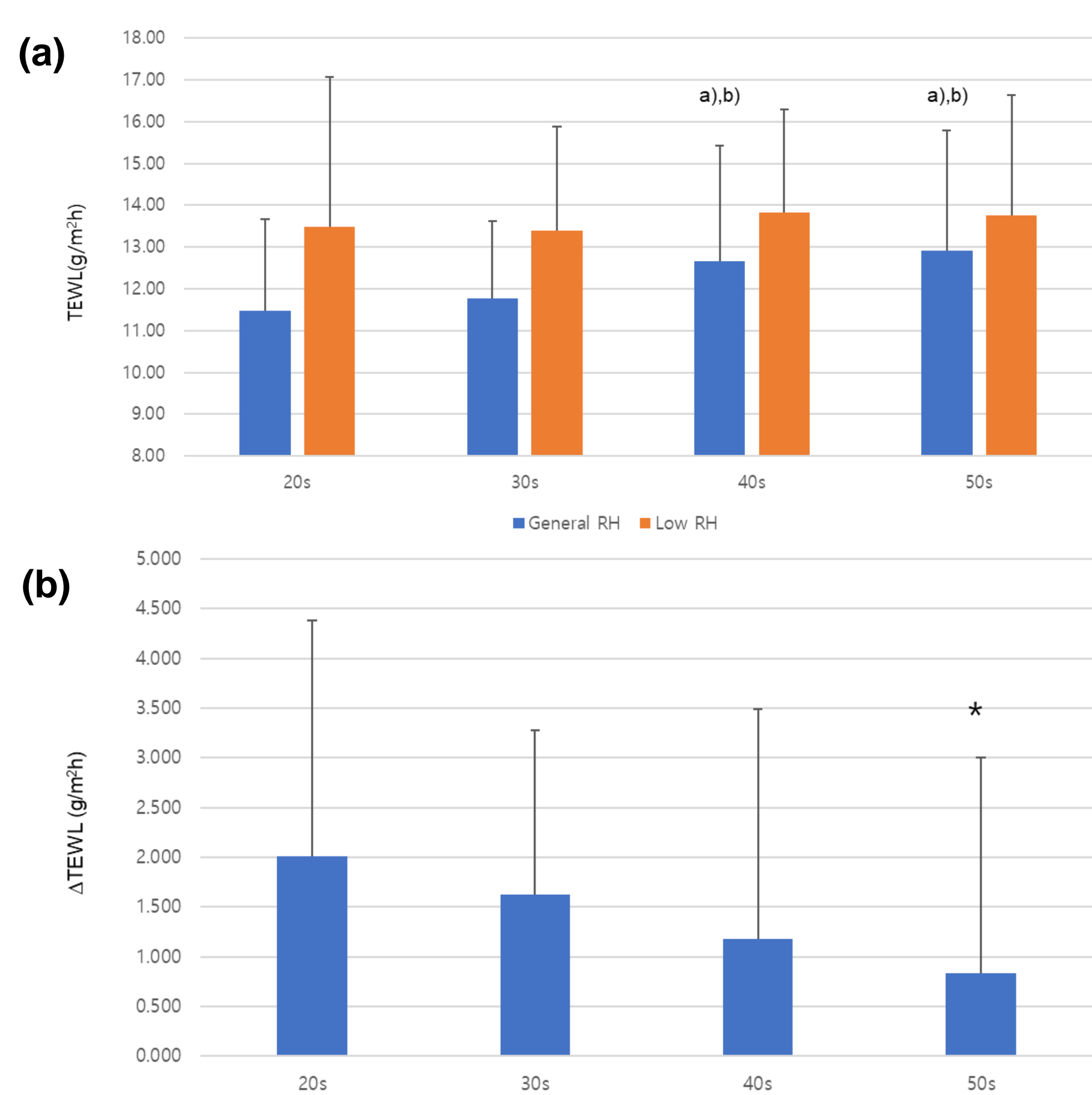
## Results

### TEWL measurements according to age

age	General RH (Avg ± std)	Low RH (Avg ± std)	ΔTEWL (Avg ± std)
20's (n=32)	11.48±2.197	13.49±3.592	2.013±2.3720
30's (n=58)	11.78±1.851	13.40±2.477	1.628±1.6513
40's (n=101)	12.66±2.768	13.83±2.472	1.176±2.3086
50's (n=76)	12.92±2.880	13.76±2.867	0.839±2.1677

### TEWL measurements in the groups classified as above and below the overall mean (overall mean TEWL=12.40)

age	General RH (Avg ± std)		Low RH (Avg ± std)		ΔTEWL (Avg ± std)	
	Below average	Above average	Below average	Above average	Below average	Above average
20's	10.569±1.3645	14.208±1.9780	12.400±2.9554	16.767±3.4799	1.8306±2.30146	2.5583±2.65693
30's	10.667±1.0026	13.887±1.0814	12.361±1.9869	15.387±2.0981	1.6947±1.60091	1.5000±1.77849
40's	10.430±1.3359	14.594±2.1648	12.437±2.3100	15.046±1.9153	2.0064±2.07820	0.4525±2.27206
50's	10.802±1.4692	14.933±2.4069	12.215±2.3320	15.223±2.5583	1.4135±2.15275	0.2932±2.06306



- General RH TEWL values showed a tendency to increase with age.
- The TEWL values in their 40s and 50s are increased significantly compared to those in their 20s and 30s.

- Low RH TEWL does not show changes with age.

- ΔTEWL shows a tendency to decrease with increasing age.
- There were significant changes between those in their 30s and 50s.

- There was significant decreases with age, especially in the group of above average. Both the 40s and 50s decreased to a statistically significant level compared to the 20s and 30s.

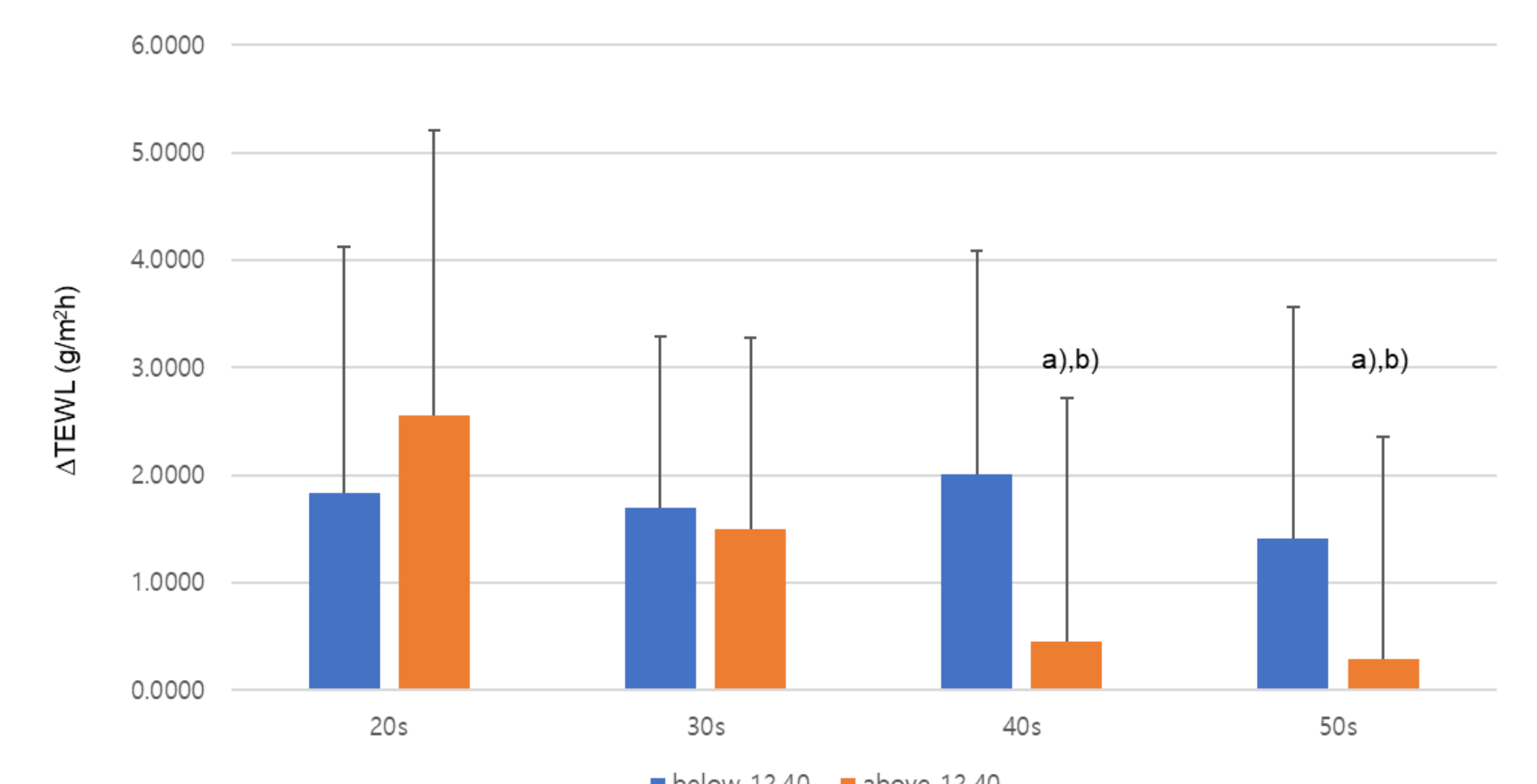


Figure. Graph of ΔTEWL according to age in the groups classified as above and below the overall mean. a),b): Mann-Whitney U test, a) 20s vs 40s, 50s. b) 30s vs 40s, 50s, p<0.05

Figure . Graph of TEWL measurement results. (a) TEWL measurement according to age. (b) ΔTEWL according to age. a),b): Mann-Whitney U test, a) 20s vs 40s, 50s. b) 30s vs 40s, 50s, p<0.05  
 \*: independent samples t-test, 30s vs 50sm p<0.05

- The skin barrier function is declining from the 40s, and it means that care for the skin barrier function is required from the 40s.
- TEWL showed significant increase in their 40s and older and ΔTEWL showed significant decrease in their 50s. This means that young skin (20s and 30s) can show more dynamic response to dry environment (low RH) than 40s and older. And ΔTEWL may be a useful parameter to evaluate the skin's adaptability to dry environment.

## Conclusion

As a result of this study, the TELW measured value in General RH showed a tendency to increase with age. In particular, compared with those in their 20s and 30s, they showed a statistically significant change from the 40s (Table 1). In other words, it means that the skin barrier function is declining from the 40s, and it is telling that people should pay attention to the skin barrier function for anti-aging care from the 40s.

The ΔTEWL value shown in the group above the overall average decreased significantly in those in their 40s and 50s (Table 2, Figure 3). This suggests that the skin in their 40s and 50s does not dynamically respond to external environmental changes.

This study was attempted in consideration of the dynamic activity of the skin. This study was tried to find how the TEWL of the skin responds to changes in the environment according to age. As a result of comparative analysis using ΔTEWL values according to changes in General RH and Low RH, it was known that the ΔTEWL values in the 40s and 50s decreased compared to the 20s and 30s. Through this study, ΔTEWL may be a useful parameter to evaluate the skin's adaptability to dry environment.

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