

**Cooling the Tube  
programme 2008**

**08014**

October 2008

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Research conducted by Synovate

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# Research Overview

# Context

- London Underground's (LU's) Cooling the Tube Programme (CTP) was created to address the problem of excessive heat in the London Underground environment and to design and construct cooling systems to alleviate the condition.
- A number of “Quick Wins” initiatives were put in place across the system:
  - Temporary **summer fans** in 29 LU stations with known heat problems, mainly those in central London and / or with deep level lines.
  - **Platform level supply** ventilation where a supply of fresh air is pumped to the platform areas via existing ventilation shafts at three stations.
  - **Impulse fans** installed at Lambeth North and Marylebone Bakerloo line stations to circulate air along the platforms.
  - **Variable refrigerant flow** system, replacing existing air conditioning at Seven Sisters, particularly reducing the heat in the ticket hall and staff areas.
  - **Chiller units** at Euston, delivering cooler air to ticket hall and staff areas.
- A programme of research is required to provide consistent and comparable feedback across the different installations, both amongst customers and staff.

# Objectives

The specific customer research objectives are as follows:

- Gauge the overall impact of the cooling initiatives on customers, in particular customers' perceptions of and satisfaction with:
  - Station temperature,
  - Thermal comfort,
  - Air quality,
  - Noise,
  - Station ambience & environment;
- Gauge the overall impact of the cooling initiatives on LU station staff, as well as capturing the staff's perceptions of customer impacts and issues;
- Where possible, examining the above before and after installation.

# Approach

- Face to face interviews with customers at selected stations where the cooling initiatives were introduced:

Cooling technology	Station(s)	Sample size	
		Pre	Post
Summer fans	Bank	n/a	120
	Charing Cross	n/a	124
	Liverpool Street	n/a	119
	Tottenham Ct Road	n/a	125
	Tufnell Park	n/a	117
	Stockwell	n/a	155
Platform level supply	Holland Park	213	235
Impulse fans	Lambeth North	220	242
	Marylebone	167	224
Variable refrigerant flow	Seven Sisters	193	205
Chiller unit	Euston	165	215

# Identifying statistically significant differences

For stations with pre and post stage installation, statistically significant differences from pre stage to post stage (based on total sample) can be assumed for:

- A difference of +/-10% on a percentage  
*(smaller differences may be significant depending on the value of the percentages)*
- A difference of +/-0.3 on a thermal perception / comfort score  
(e.g. Q3, Q4 - scale +3 to -3)
- A difference of +/-5 points on a satisfaction score  
(e.g. Q1, Q2 - scale 0 to 100)
- A difference of +/-0.2 on a better / worse  
(e.g. Q9 - scale +2 to -2)



# Overall Summary

# Overall summary: customer impact

- The cooling initiatives have had quite differing impacts on customers.
- The most effective initiative was **platform level supply** (at Holland Park), with significant reduction in customer temperature perceptions and significant increase in satisfaction with temperature.
- **Impulse fans** (at Lambeth North and Marylebone) generated increases in customer satisfaction with temperature, but overall, customers' temperature perceptions or preferences were not changed significantly.
- Cooling at **Seven Sisters** and **Euston** had relatively limited customer impact, although any impact they have had were positive.
- Reaction to **summer fans** is variable, but overall they are a visible demonstration of TfL's commitment to the issue, and typically have a more positive than negative impact. However, unlike other cooling initiatives, a minority of customers consider fans to have made temperature worse.

# Overall summary: staff impacts and feedback

- The greatest staff impact is at **Euston**, where a significant cooling effect is mentioned (sometimes too cold!), solving an acknowledged heat problem. However some staff felt platform areas should be a greater focus. No customer comments on the cooling were mentioned.
- Staff at **Seven Sisters** were pleased with the cooling, but took some time to properly appreciate it (not a significant immediate impact). Whilst benefit in staff areas, they have had occasional customer comments noticing cooling.
- Staff are somewhat underwhelmed by the **impulse fans**, claiming there has been some effect, but not significant cooling and only in some areas. Very few customer comments received.
- Staff at **Holland Park** are not as positive as customers, saying the cooling effect was not felt over the entire platform level. Some positive customer comments received, but not a significant number.
- Staff feedback on the **summer fans** is variable, and can be extreme (Stockwell station manager!). Most comment that they 'just push the hot air around'. Mixed customer feedback also received, but some are positive.

# Overall summary: other interesting points

While not necessarily applicable to all initiatives at all stations, there are some other general points worth noting in relation to cooling:

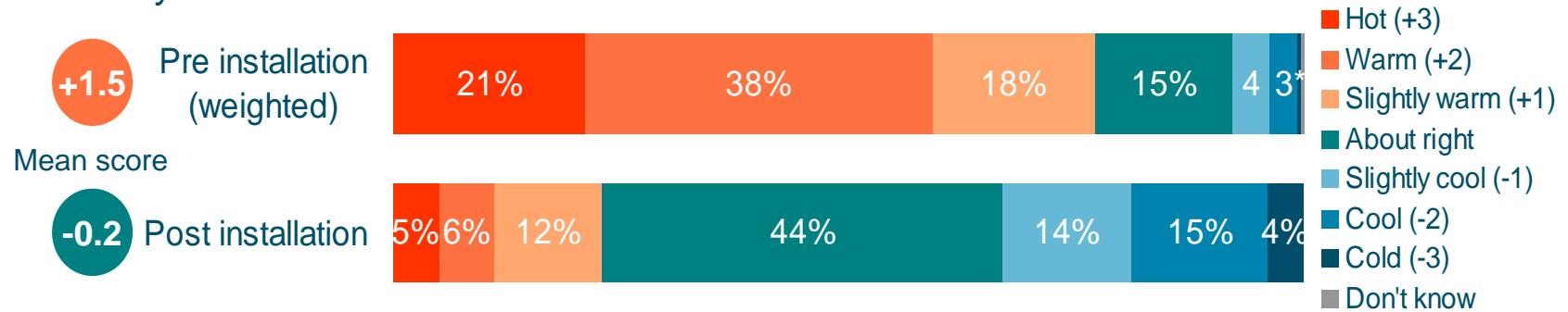
- **Improving temperature can have a big impact:** customers most satisfied with temperature in the station were significantly more satisfied with the visit to the station overall.
- **Cooling initiatives tend to have gradual rather than immediate impact:** more frequent visitors to the station were more likely to notice a cooling effect.
- **Awareness can influence perceptions:** those (at least claiming to be) aware of the cooling initiative were more likely to notice a cooling effect and to be more satisfied with the station temperature.
- **Some cooling effect is not always enough:** we measured a cooling effect in all (pre-post) stations, but the post installation temperature may still not be regarded as sufficiently 'cool' by customers.

# Key Findings

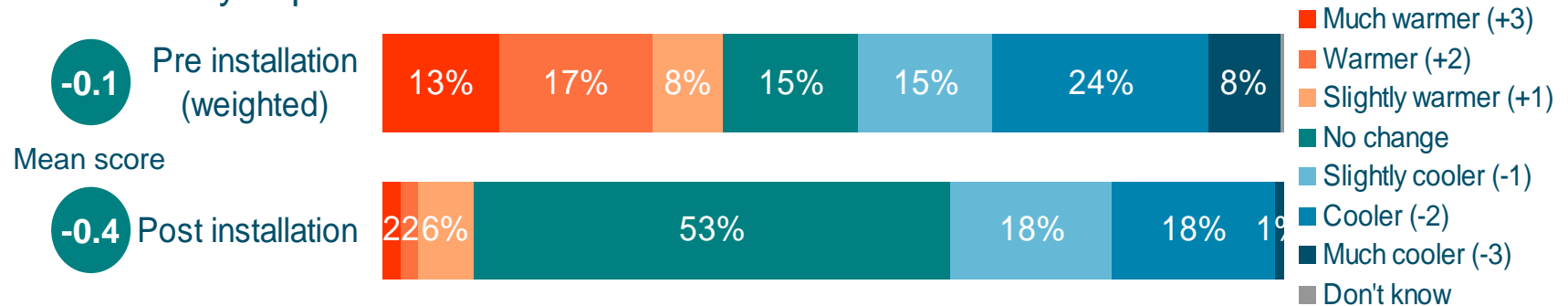
- Holland Park: platform level supply

# There is a significant difference in how customers feel at Holland Park after installation

How do you feel at the moment?

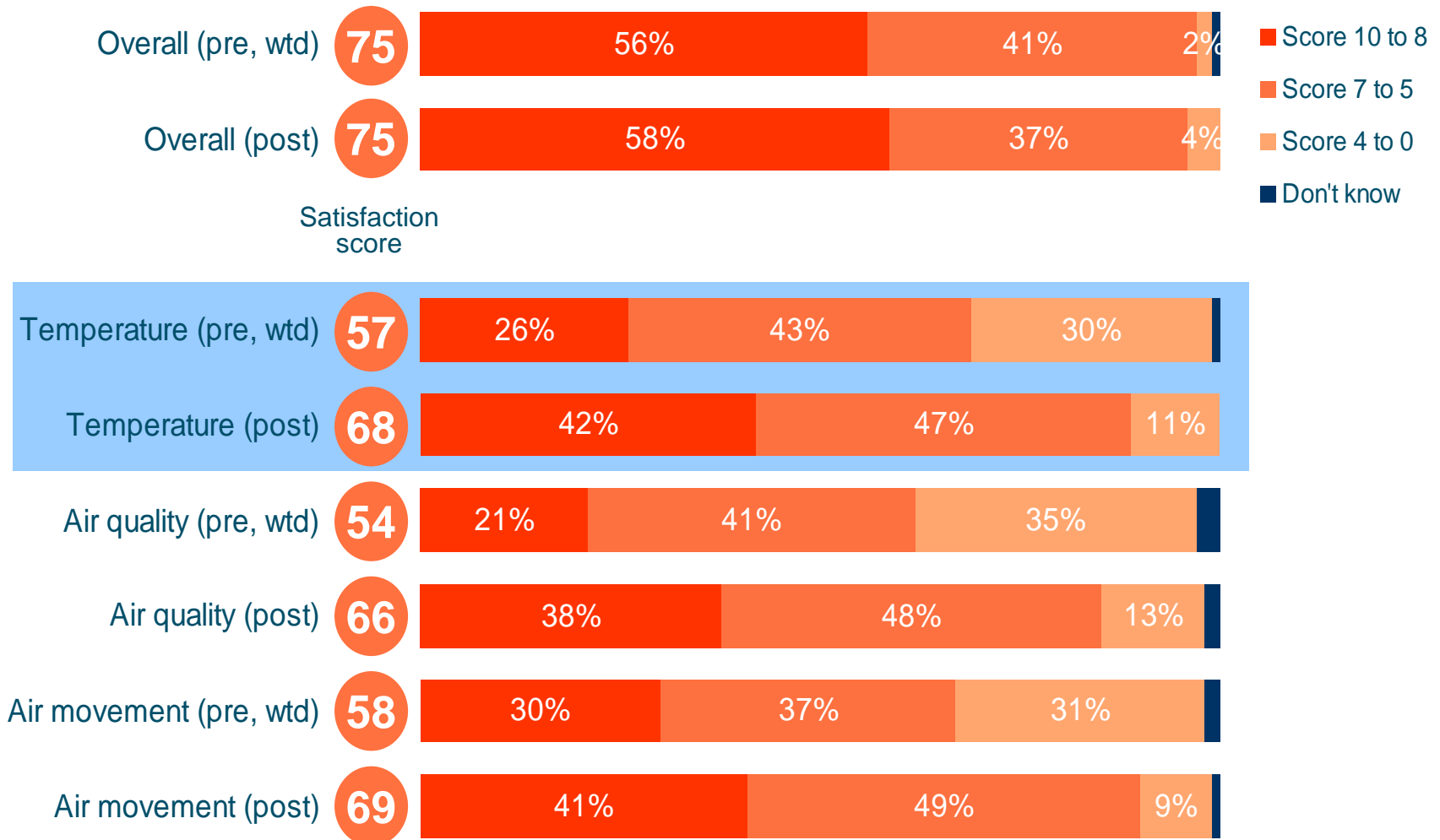


How would you prefer to feel at the moment?



Source: Q3; Q4 / Base: all respondents, Holland Park: pre installation (n=213); post installation (n=235)

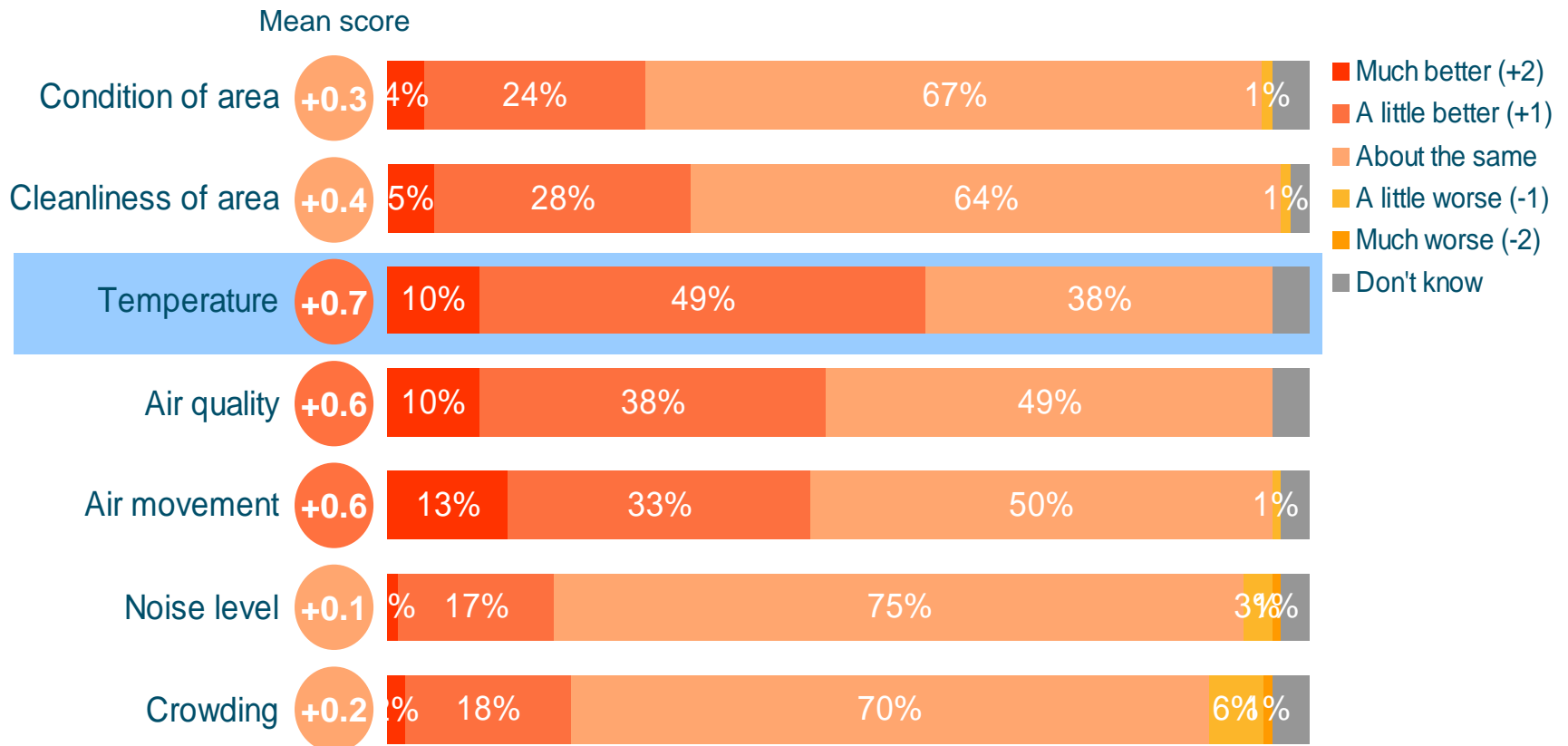
# Customers at Holland Park are much more satisfied with the temperature after installation



Source: Q1; Q2 / Base: all respondents, Holland Park: pre installation (n=213); post installation (n=235)

# More than half of customers at Holland Park explicitly notice an improvement in temperature

59% had visited Holland Park station before the cooling initiative was installed



Source: Q9 / Base: all (post installation) who have used station before cooling initiative installed (n=138)

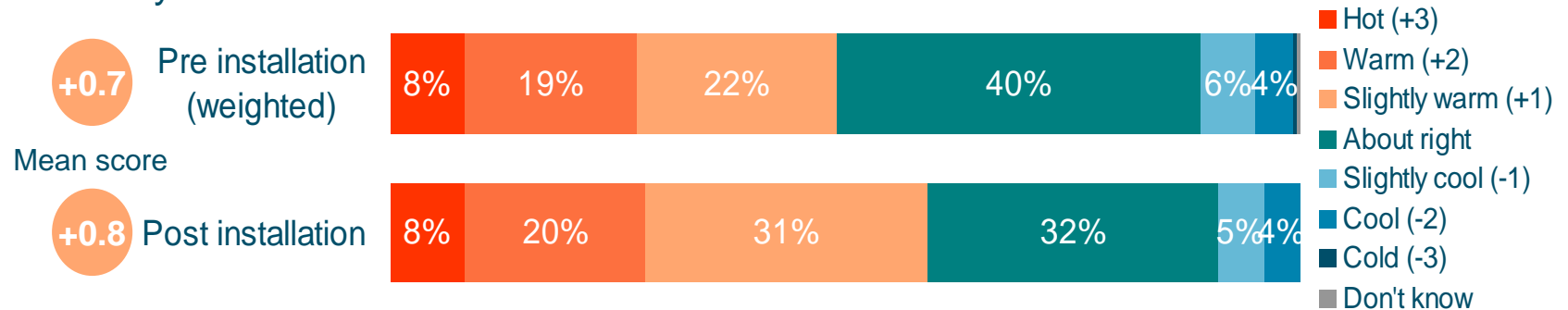


# Key Findings

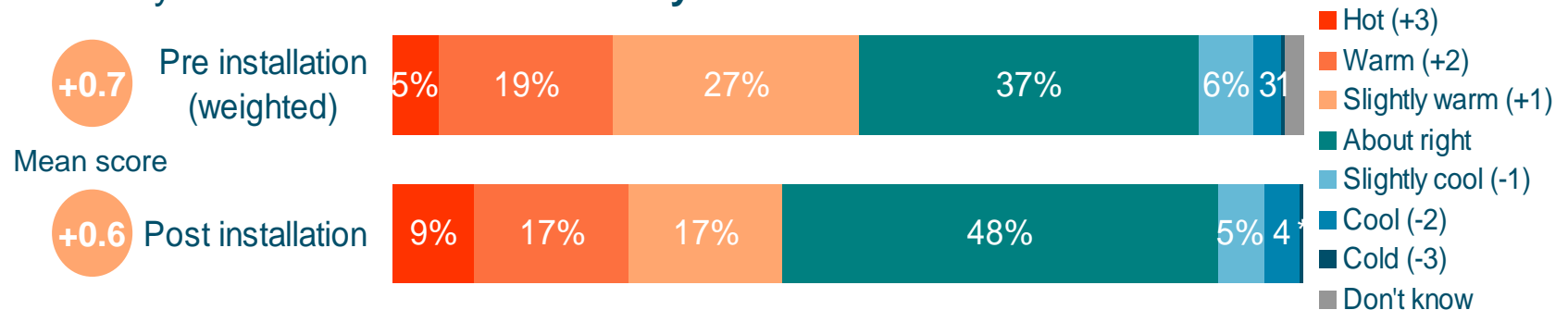
- Lambeth North & Marylebone:  
impulse fans

# Customers at both Lambeth North and Marylebone do not feel significantly different after installation

## How do you feel at the moment? **Lambeth North**



## How do you feel at the moment? **Marylebone**

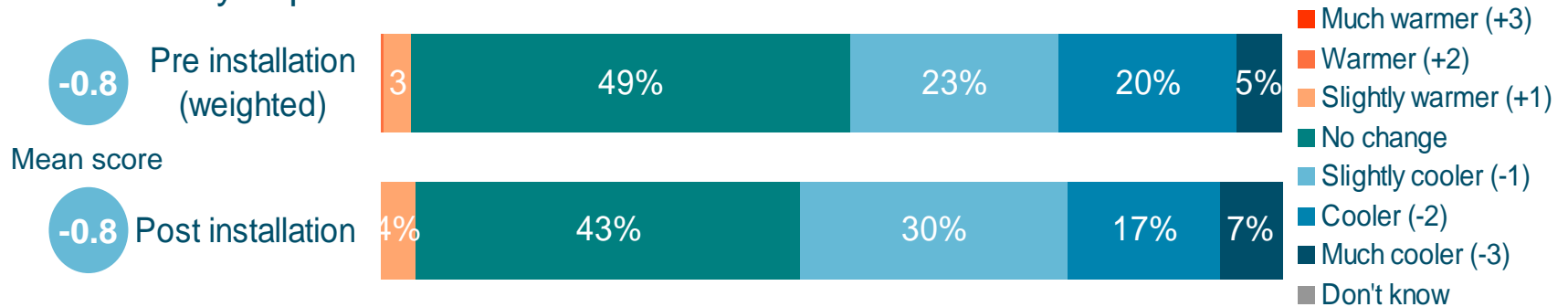


Source: Q3 / Base: all respondents, Lambeth North: pre installation (n=220); post installation (n=242)

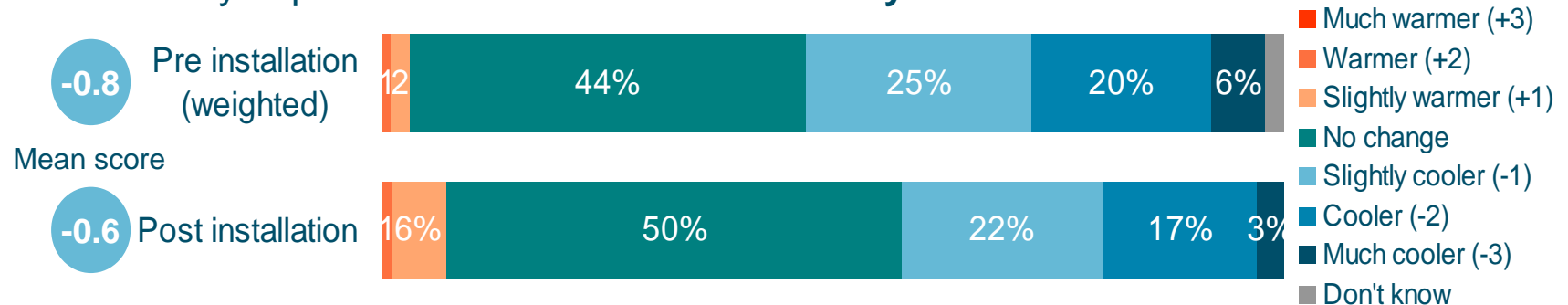
Source: Q3 / Base: all respondents, Marylebone: pre installation (n=167); post installation (n=224)

# Customers at both Lambeth North and Marylebone do not feel significantly different after installation

How would you prefer to feel at the moment? **Lambeth North**



How would you prefer to feel at the moment? **Marylebone**

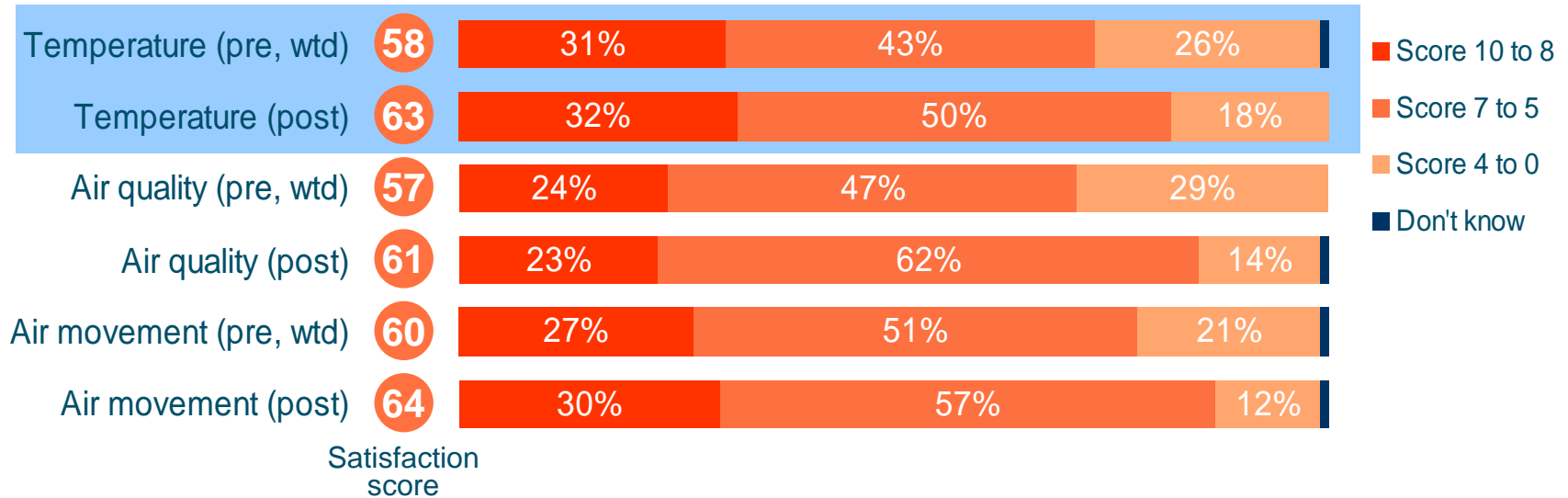


Source: Q4 / Base: all respondents, Lambeth North: pre installation (n=220); post installation (n=242)

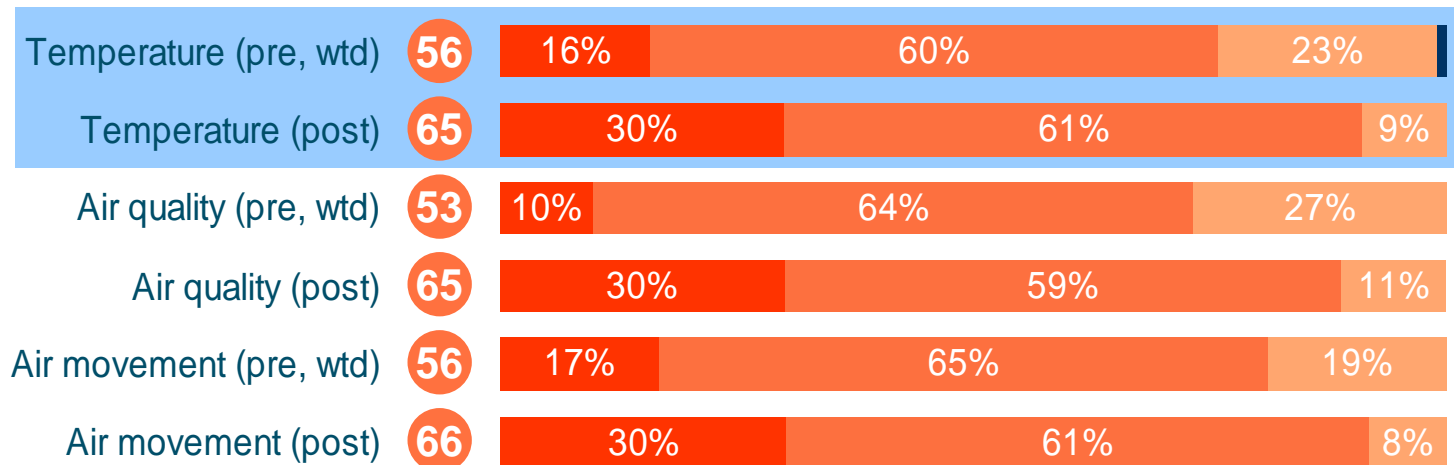
Source: Q4 / Base: all respondents, Marylebone: pre installation (n=167); post installation (n=224)

# However customers *are* more satisfied with temperature, especially at Marylebone

Lambeth North



Marylebone

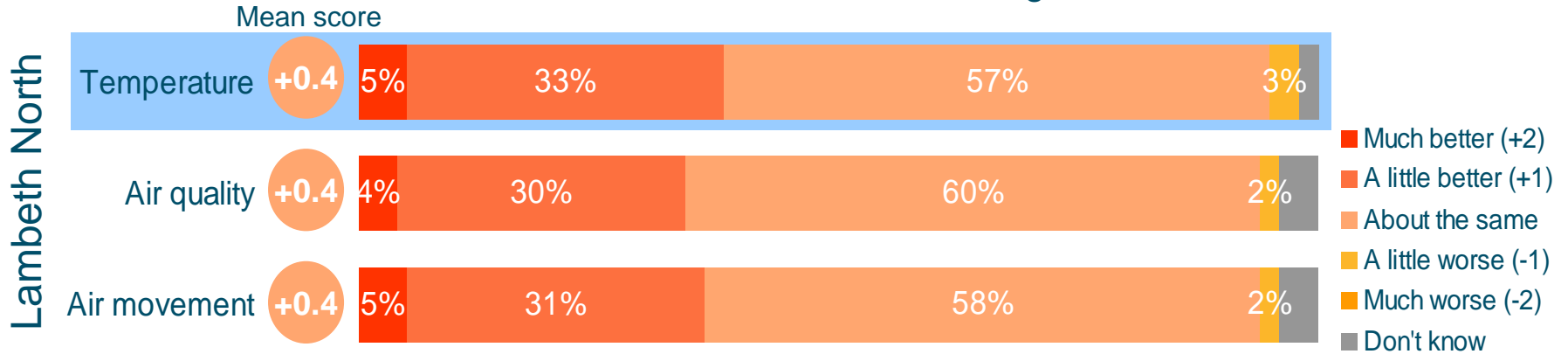


Source: Q2 / Base: all respondents, Lambeth North: pre installation (n=220); post installation (n=242)

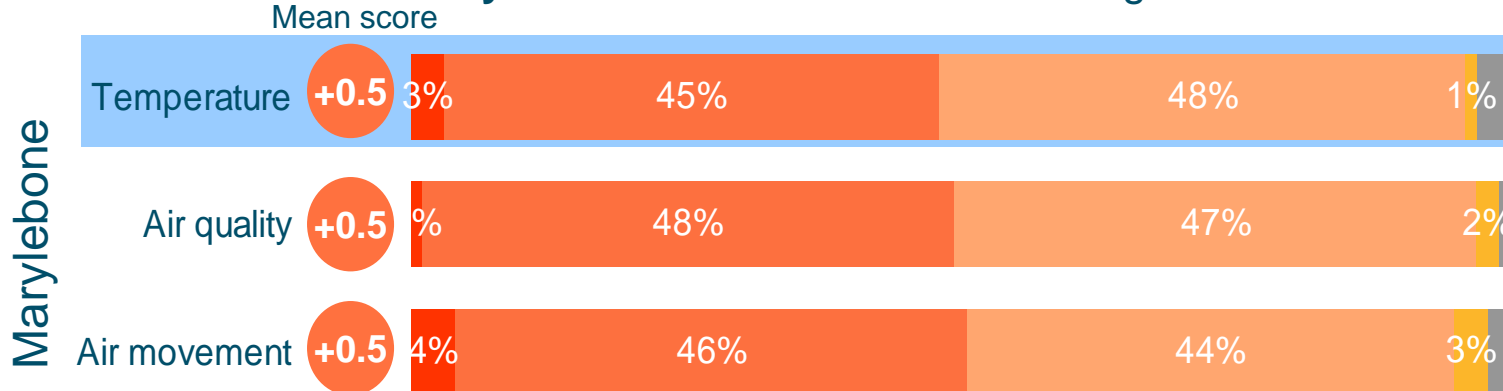
Source: Q2 / Base: all respondents, Marylebone: pre installation (n=167); post installation (n=224)

# More than two fifths of customers notice an improvement in temperature

43% had visited **Lambeth North** station before the cooling initiative was installed



63% had visited **Marylebone station** before the cooling initiative was installed



Source: Q9 / Base: all (Lambeth North) who have used station before cooling initiative installed (n=103)

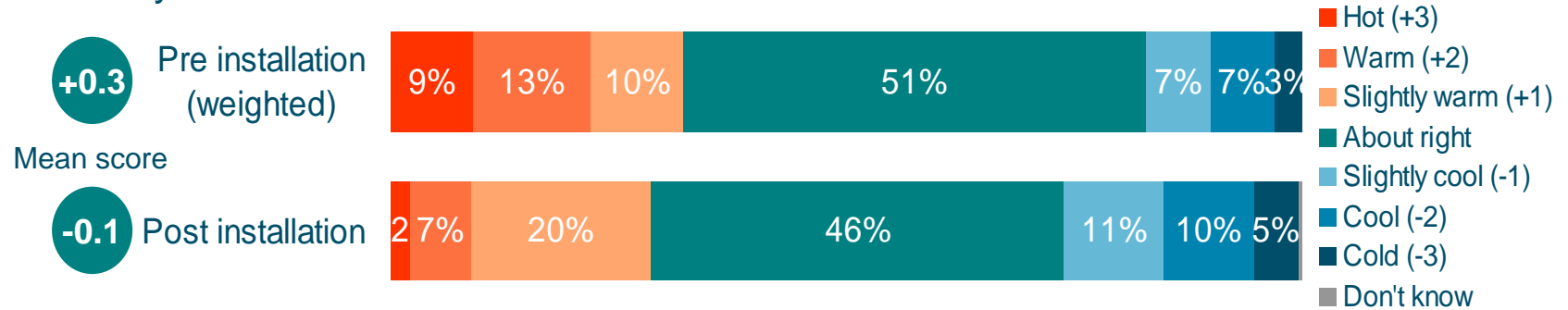
Source: Q9 / Base: all (Marylebone) who have used station before cooling initiative installed (n=140)

# Key Findings

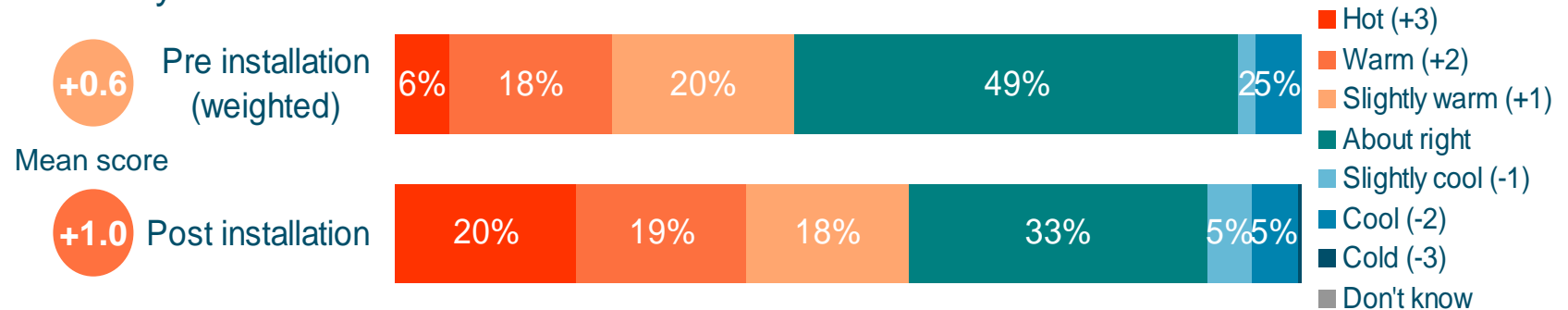
- Seven Sisters: variable refrigerant flow
- Euston: chiller units

# Customers felt a little cooler at Seven Sisters, but felt warmer at Euston post installation

## How do you feel at the moment? **Seven Sisters**



## How do you feel at the moment? **Euston**

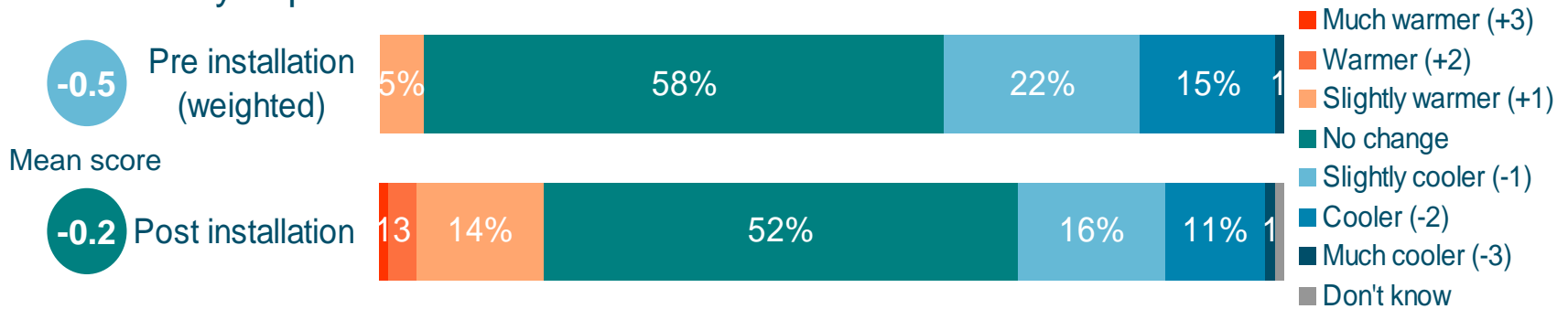


Source: Q3 / Base: all respondents, Seven Sisters: pre installation (n=193); post installation (n=205)

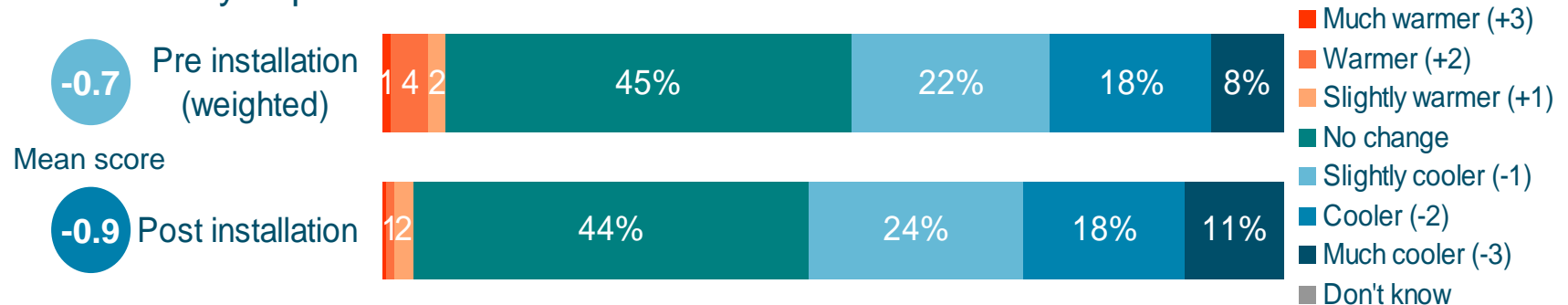
Source: Q3 / Base: all respondents, Euston: pre installation (n=165); post installation (n=215)

# Consistent with this, fewer customers at Seven Sisters preferred to be cooler. No change at Euston

How would you prefer to feel at the moment? **Seven Sisters**



How would you prefer to feel at the moment? **Euston**

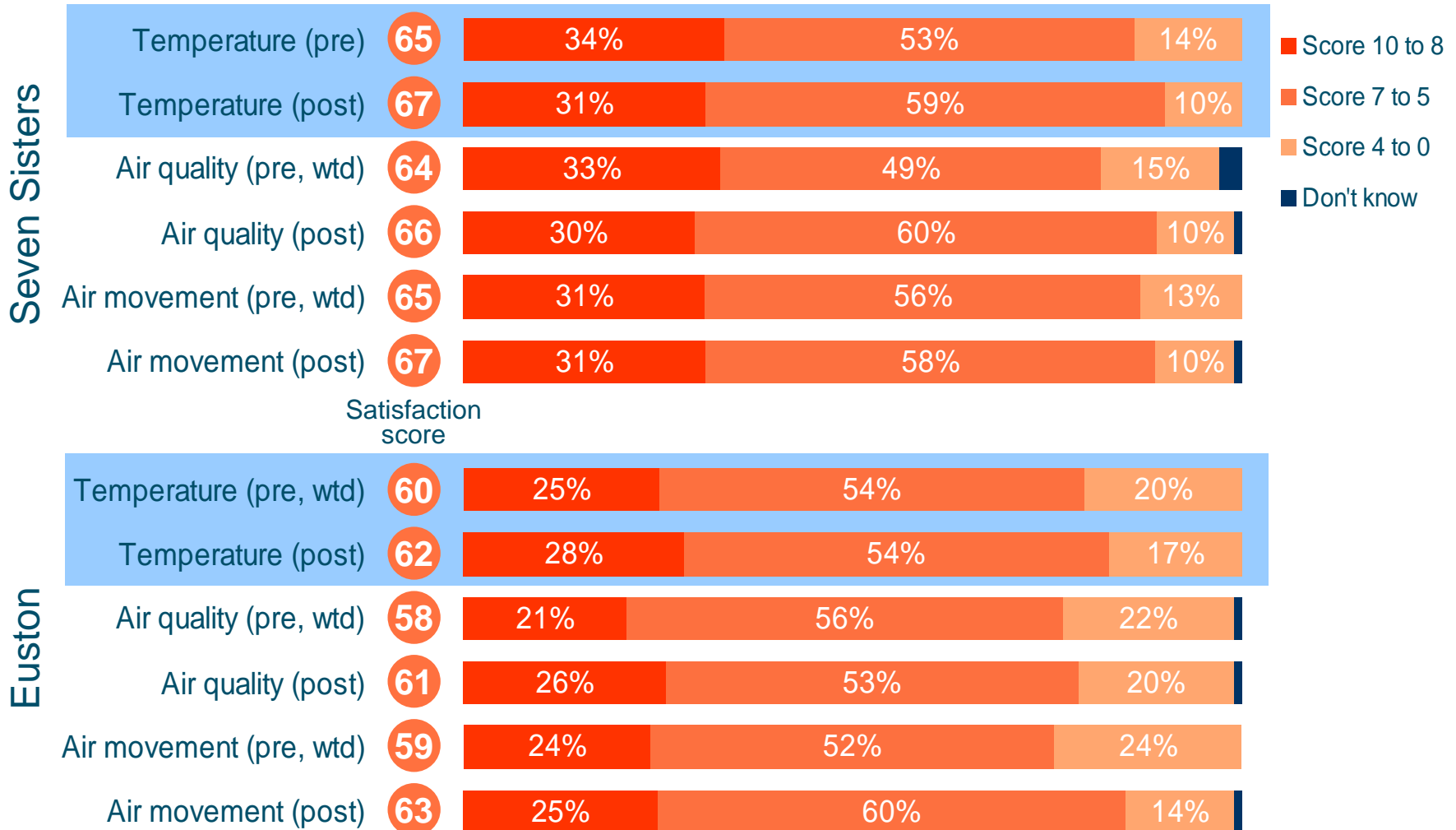


Source: Q4 / Base: all respondents, Seven Sisters: pre installation (n=193); post installation (n=205)

Source: Q4 / Base: all respondents, Euston: pre installation (n=165); post installation (n=215)



# There are no significant differences in customer satisfaction with temperature after installation

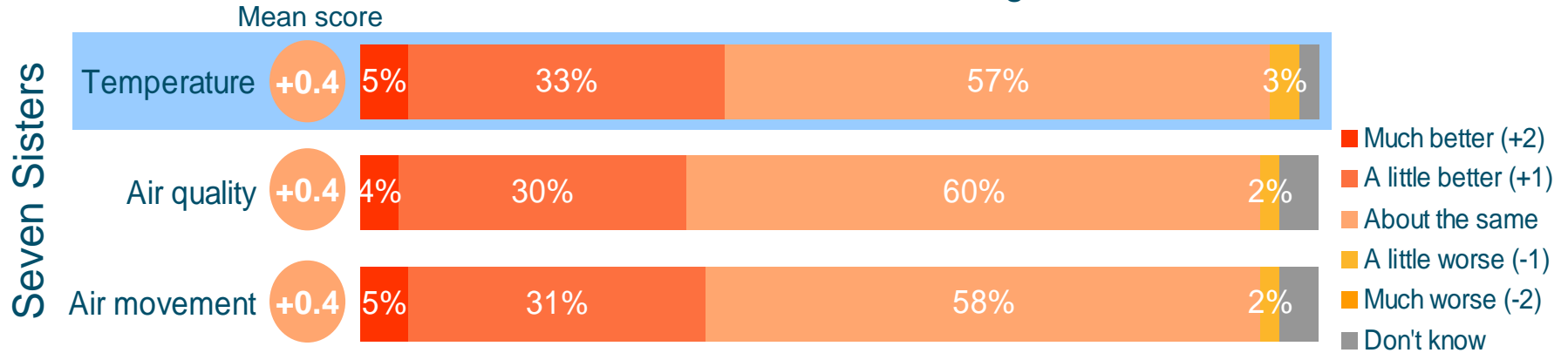


Source: Q2 / Base: all respondents, Seven Sisters: pre installation (n=193); post installation (n=205)

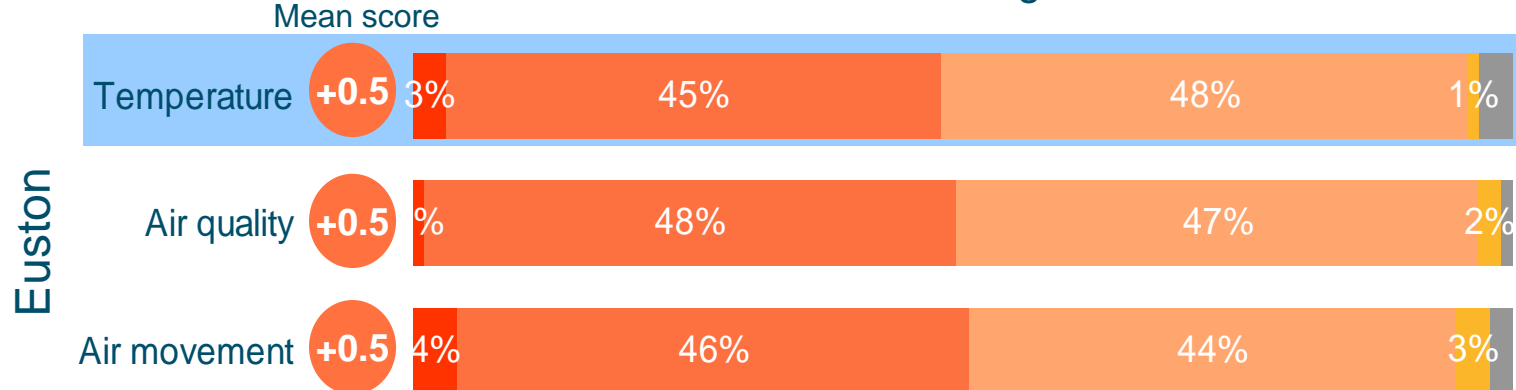
Source: Q2 / Base: all respondents, Euston: pre installation (n=165); post installation (n=215)

# An improvement in temperature is noticed by a notable proportion of customers, more in Euston

70% had visited **Seven Sisters** station before the cooling initiative was installed



68% had visited **Euston** station before the cooling initiative was installed



Source: Q9 / Base: all (Seven Sisters) who have used station before cooling initiative installed (n=144)

Source: Q9 / Base: all (Euston) who have used station before cooling initiative installed (n=147)

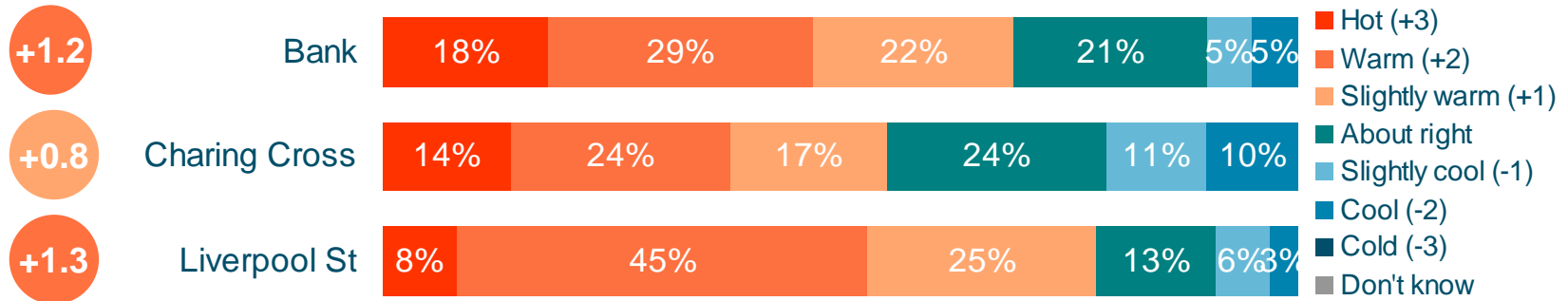
# Key Findings

- Temporary summer fans

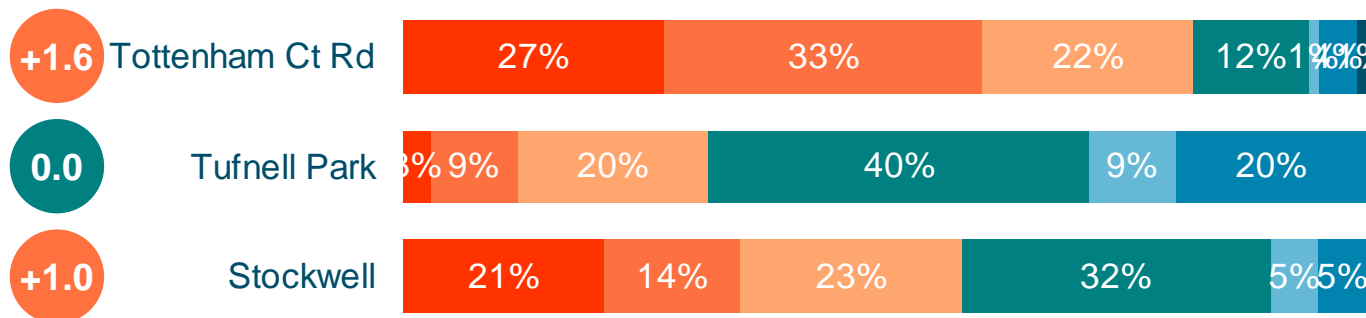
# At almost all summer fans locations, customers felt warm or hot

How do you feel at the moment?

Mean score



Mean score

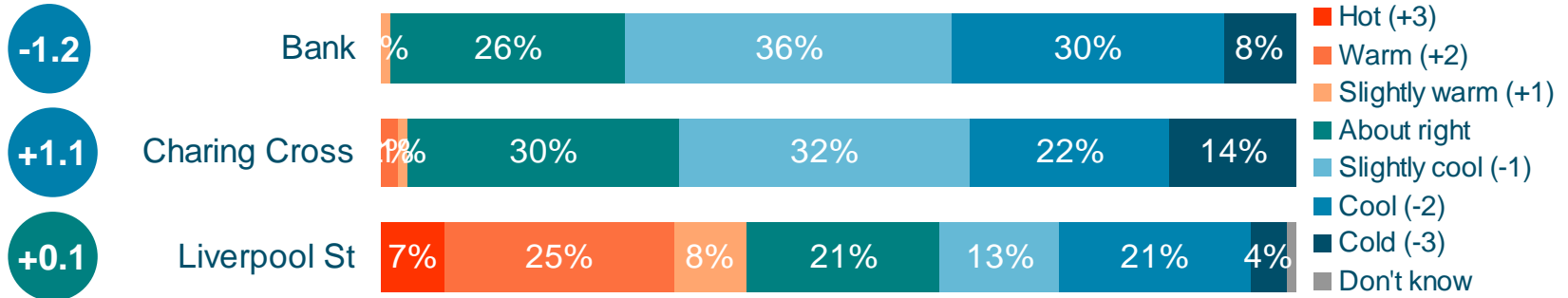


Source: Q3 / Base: all respondents: Bank (n=120); Charing Cross (n=124); Liverpool Street (n=119); Tottenham Court Road (n=125); Tufnell Park (n=117); Stockwell (n=155)

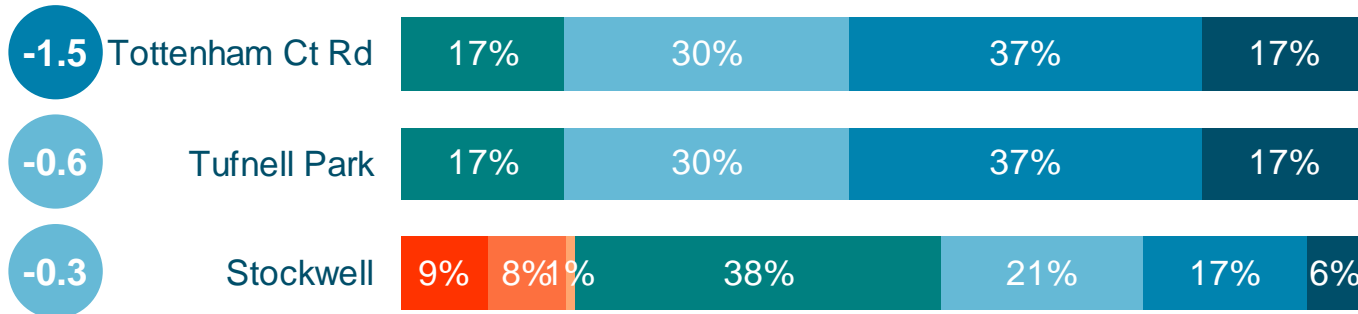
# The majority of customers at almost all stations preferred to feel cooler

How would you prefer to feel at the moment?

Mean score

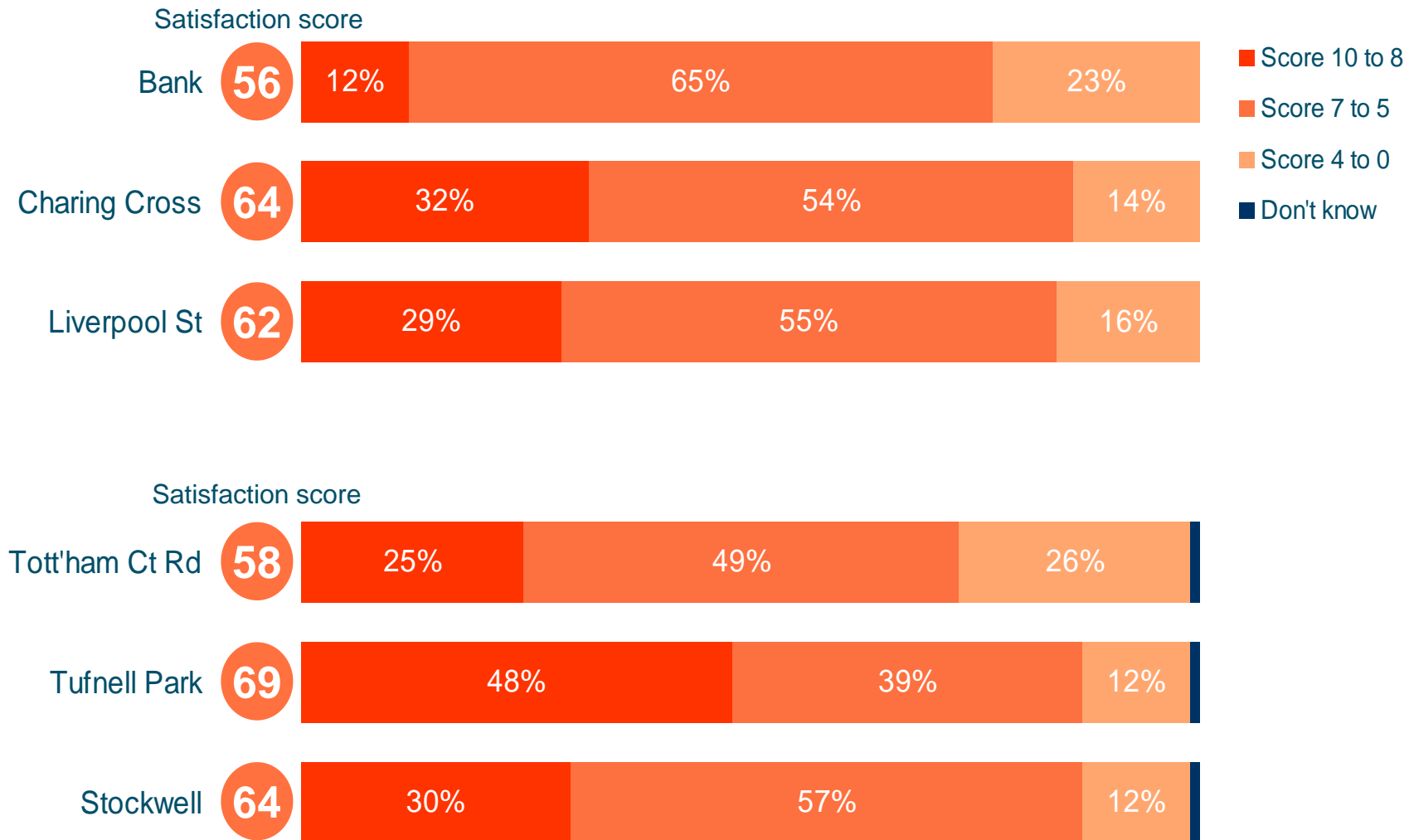


Mean score



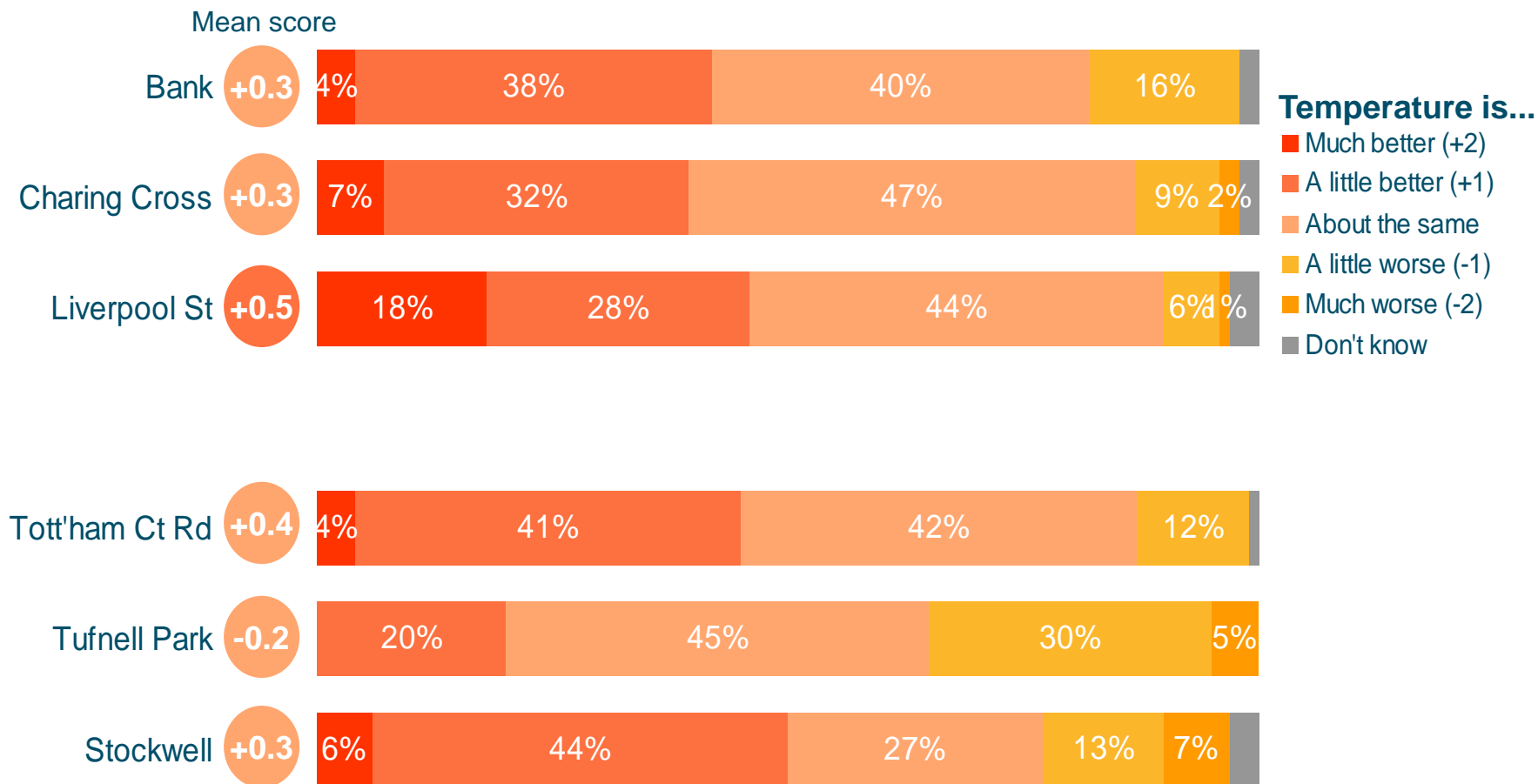
Source: Q4 / Base: all respondents: Bank (n=120); Charing Cross (n=124); Liverpool Street (n=119); Tottenham Court Road (n=125); Tufnell Park (n=117); Stockwell (n=155)

# Customers are reasonably satisfied with temperature, but this is not rated as highly as other aspects of station environment



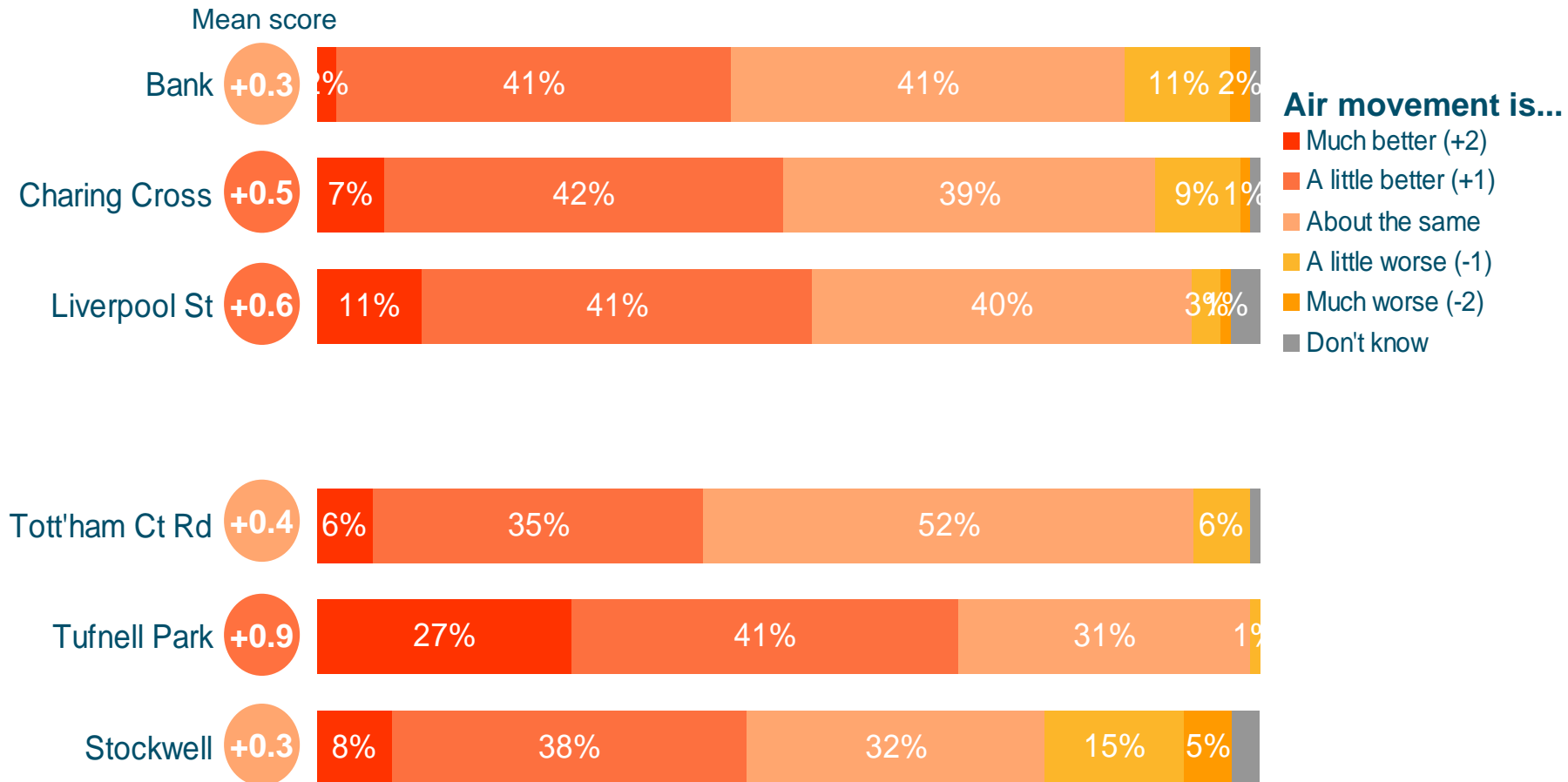
Source: Q2 / Base: all respondents: Bank (n=120); Charing Cross (n=124); Liverpool Street (n=119); Tottenham Court Road (n=125); Tufnell Park (n=117); Stockwell (n=155)

# Apart from Tufnell Park, more customers noted temperature improvements, but a significant minority felt temperature had got worse



Source: Q9 / Base: all respondents who have used station before fan installed: Bank (n=82); Charing Cross (n=95); Liverpool Street (n=97); Tottenham Court Road (n=83); Tufnell Park (n=88); Stockwell (n=117)

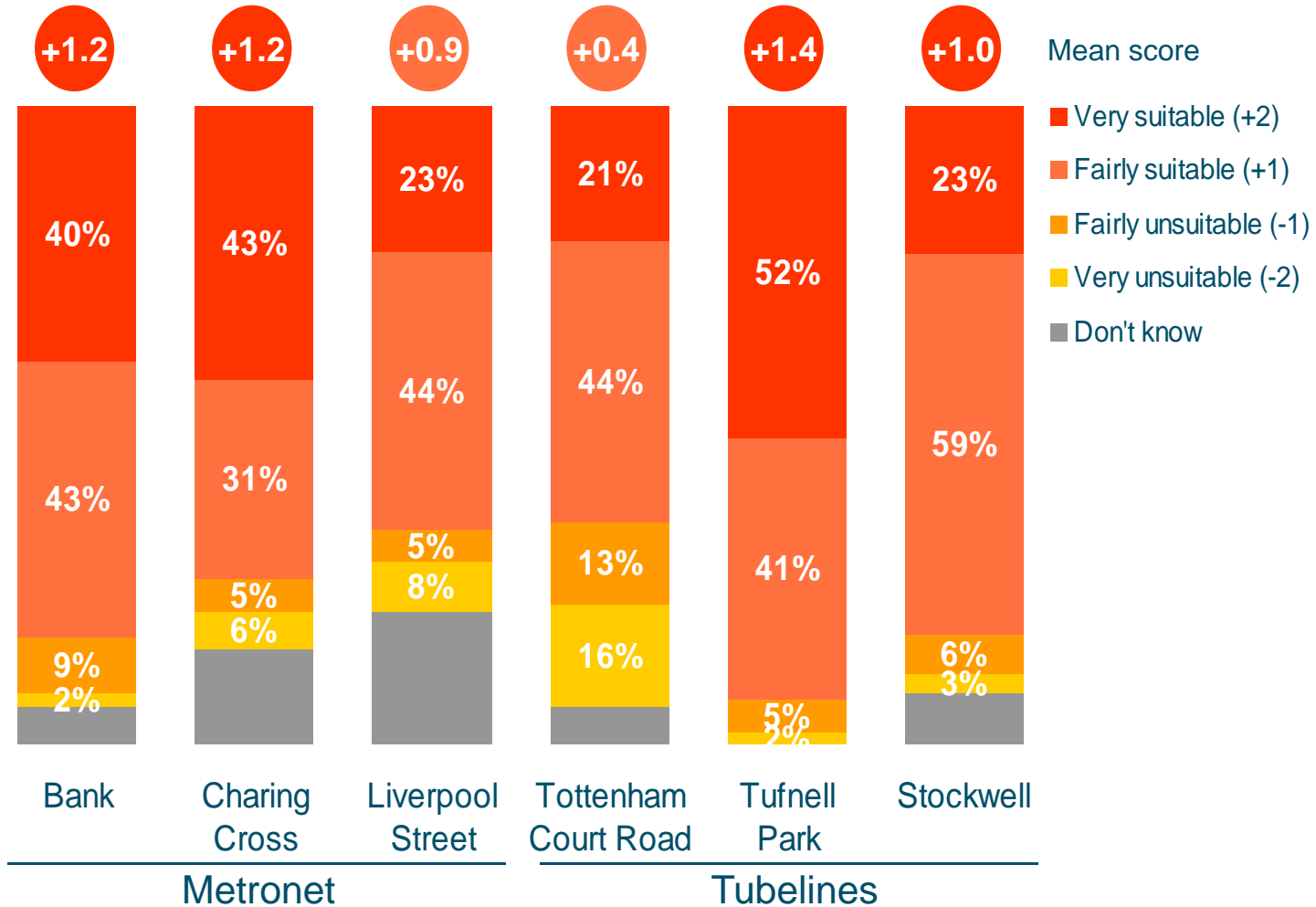
# A slightly greater proportion of customers noticed improvement in air movement than in temperature



Source: Q9 / Base: all respondents who have used station before fan installed: Bank (n=82); Charing Cross (n=95); Liverpool Street (n=97); Tottenham Court Road (n=83); Tufnell Park (n=88); Stockwell (n=117)

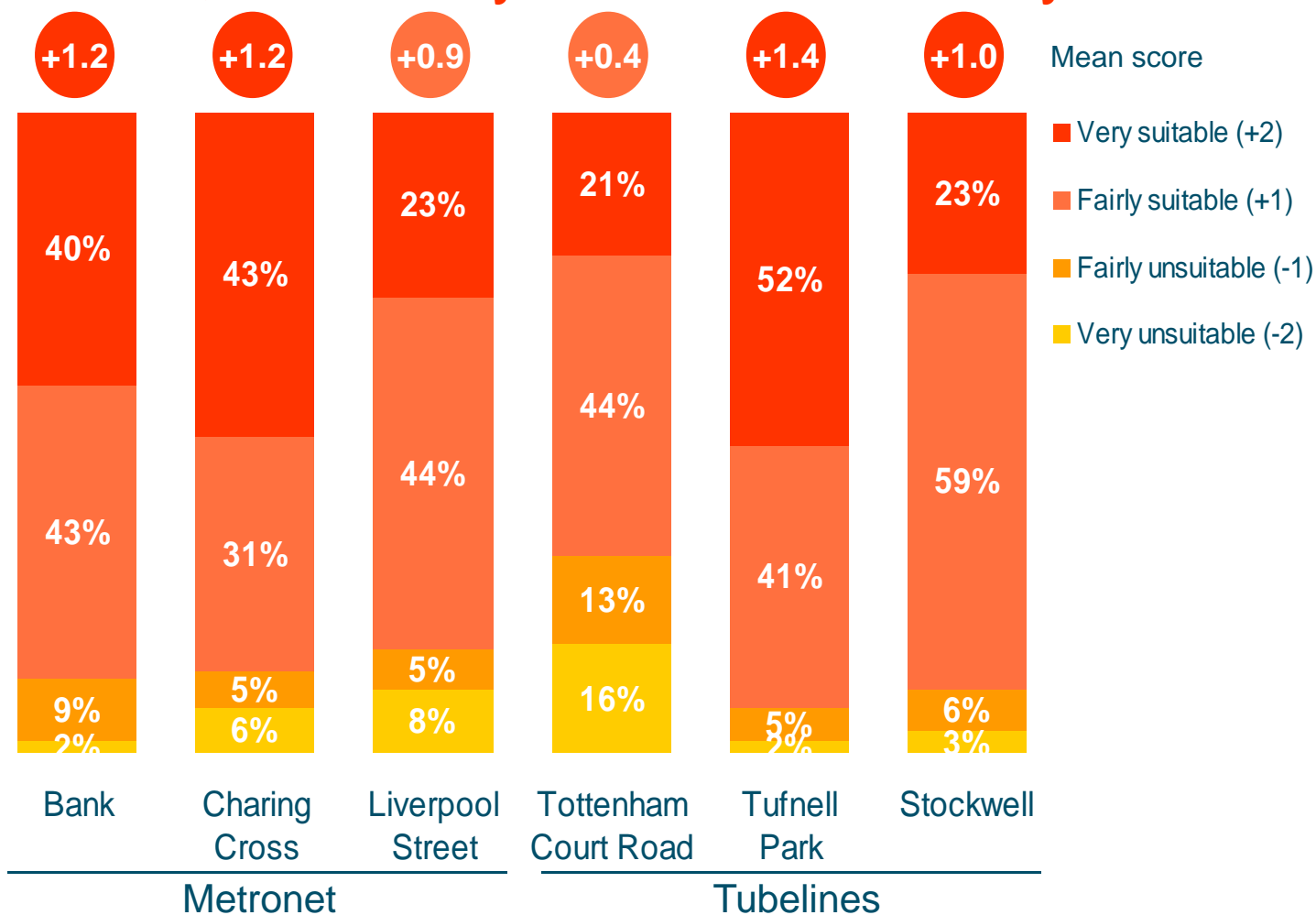


# Customers generally consider the fan location to be suitable, not always in the same way as TfL



Source: Q7 / Base: all respondents: Bank (n=120); Charing Cross (n=124); Liverpool Street (n=119); Tottenham Court Road (n=125); Tufnell Park (n=117); Stockwell (n=155)

# Customers generally consider the fan location to be suitable, not always in the same way as TfL



Source: Q7 / Base: all respondents: Bank (n=120); Charing Cross (n=124); Liverpool Street (n=119); Tottenham Court Road (n=125); Tufnell Park (n=117); Stockwell (n=155)

# Conclusions

# Conclusions

- In all cases the cooling initiatives can be shown to be a 'win', but often the customer impact is not very strong.
- On the customer evidence, our recommendations are as follows:
- Consider development of **platform level supply** technology at stations where this is possible.
- Carefully consider how use of **impulse fans** can be improved to deliver a more significant cooling effect.
- Use temporary **summer fans** at locations where space and power allow, but manage customer (and media) expectations of effect.