Characterizing wine finish using TCATA product contrails

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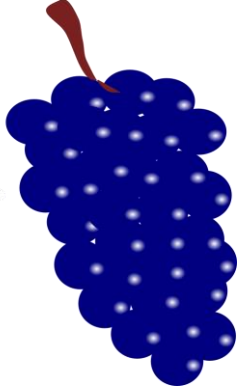
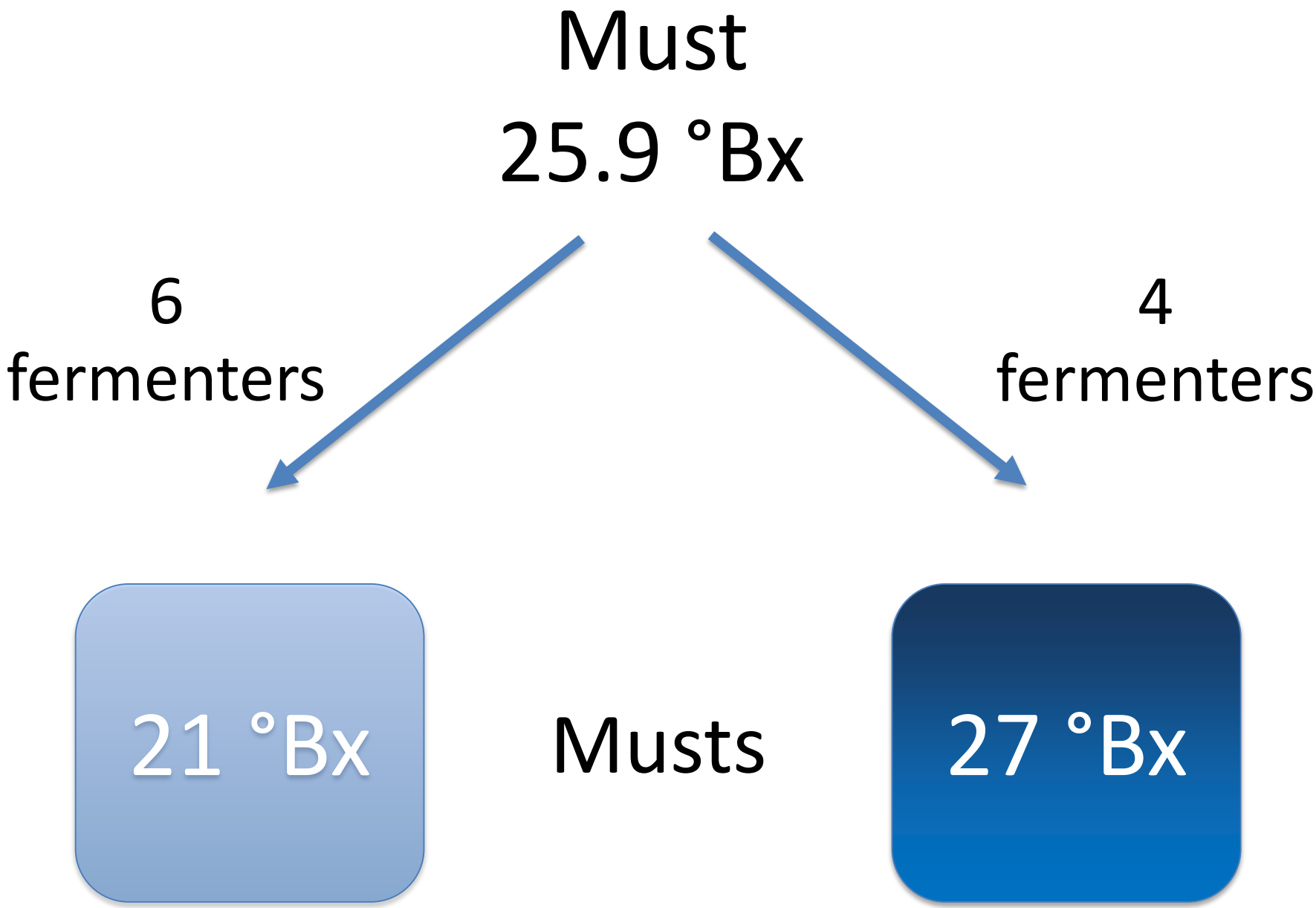
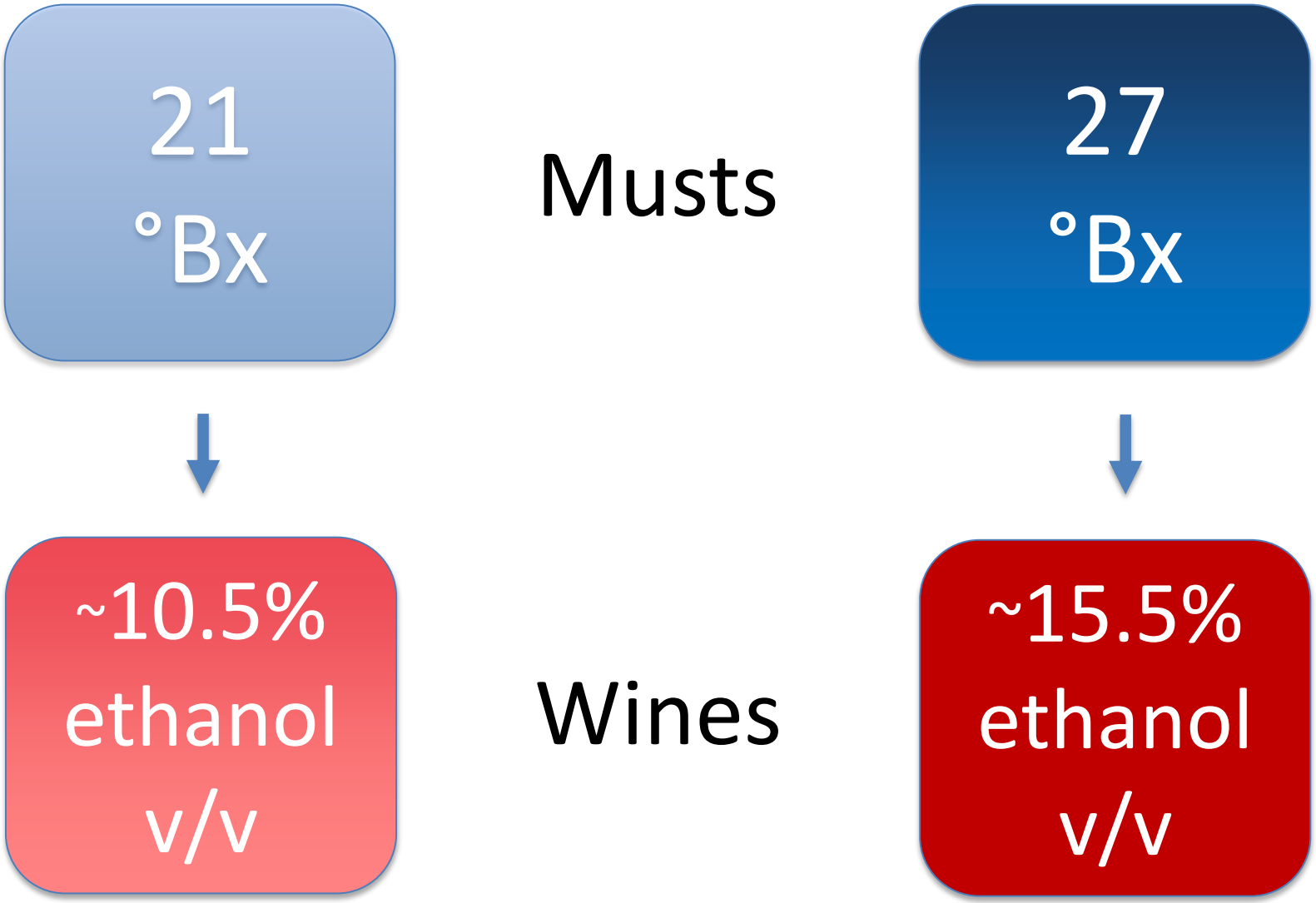


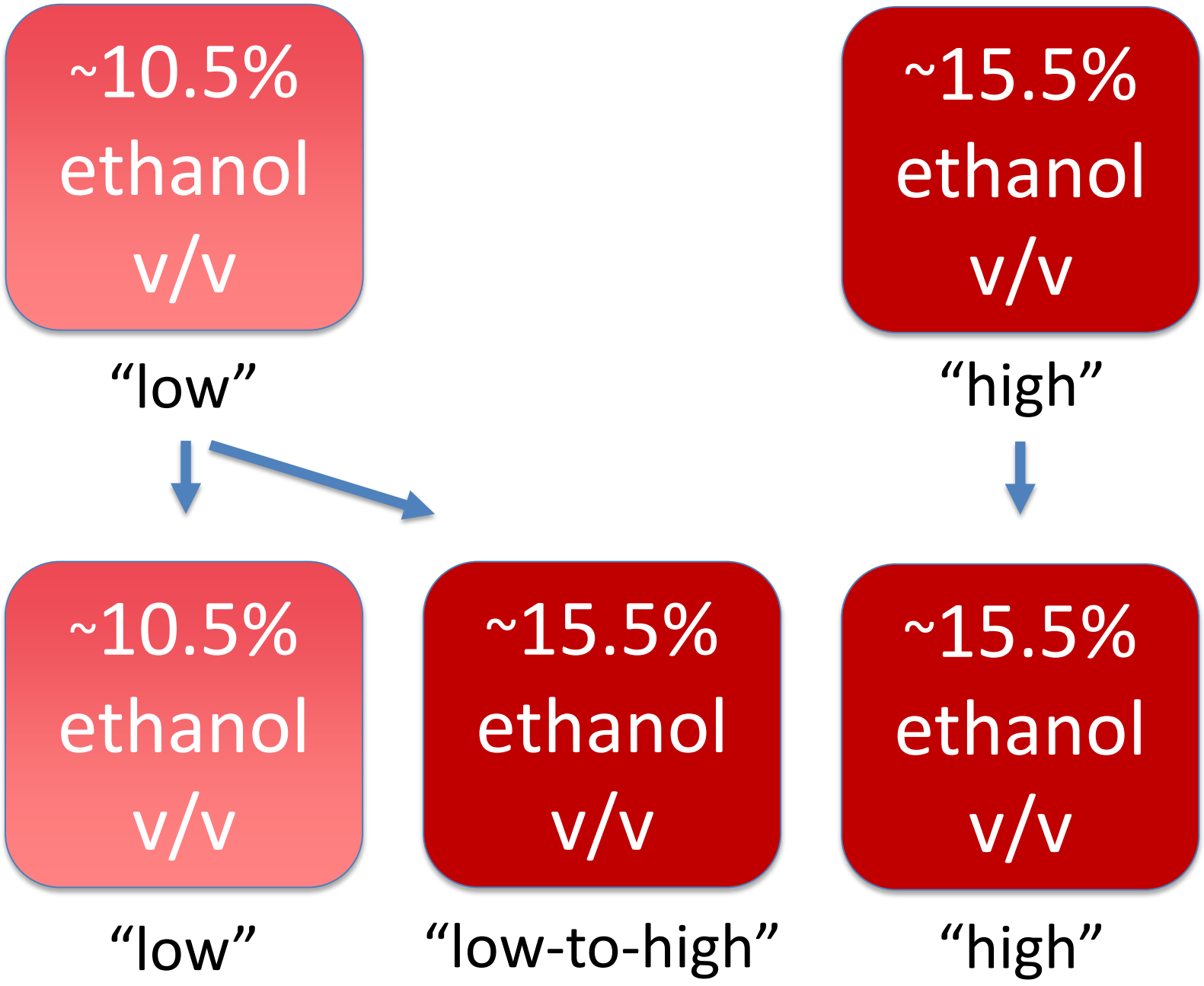
Hand-picked
Syrah Grapes

Crush & destem

Grape must


Must
25.9 °Bx
6
fermenters
4
fermenters
21 °Bx
Musts
27 °Bx


21
°Bx
Musts
27
°Bx
~10.5%
ethanol
v/v
Wines
~15.5%
ethanol
v/v


~10.5% ethanol v/v
~15.5% ethanol v/v
"low"
"high"
~10.5% ethanol v/v
~15.5% ethanol v/v
~15.5% ethanol v/v
"low"
"low-to-high"
"high"

3 wines

Low	**A**djusted	**H**igh
~10.5% ethanol v/v	~15.5% ethanol v/v	~15.5% ethanol v/v
“low”	“low-to-high”	“high”

3 wines

Low	**A**djusted	**H**igh
~10.5% ethanol v/v	~15.5% ethanol v/v	~15.5% ethanol v/v
“low”	“low-to-high”	“high”

Temporal Check All That Apply (TCATA)

Temporal Check-All-That-Apply (TCATA)

Check and uncheck words to track changes in the wine.
(Check *all* that apply. Uncheck all that *do not* apply.)

0:00

- ☐ Heat
- ☐ Earthy
- ☐ Astringent
- ☐ Red Fruit
- ☐ Green
- ☐ Sour
- ☐ Other
- ☐ Bitter
- ☐ Spices
- ☐ Dark Fruit

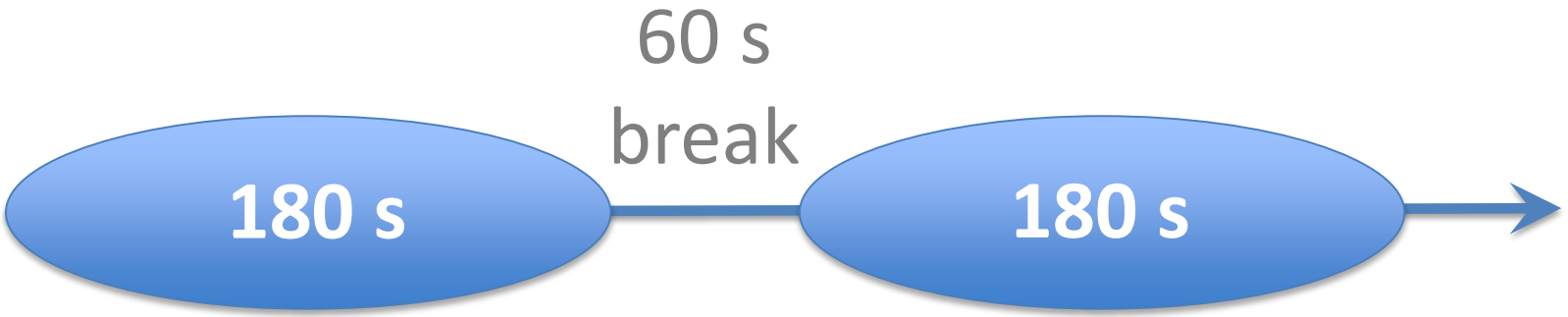
Temporal Check-All-That-Apply (TCATA)

Check and uncheck words to track changes in the wine.
(Check *all* that apply. Uncheck all that *do not* apply.)

0:10

Expectorate now

- ☐ Heat
- ☐ Earthy
- ☐ Astringent
- ☐ Red Fruit
- ☐ Green
- ☐ Sour
- ☐ Other
- ☐ Bitter
- ☐ Spices
- ☐ Dark Fruit

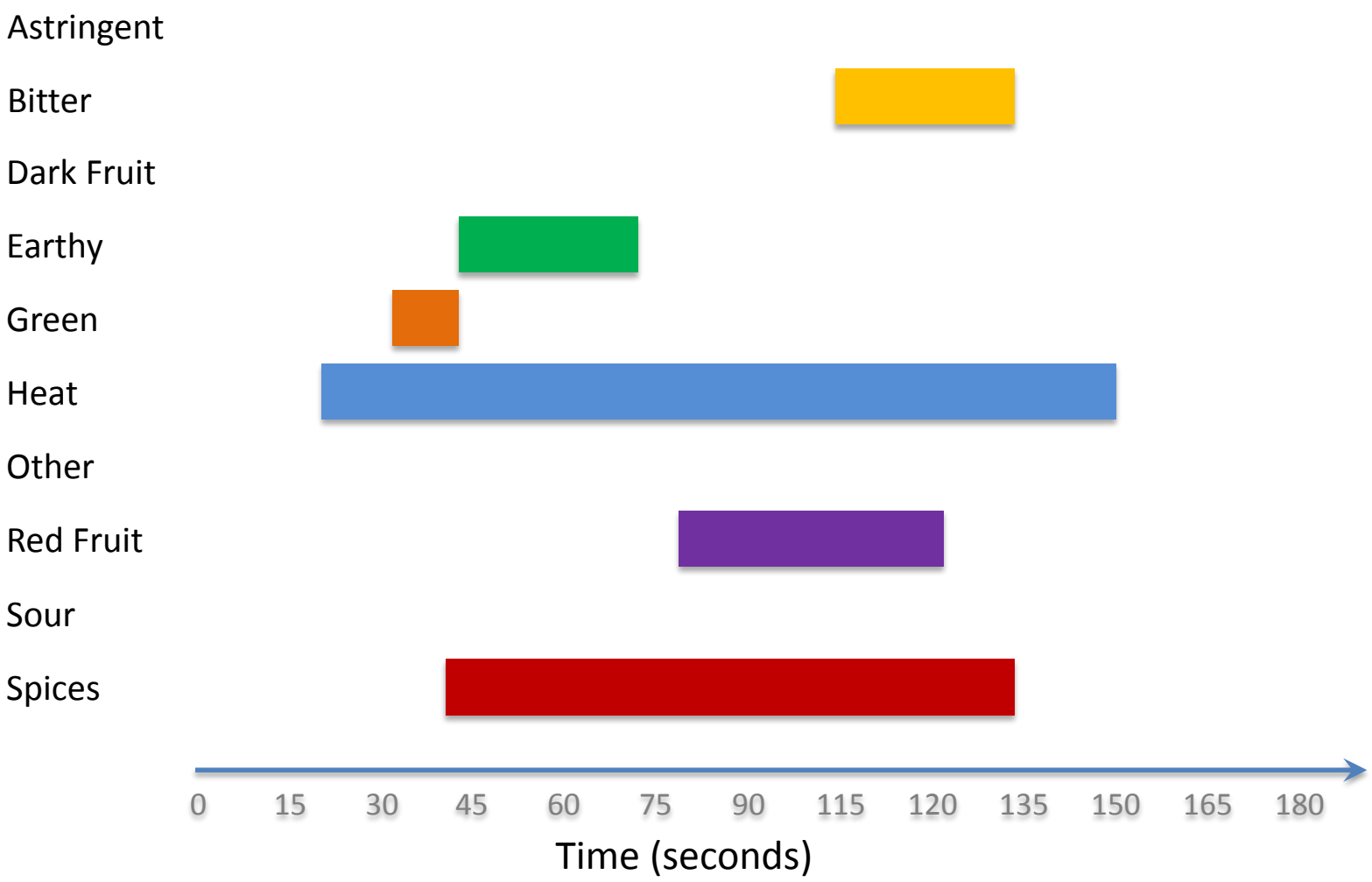


Sip 1
evaluation

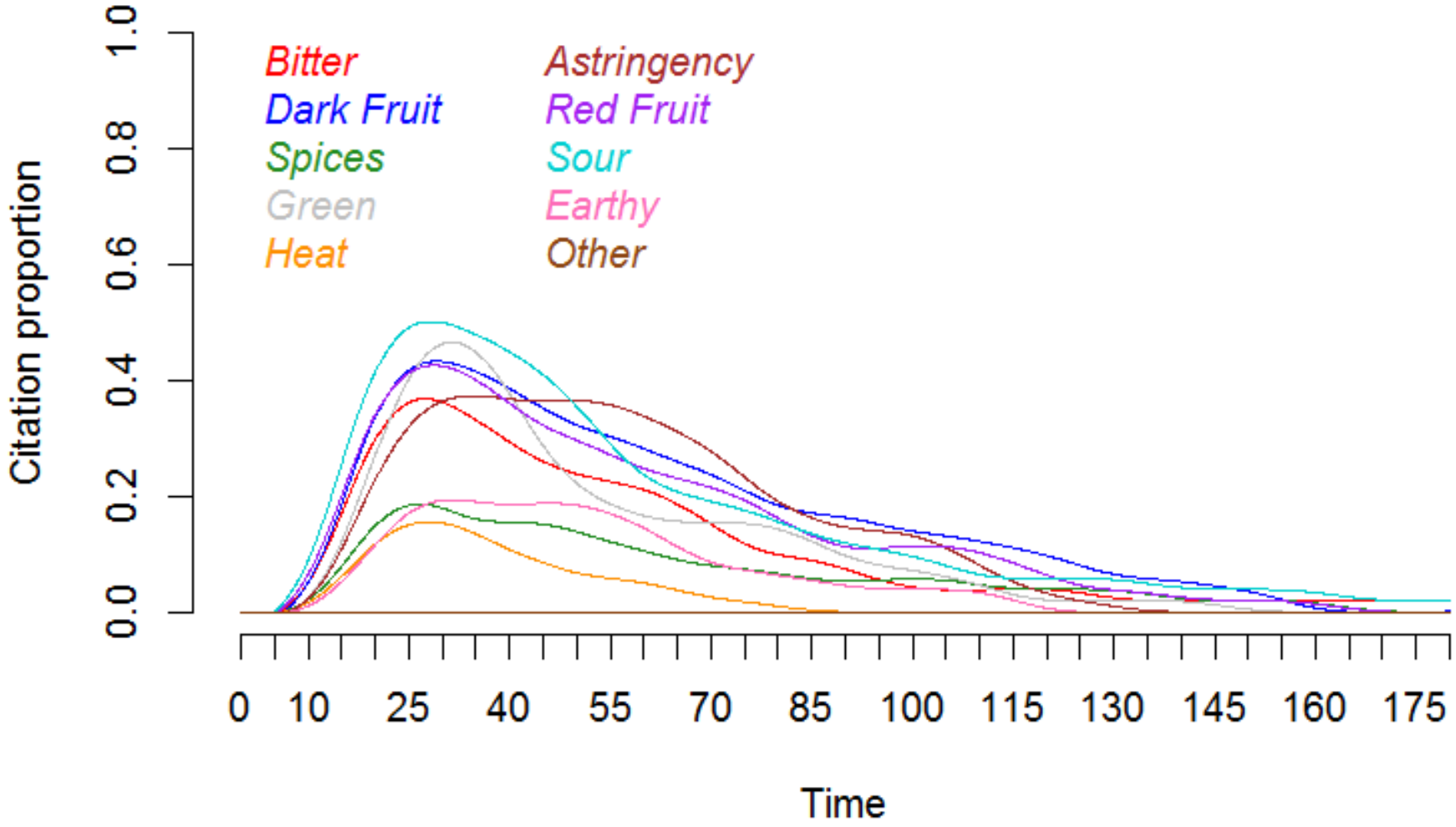
Sip 2
evaluation

n = 13
(4 replicates)

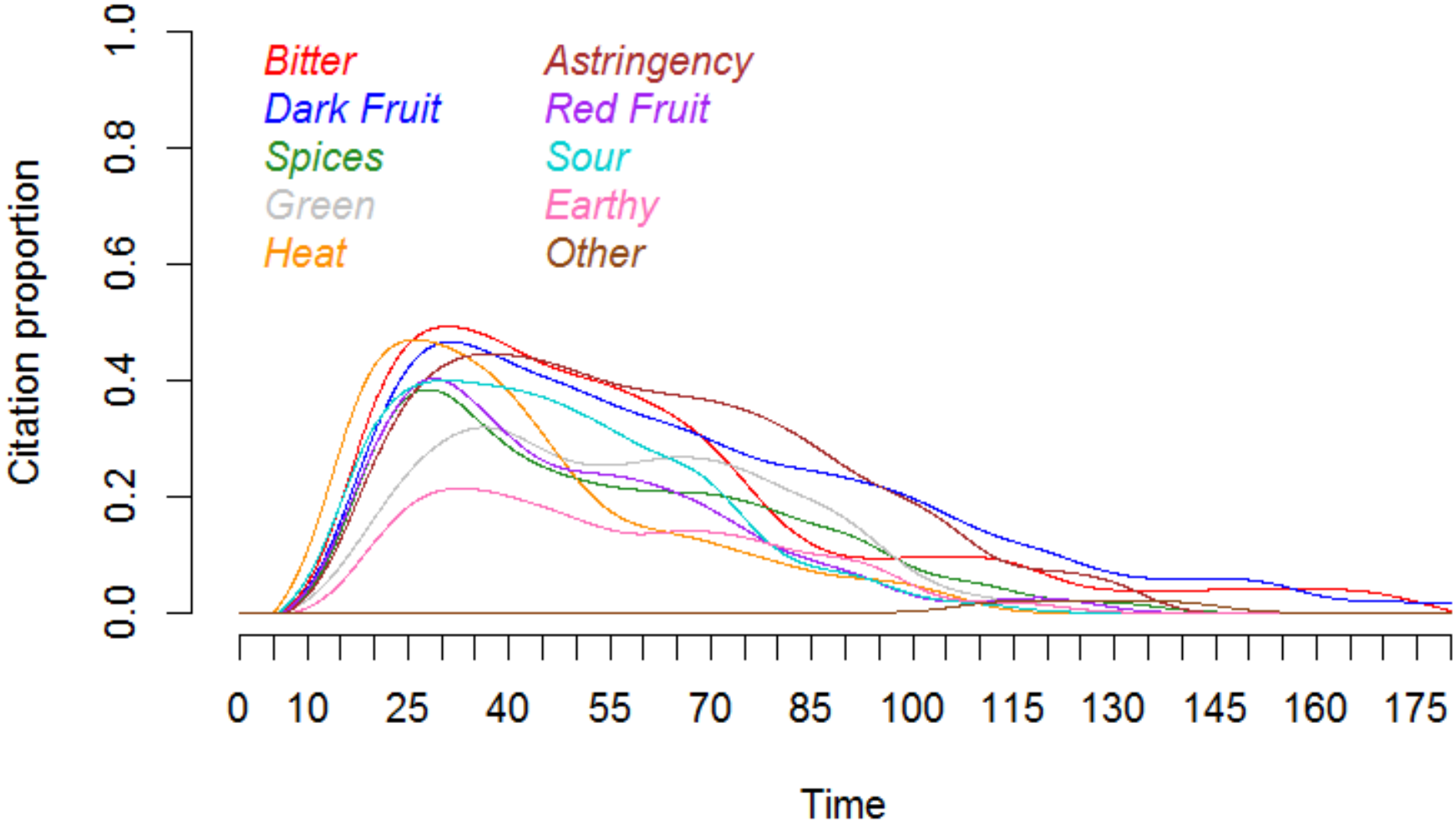
TCATA raw data



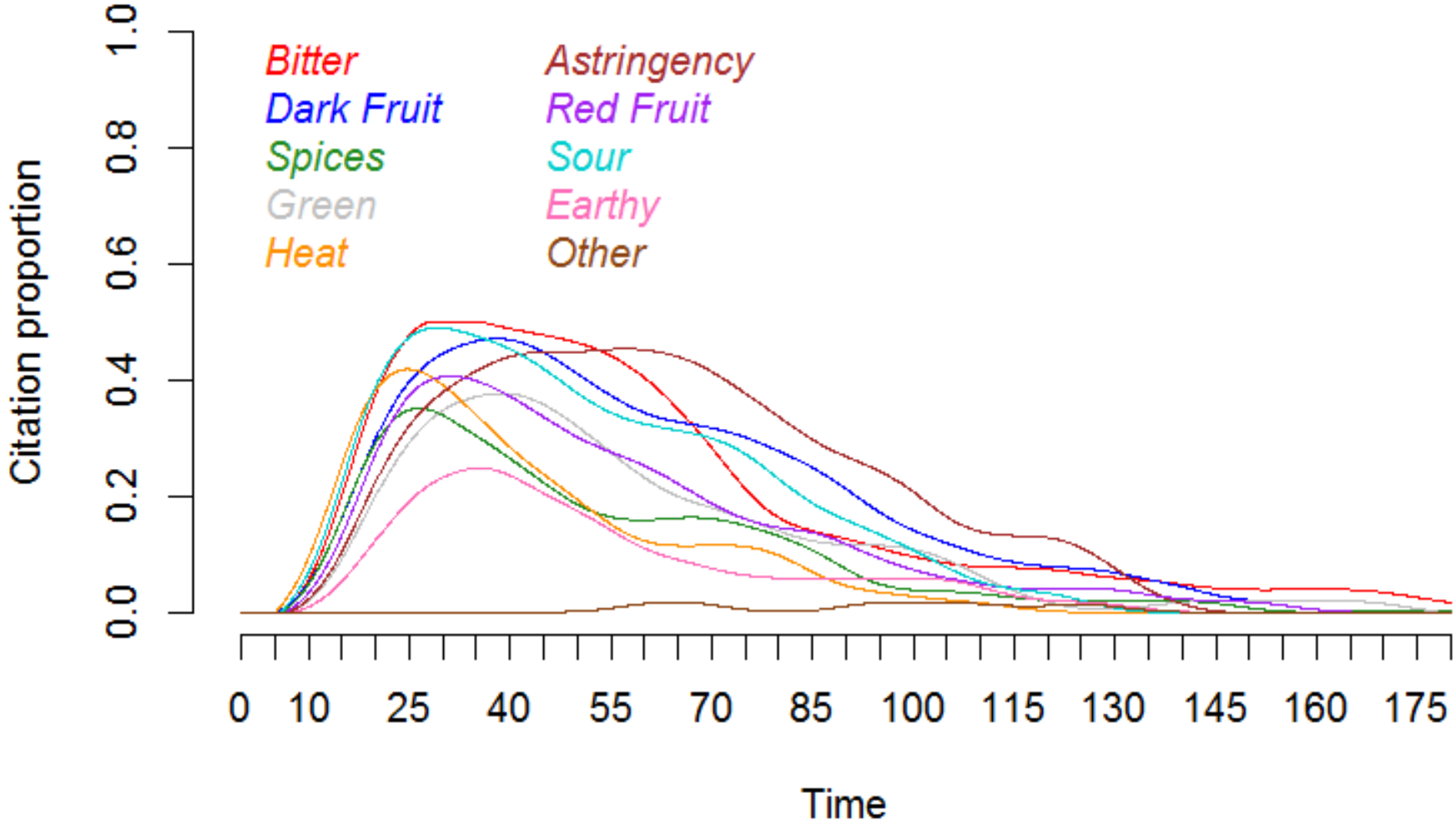
Low

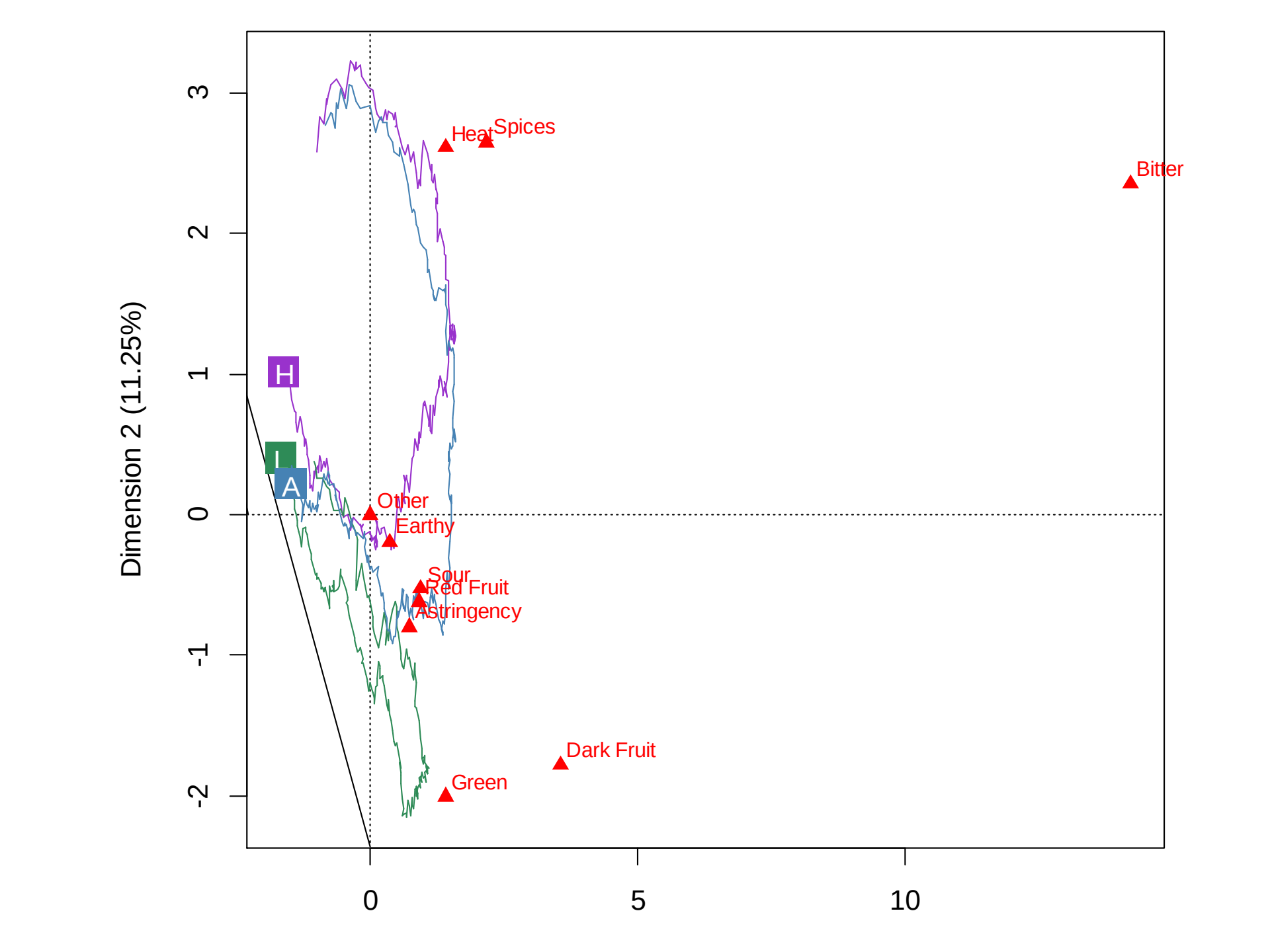

Bitter
Dark Fruit
Spices
Green
Heat
Astringency
Red Fruit
Sour
Earthy
Other
Citation proportion
0.0
0.2
0.4
0.6
0.8
1.0
0
10
25
40
55
70
85
100
115
130
145
160
175
Time

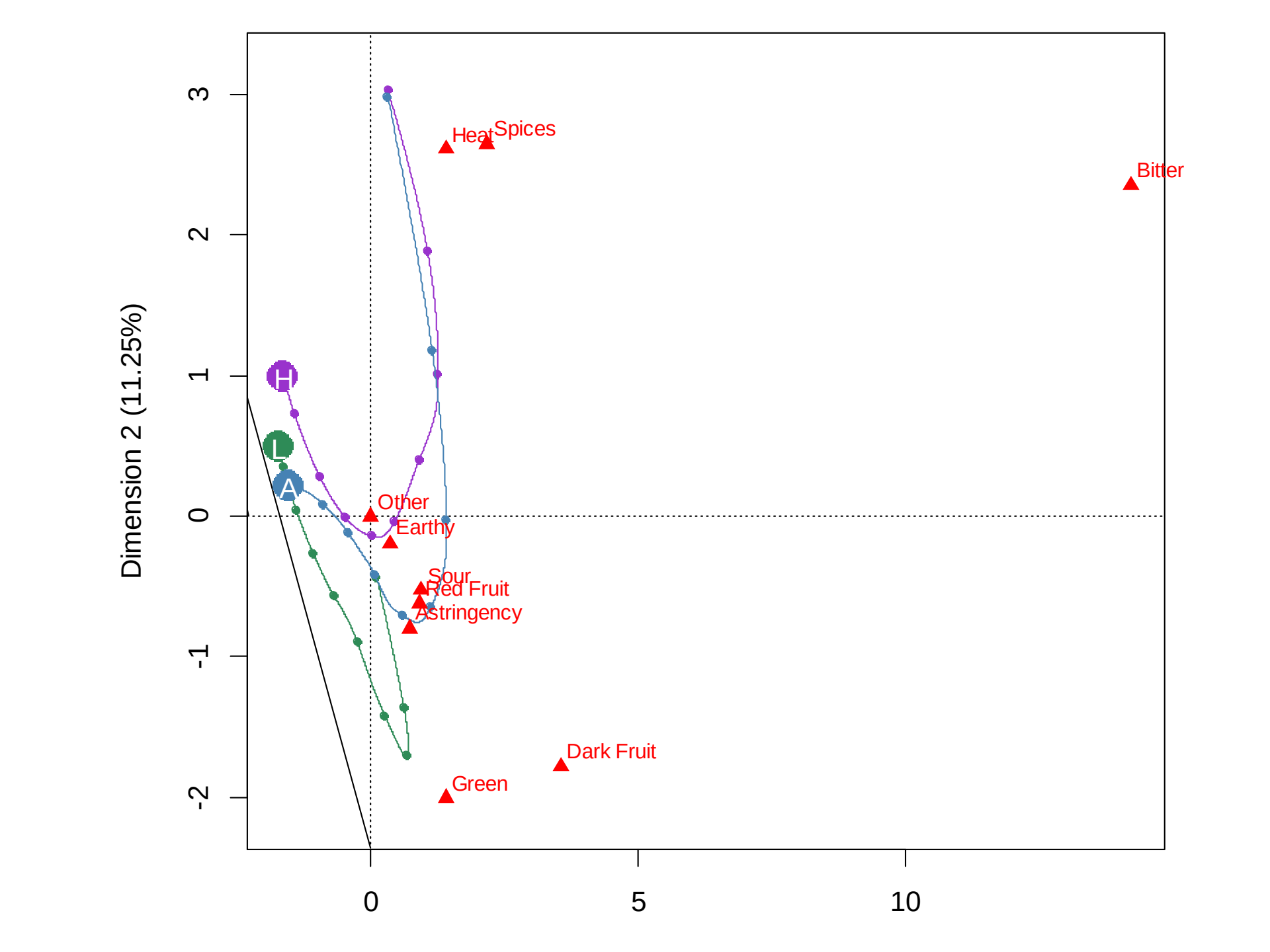
High


Bitter
Dark Fruit
Spices
Green
Heat
Astringency
Red Fruit
Sour
Earthy
Other
Citation proportion
0.0
0.2
0.4
0.6
0.8
1.0
0
10
25
40
55
70
85
100
115
130
145
160
175
Time

Adjusted (Low to High)




Dimension 2 (11.25%)
3
2
1
0
-1
-2
0
5
10
Heat
Spices
Bitter
H
I
A
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green


Dimension 2 (11.25%)
3
2
1
0
-1
-2
0
5
10
Heat
Spices
Bitter
H
L
A
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green

How well do these product paths represent the evolution of flavours in the finish of the wines?

Intuitively, we understand that we can be misled if we rely too heavily on point estimates.

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$\bar{x} = 21.7$

$\bar{y} = 18.6$

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$\bar{x} = 21.7$

$\bar{y} = 18.6$

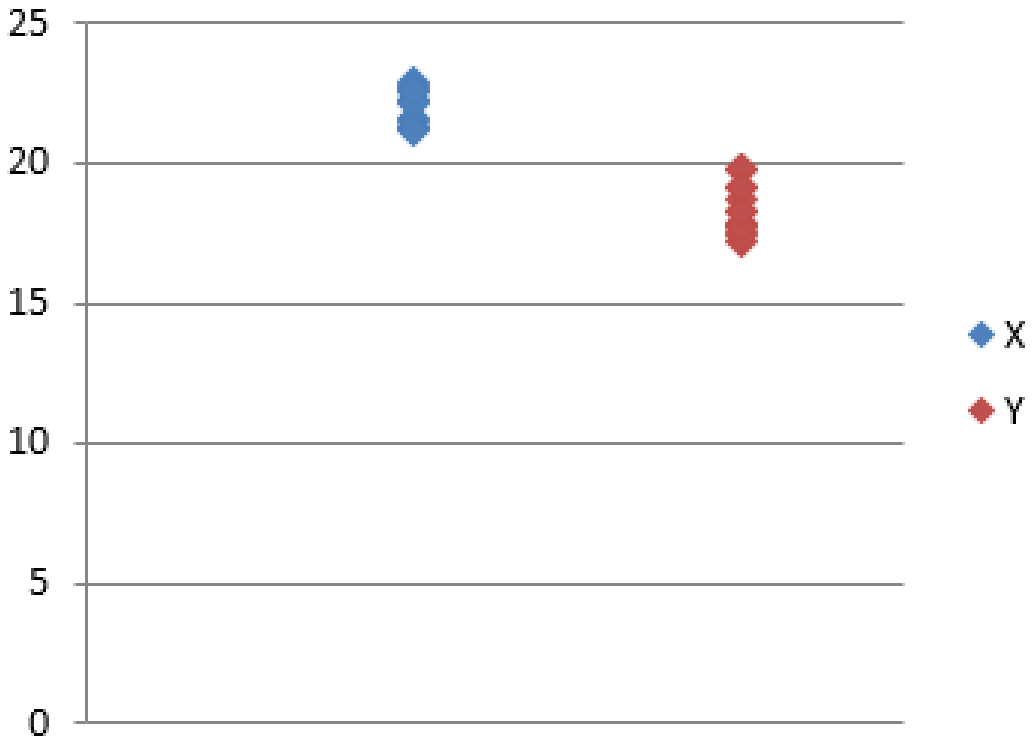
*So, is **X** > **Y**?*

Intuitively, we understand that we can be misled if we rely too heavily on point estimates.

$\bar{x} = 21.7$

$\bar{y} = 18.6$

*So, is **X** > **Y**?*

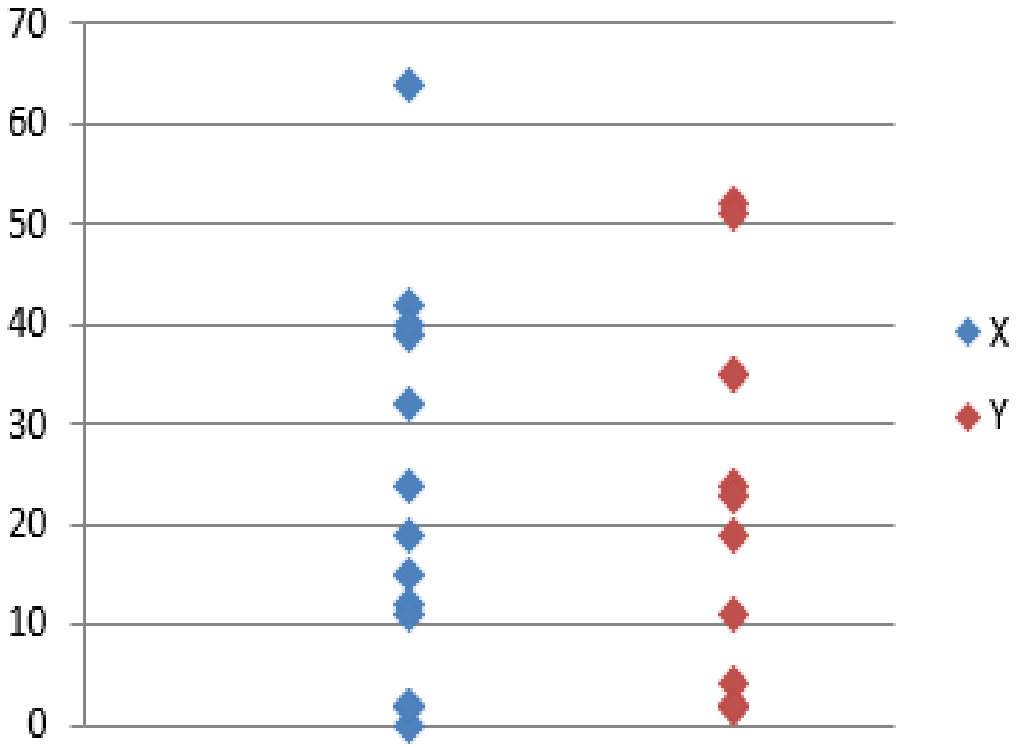


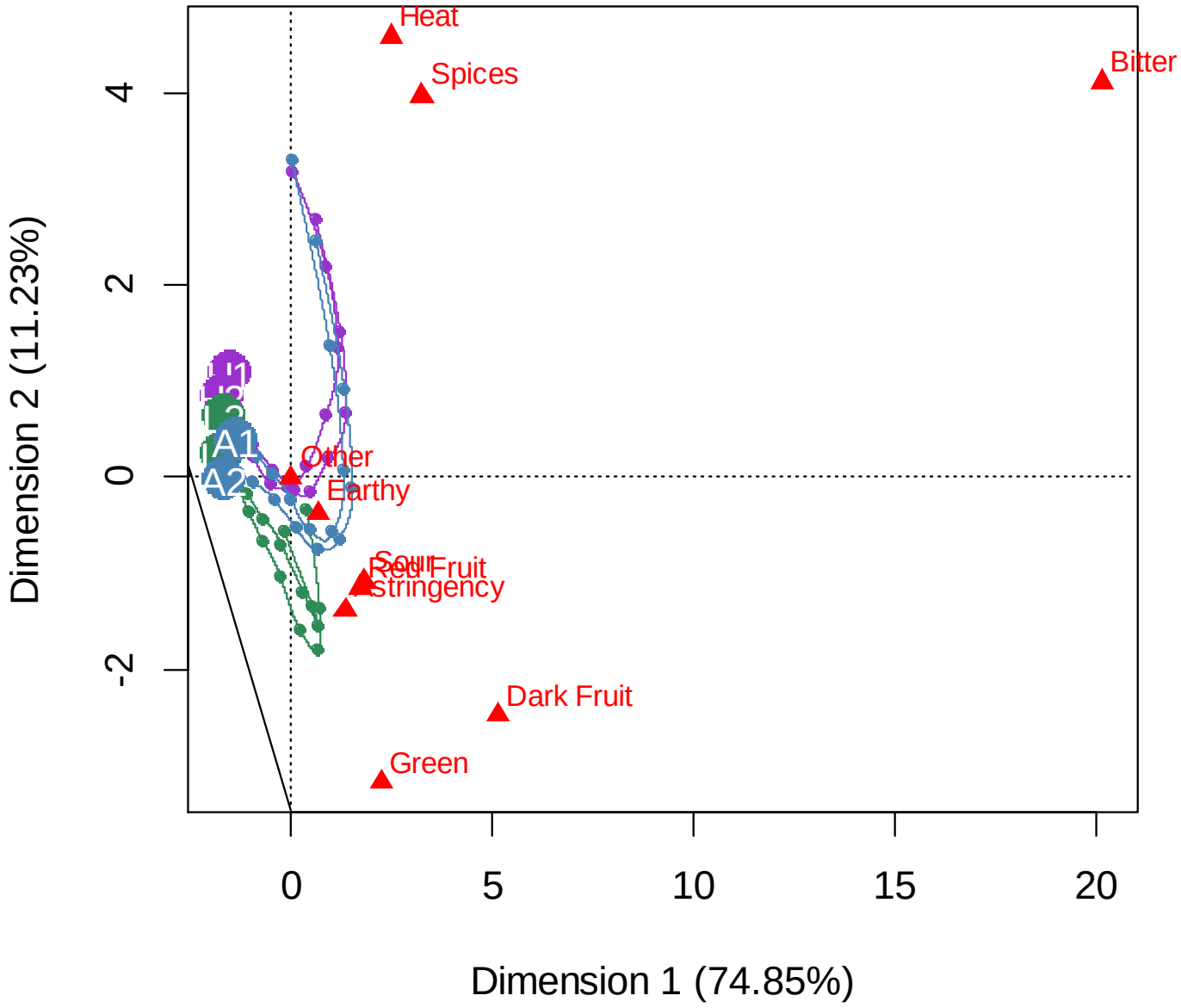
Intuitively, we understand that we can be misled if we rely too heavily on point estimates.

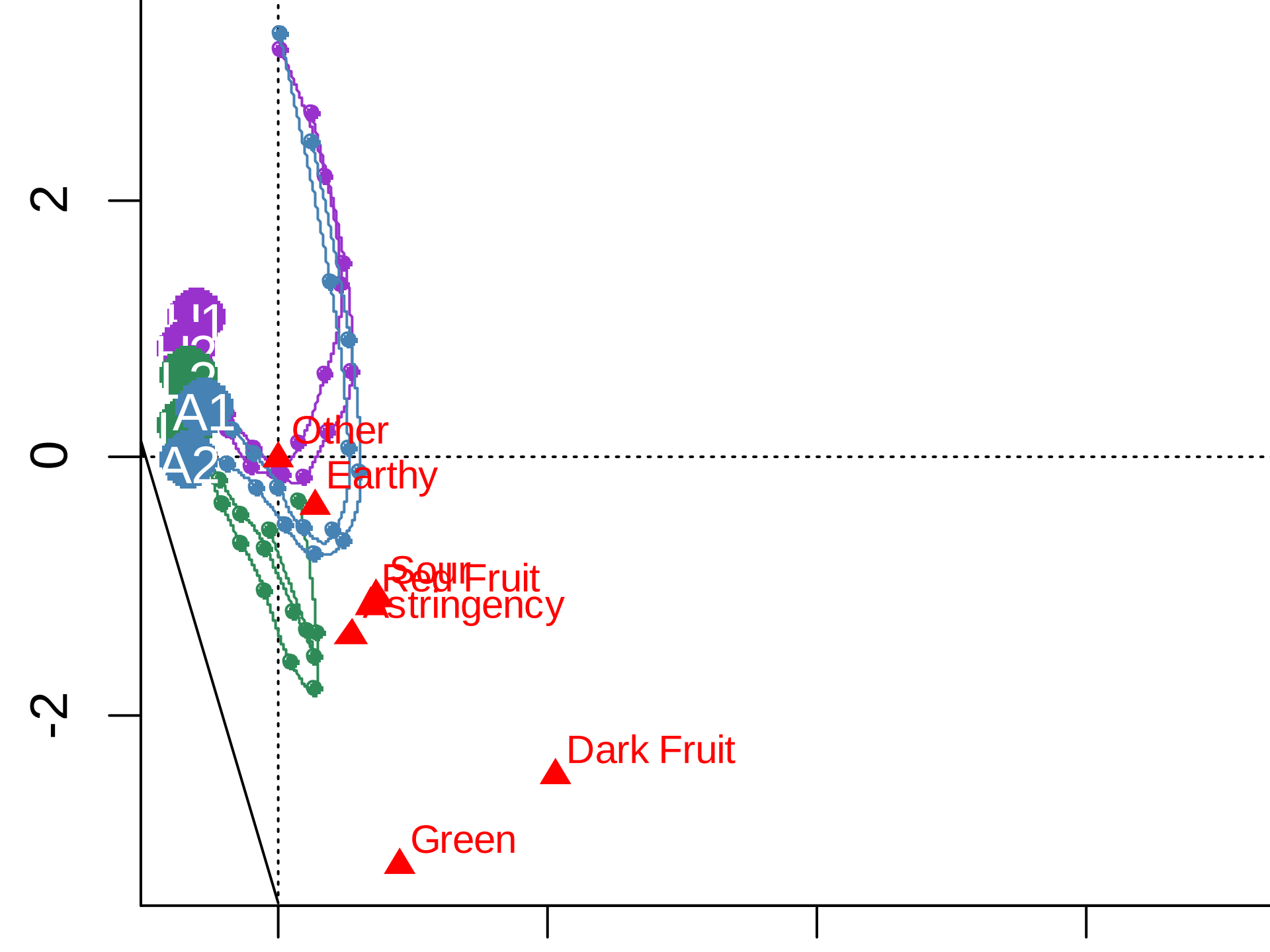
$\bar{x} = 21.7$

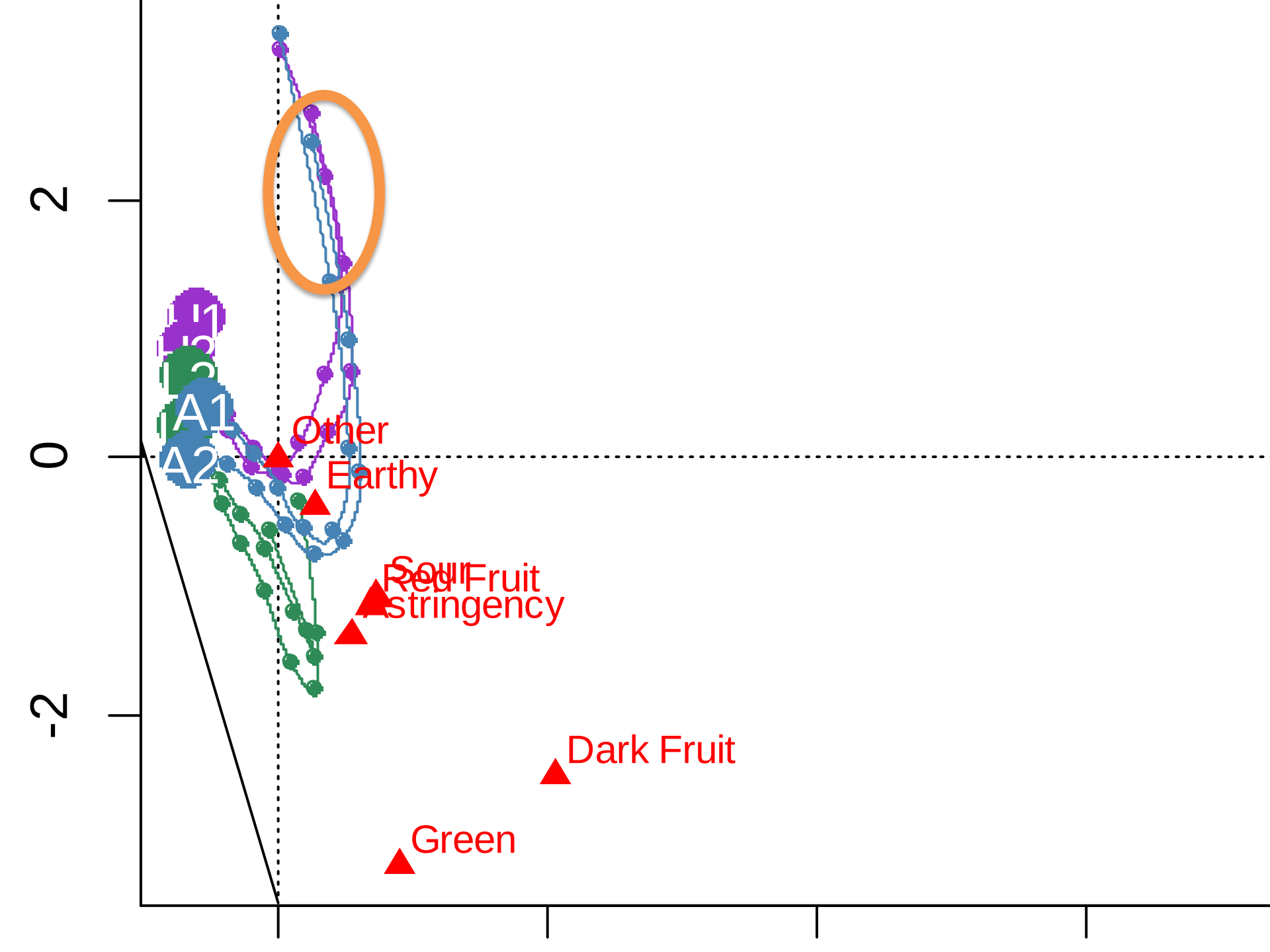
$\bar{y} = 18.6$

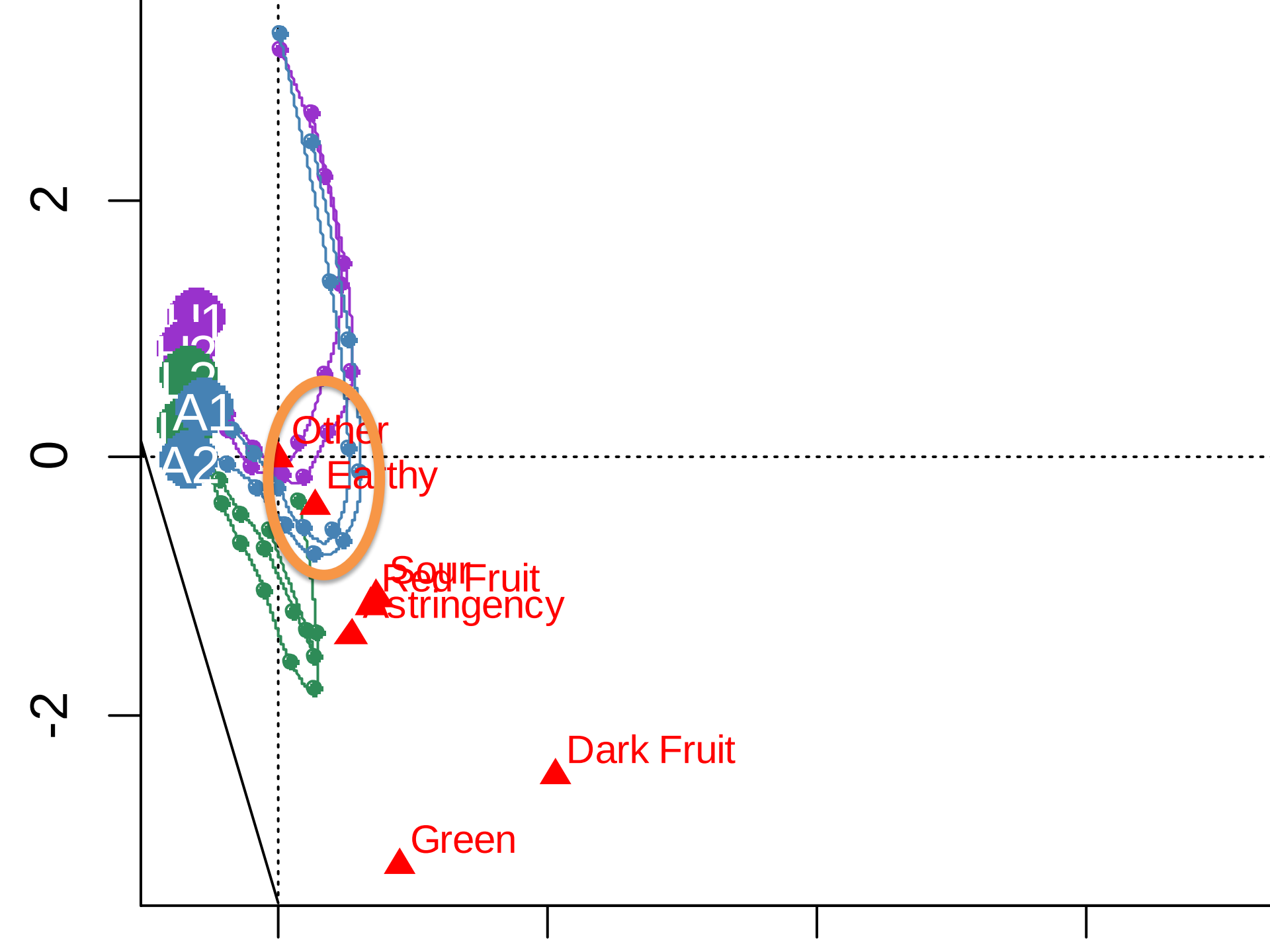
*So, is **X** > **Y**?*




Heat
Spices
Bitter
Other
Earthy
Sour
Red Fruit
Stringency
Dark Fruit
Green
A1
A2
Dimension 2 (11.23%)
Dimension 1 (74.85%)
4
2
0
-2
0
5
10
15
20


2
0
-2
A1
A2
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green


2
0
-2
A1
A2
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green

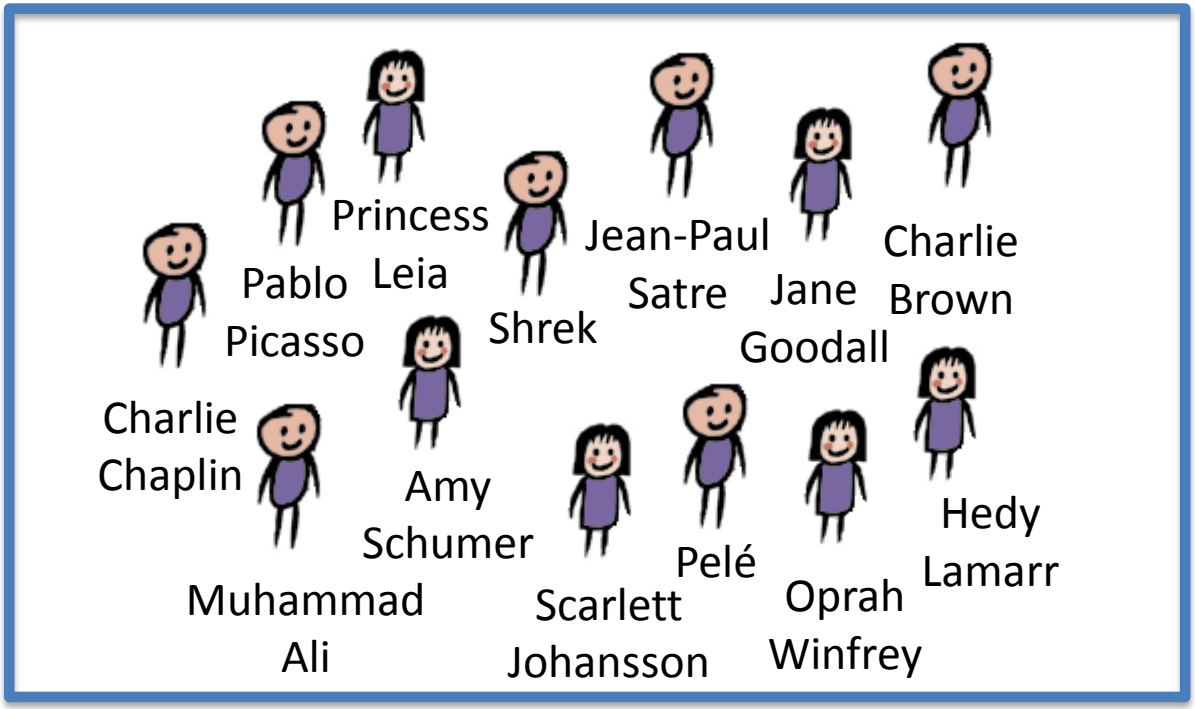

2
0
-2
A1
A2
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green

Data resampling

Assume that observed data is representative of underlying data distribution…

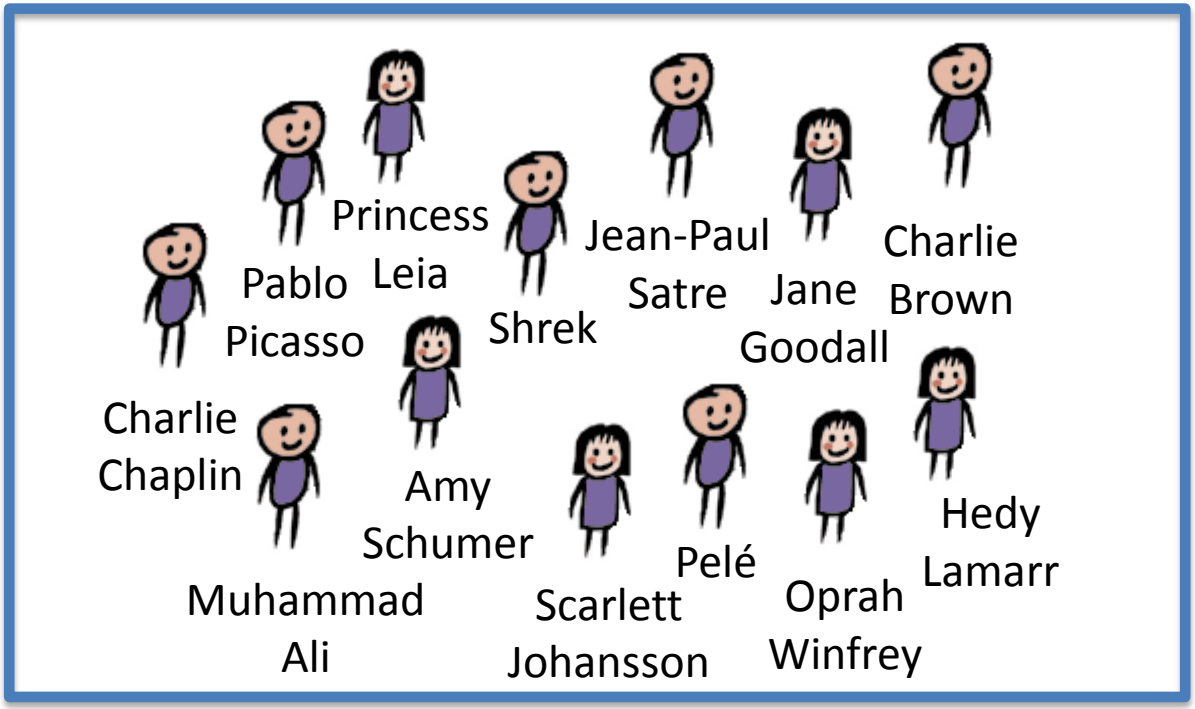
The Real Panel

(n=13)



The Real Panel

(n=13)

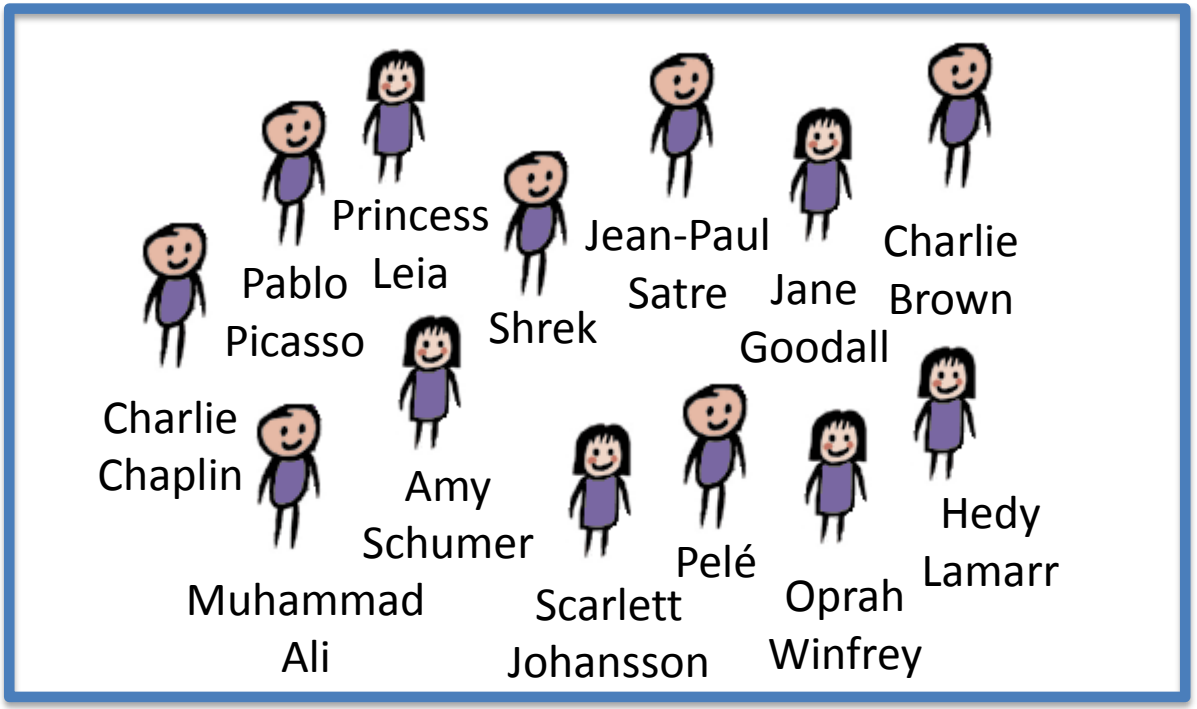


Virtual Panel 1

(n=13)

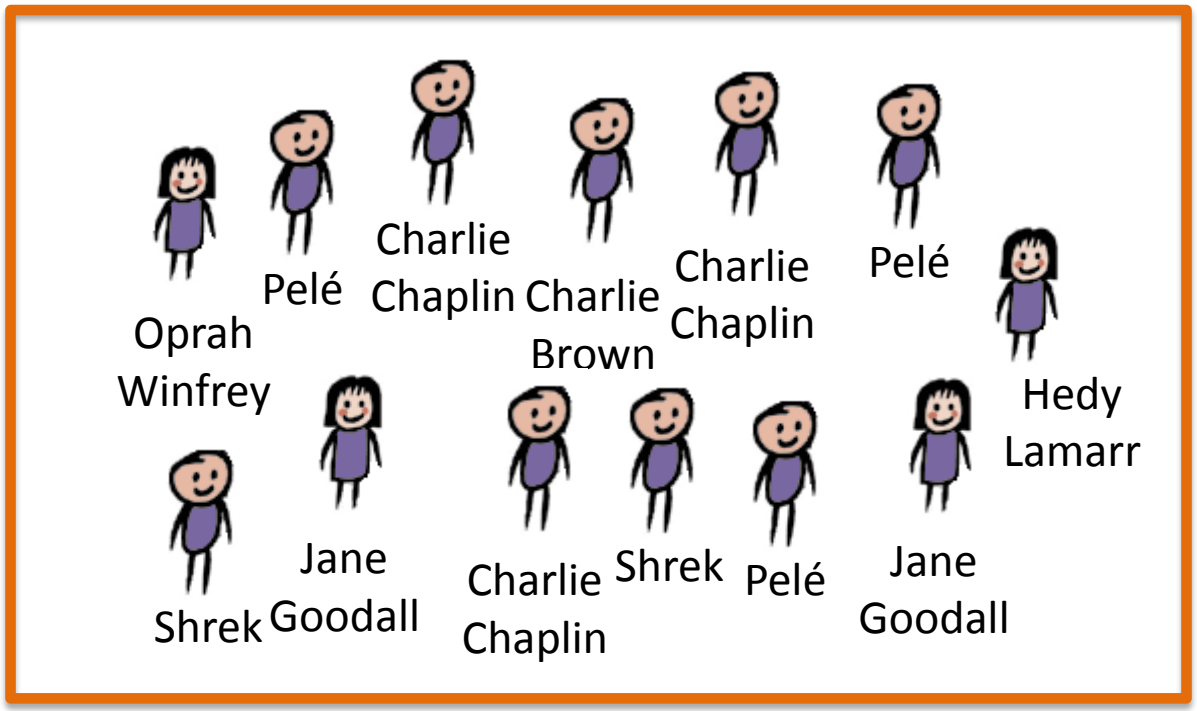
The Real Panel

(n=13)



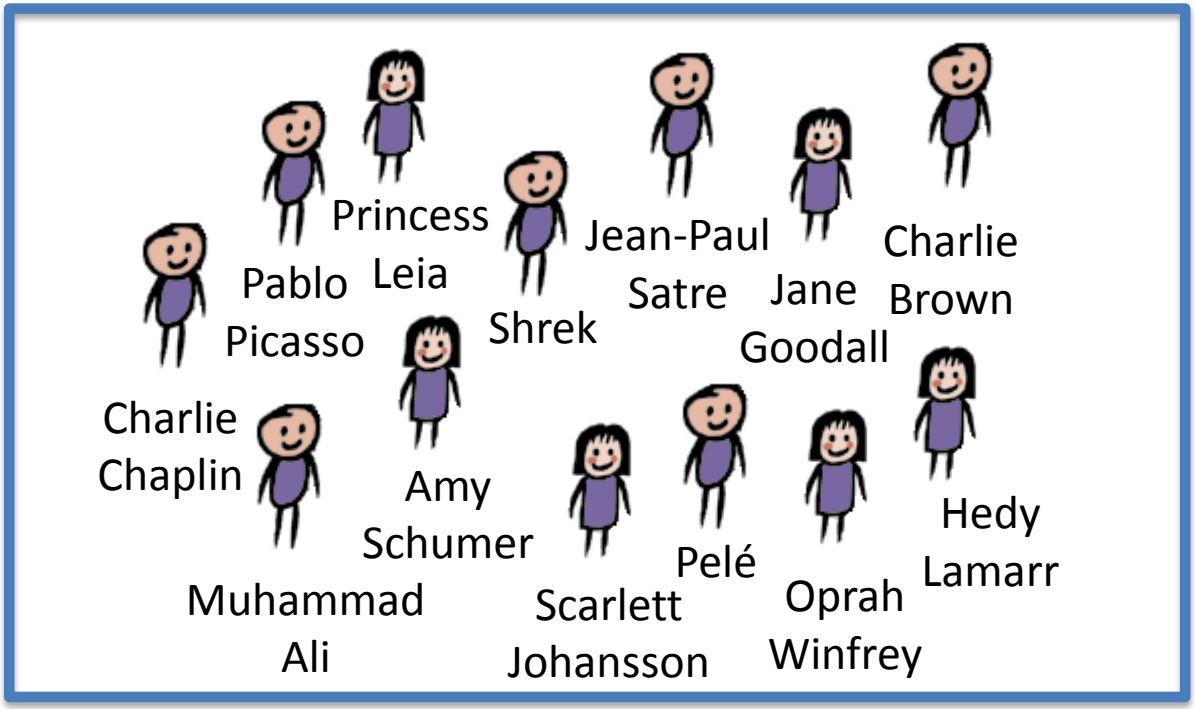
Virtual Panel 1

(n=13)



The Real Panel

(n=13)

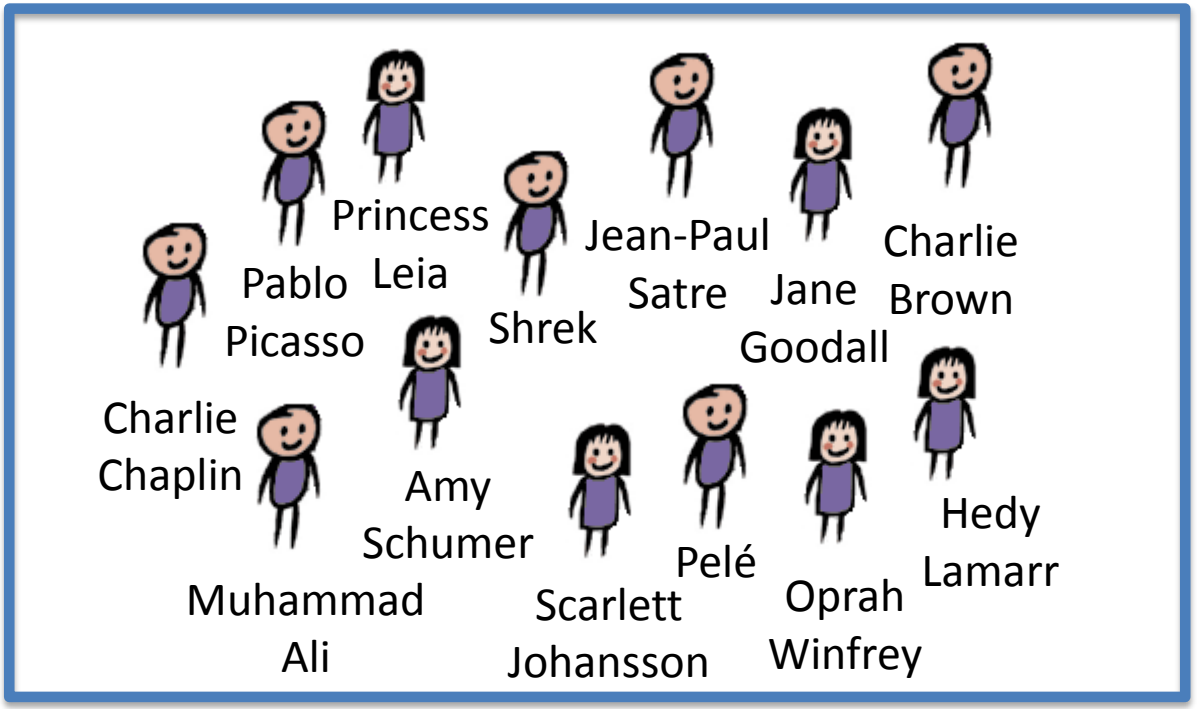


Virtual Panel 2

(n=13)

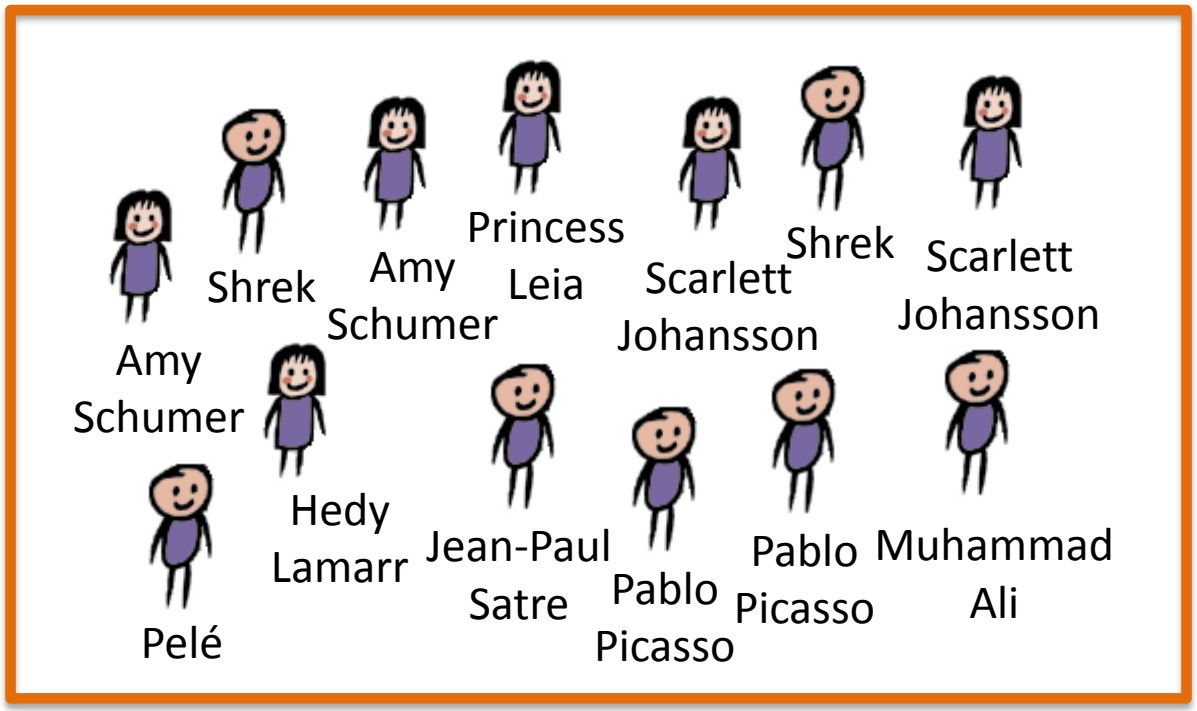
The Real Panel

(n=13)



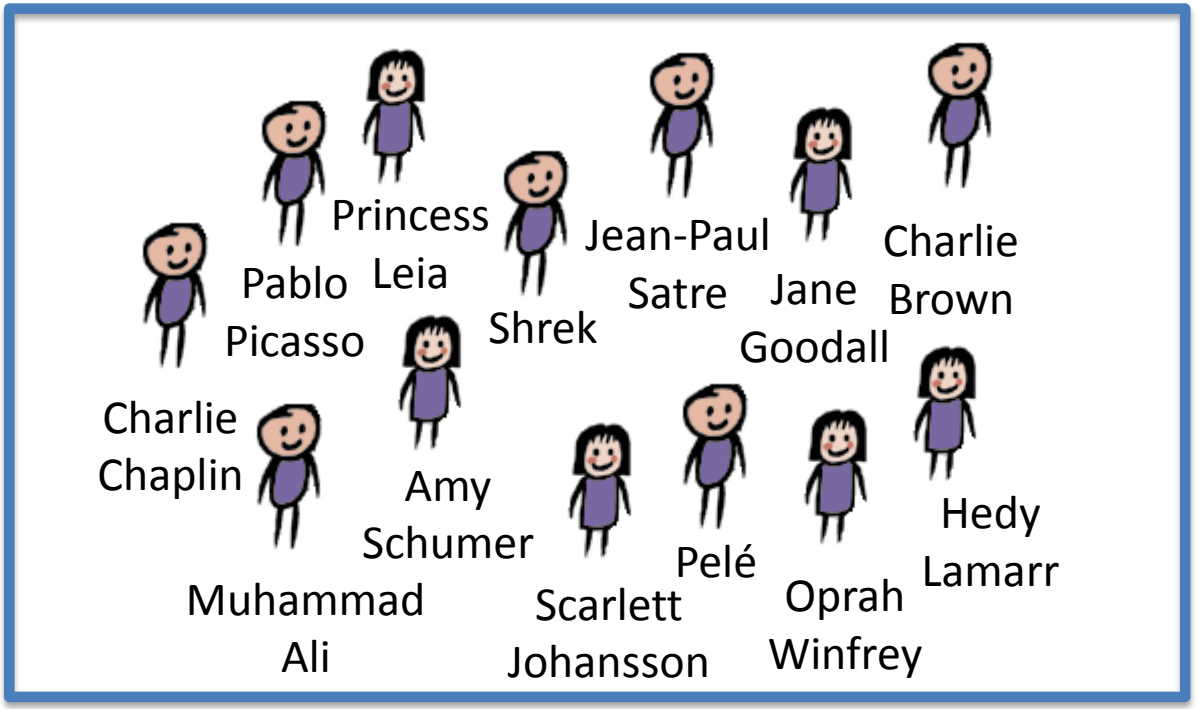
Virtual Panel 2

(n=13)



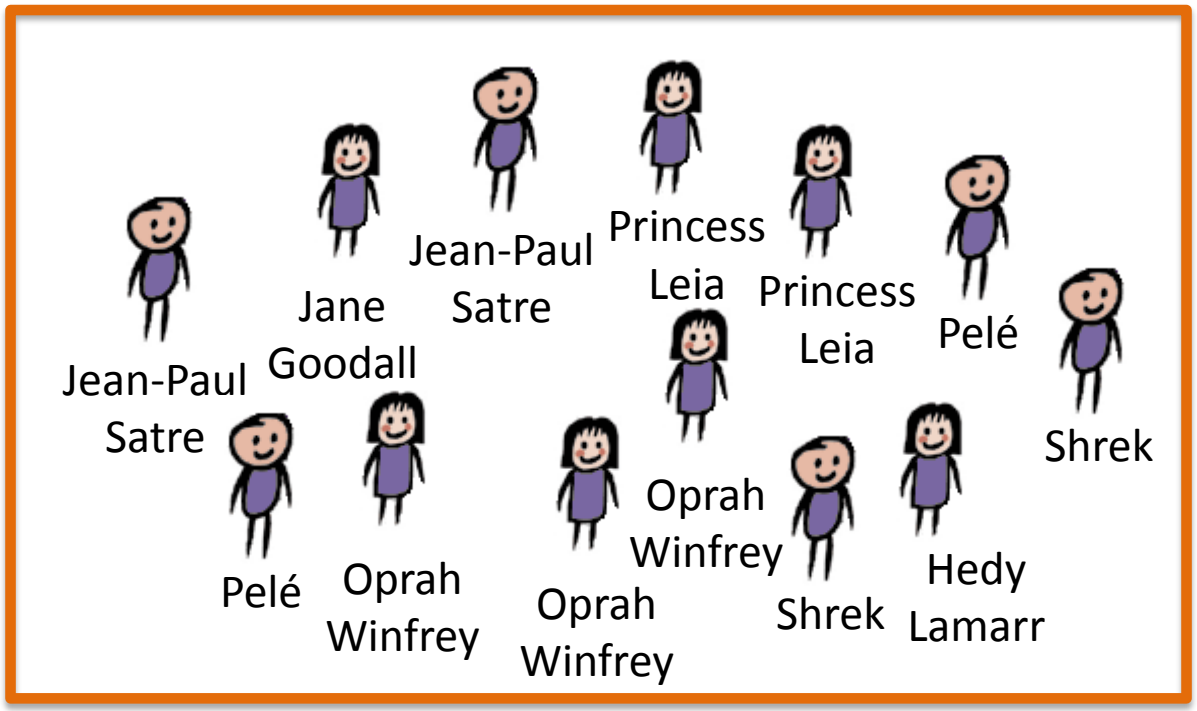
The Real Panel

(n=13)



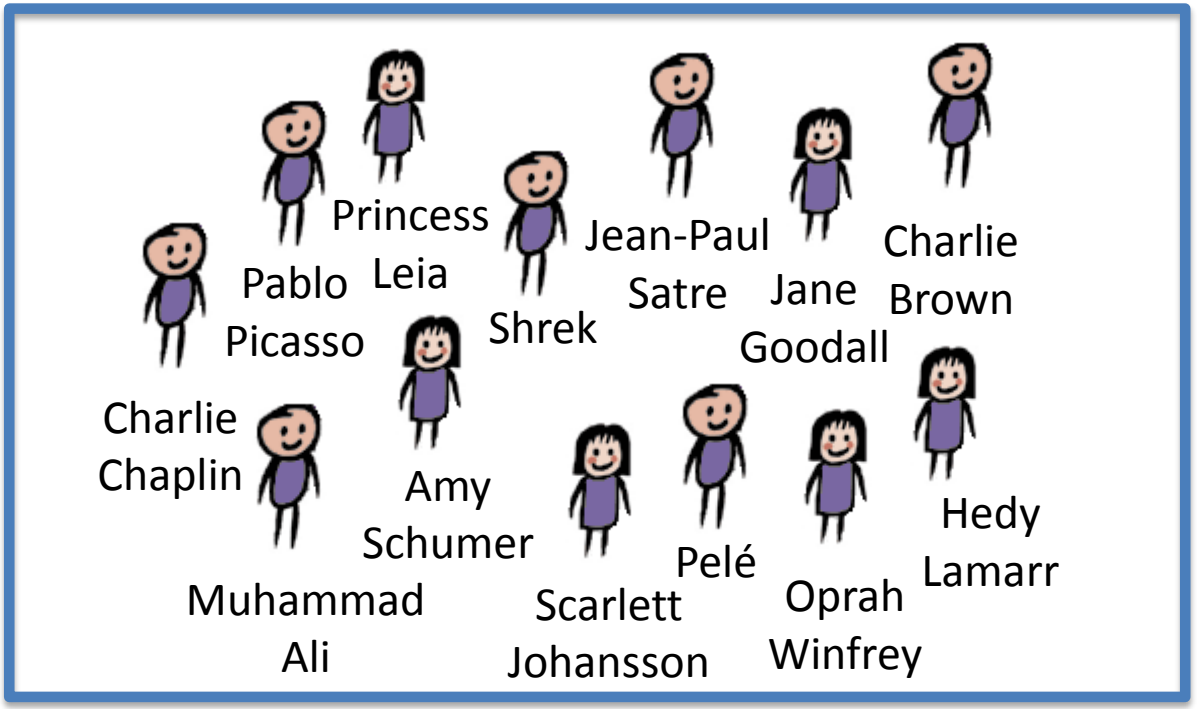
Virtual Panel 3

(n=13)



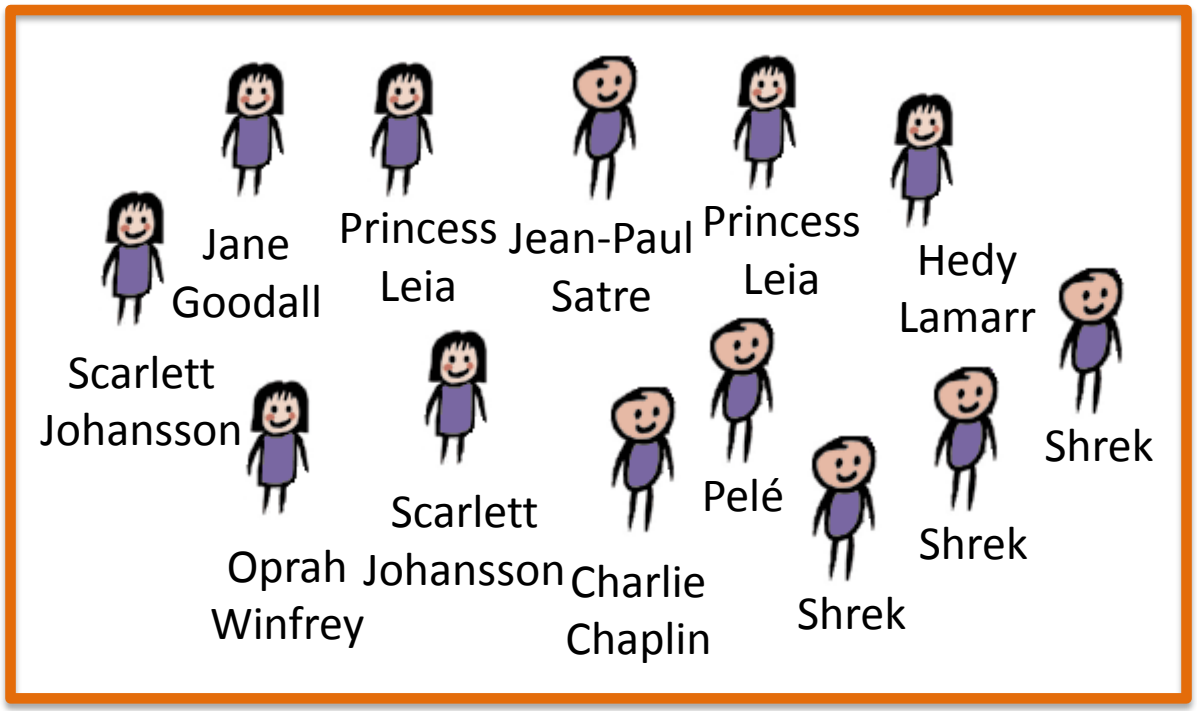
The Real Panel

(n=13)



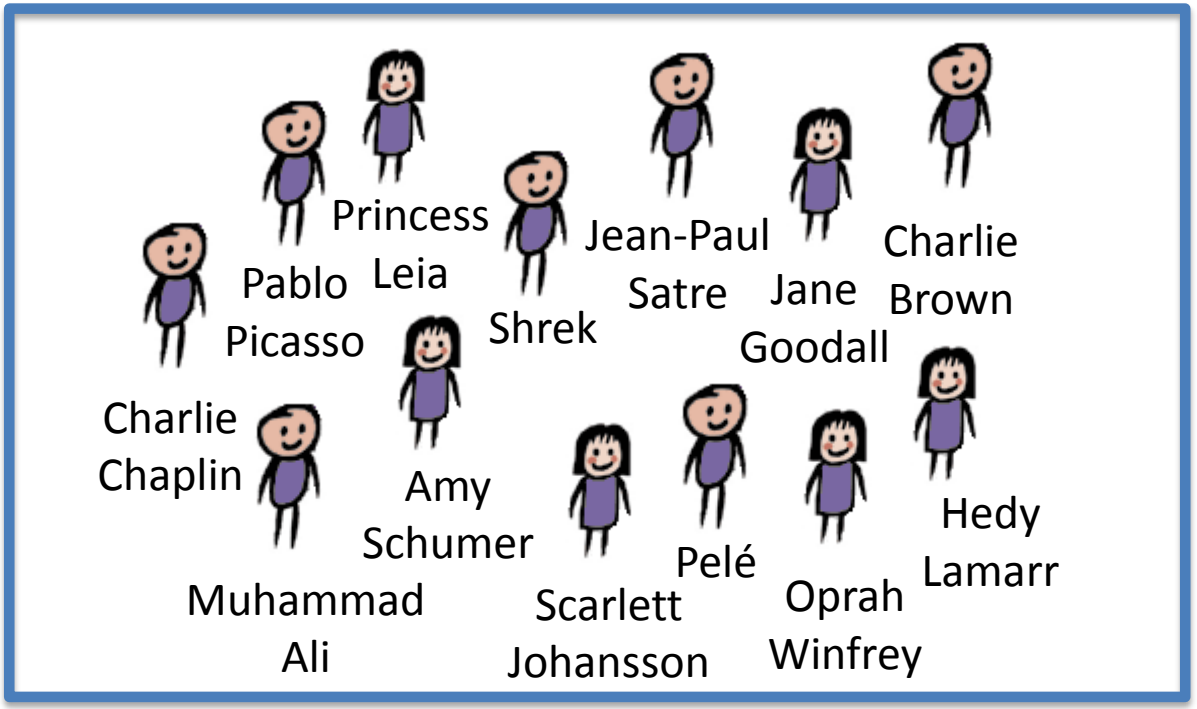
Virtual Panel 4

(n=13)



The Real Panel

(n=13)



…and so on…

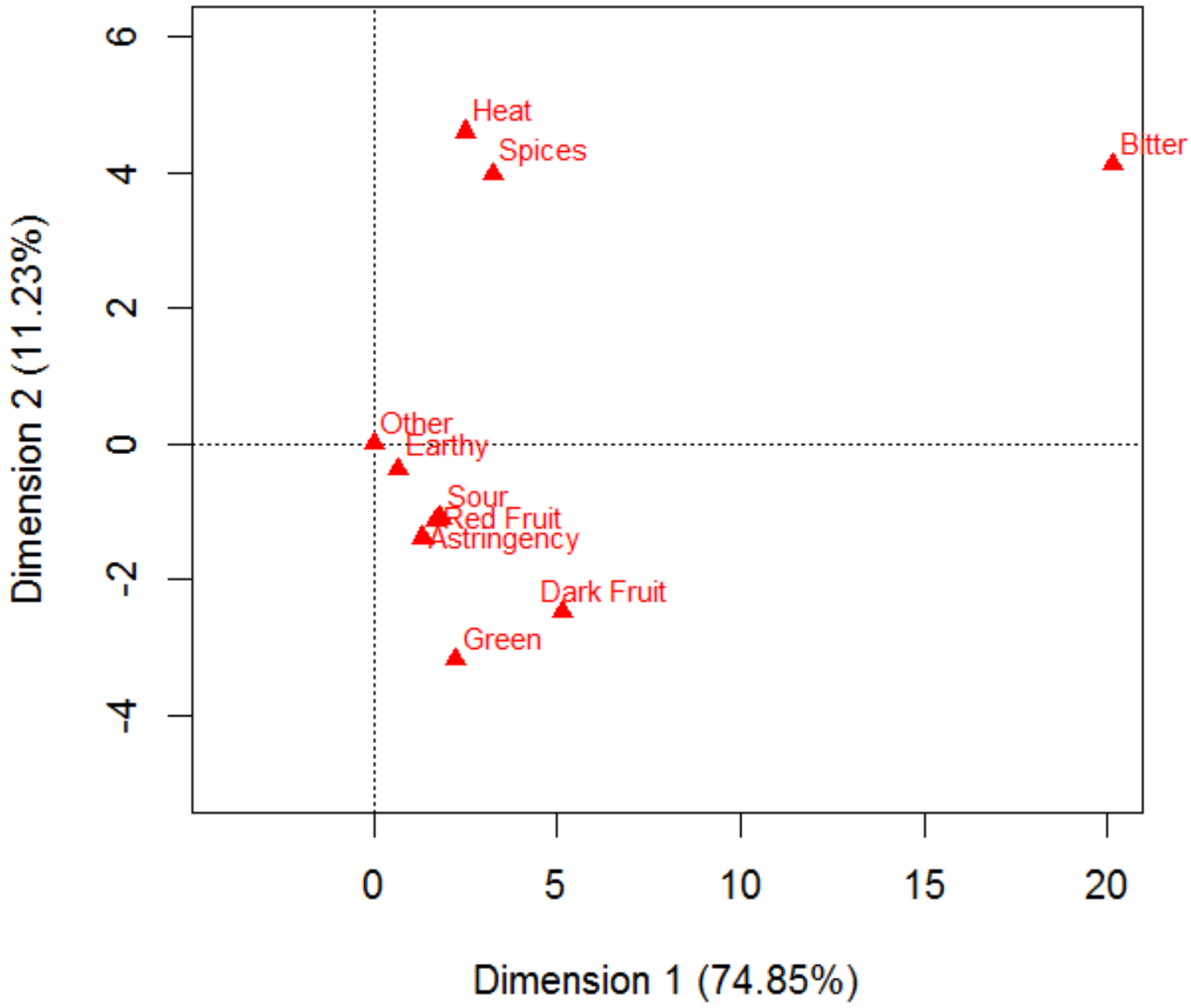
Partial bootstrap

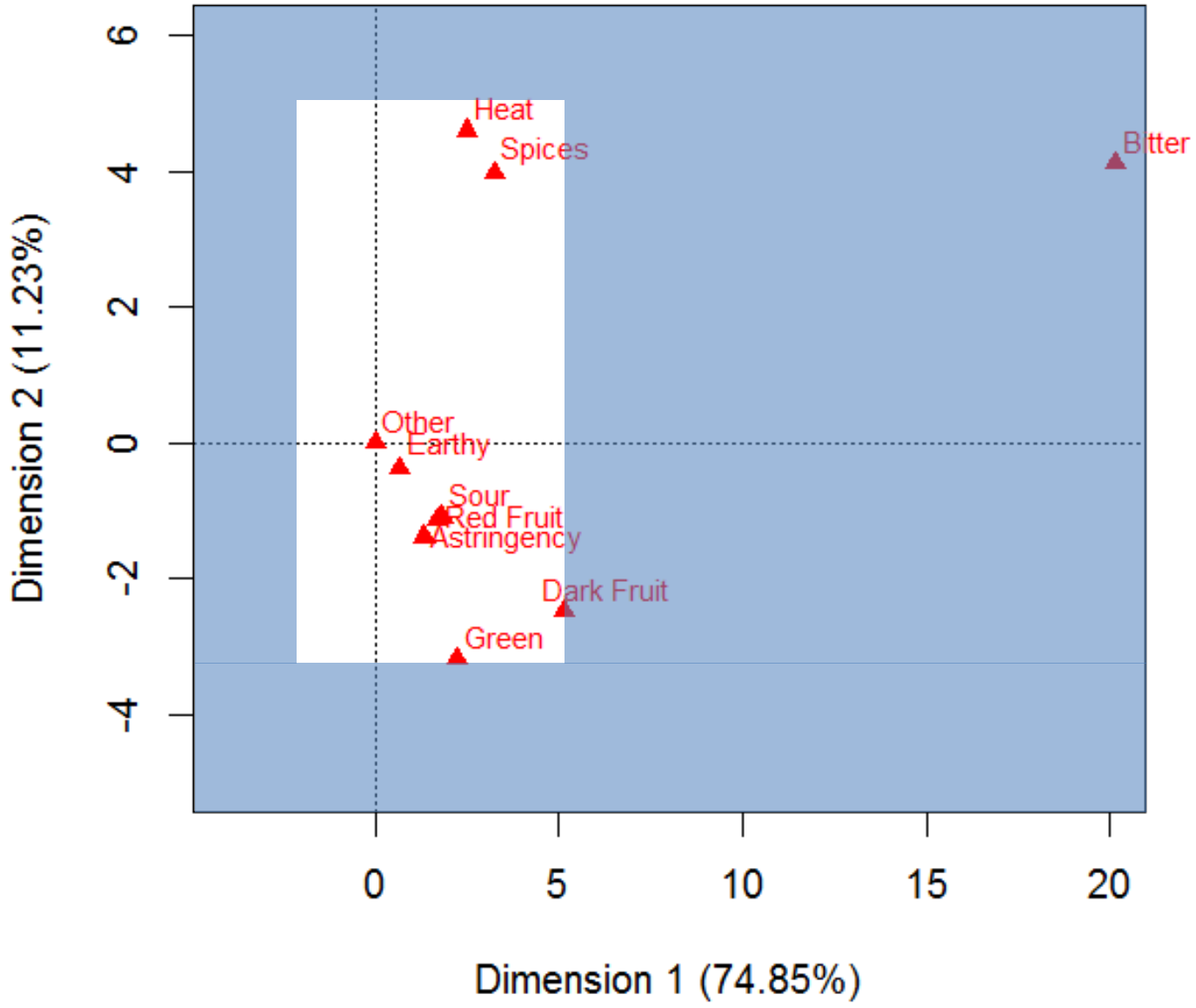
1 real panel (n=13)

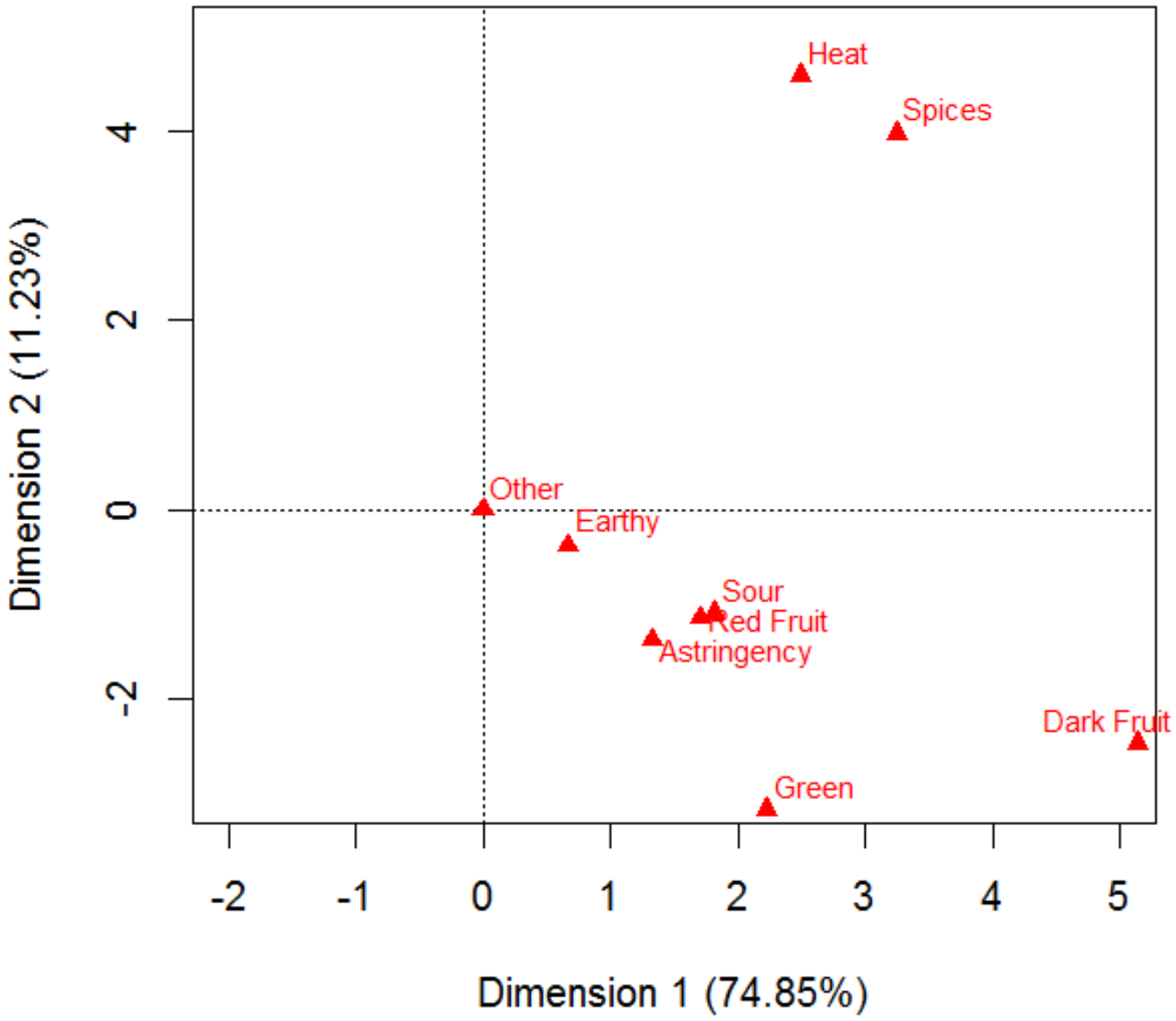
+

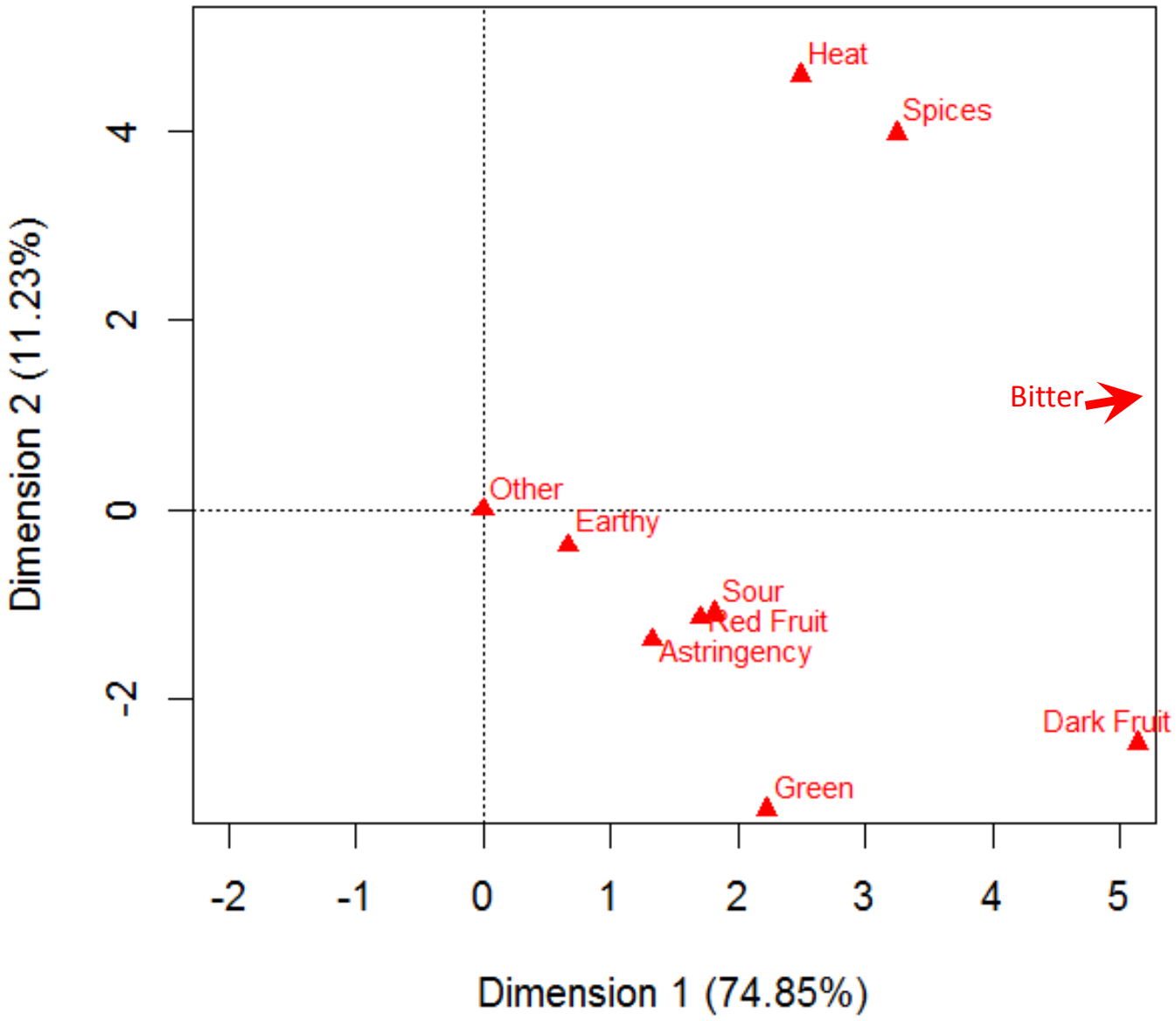
499 virtual panels (n=13)

For each panel, obtain and project coordinates for each product×time into the multivariate sensory space


Heat
Spices
Bitter
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
6
4
2
0
-2
-4
0
5
10
15
20


Heat
Spices
Bitter
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
6
4
2
0
-2
-4
0
5
10
15
20
Dimension 2 (11.23%)
Dimension 1 (74.85%)


Heat
Spices
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
-2
0
2
4
-2
-1
0
1
2
3
4
5


Heat
Spices
Bitter
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
-2
-1
0
1
2
3
4
5
-2
0
2
4

High alcohol

Sip 1 H1

Sip 2 H2

Low alcohol

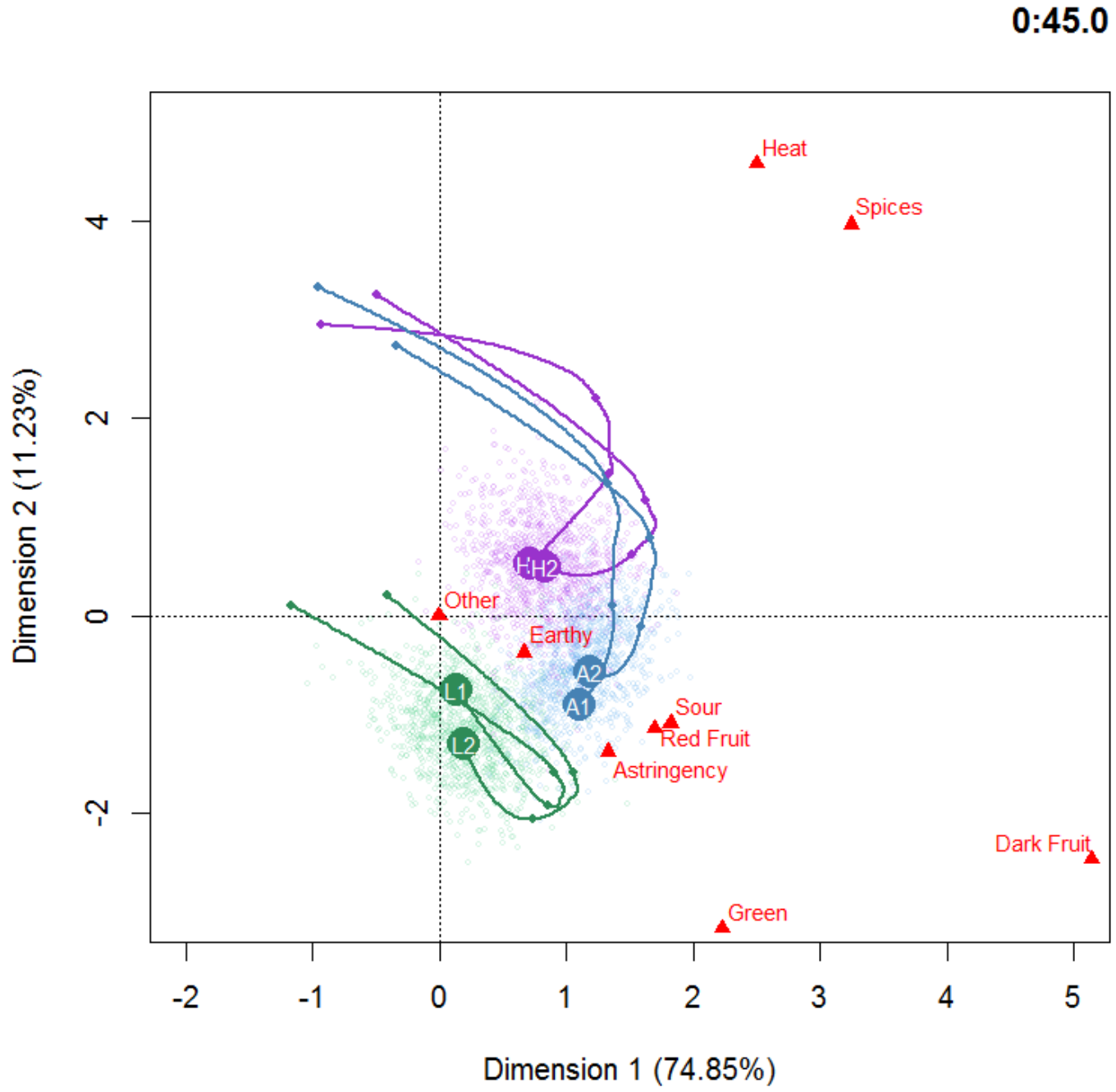
Sip 1 L1

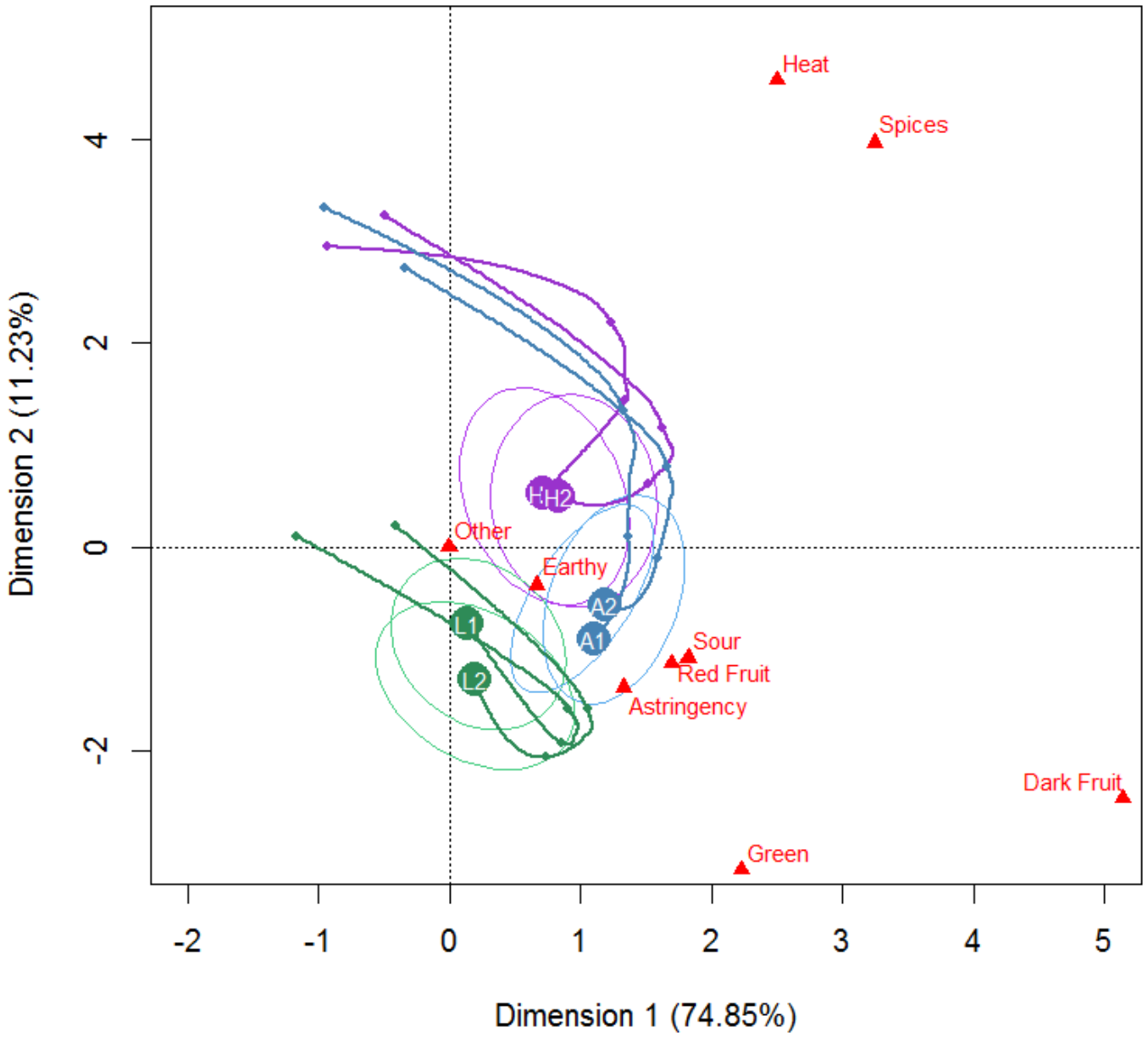
Sip 2 L2

Adjusted (Low-to-High) alcohol

Sip 1 A1

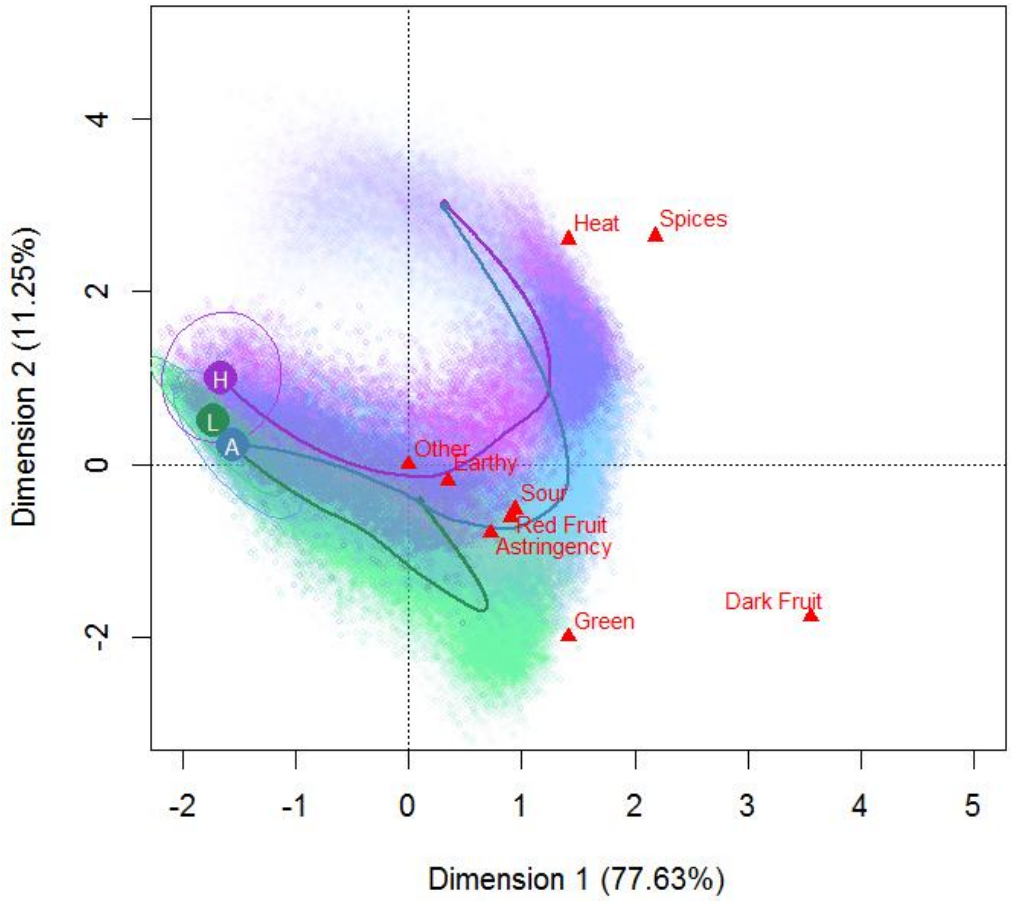
Sip 2 A2


0:45.0
Heat
Spices
H1
H2
Other
Earthy
A2
A1
L1
L2
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
4
2
0
-2
-2
-1
0
1
2
3
4
5


Heat
Spices
H
H2
Other
Earthy
A2
A1
L1
L2
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
-2
0
2
4
-2
-1
0
1
2
3
4
5

TCATA
Product Contrails

1:40.0

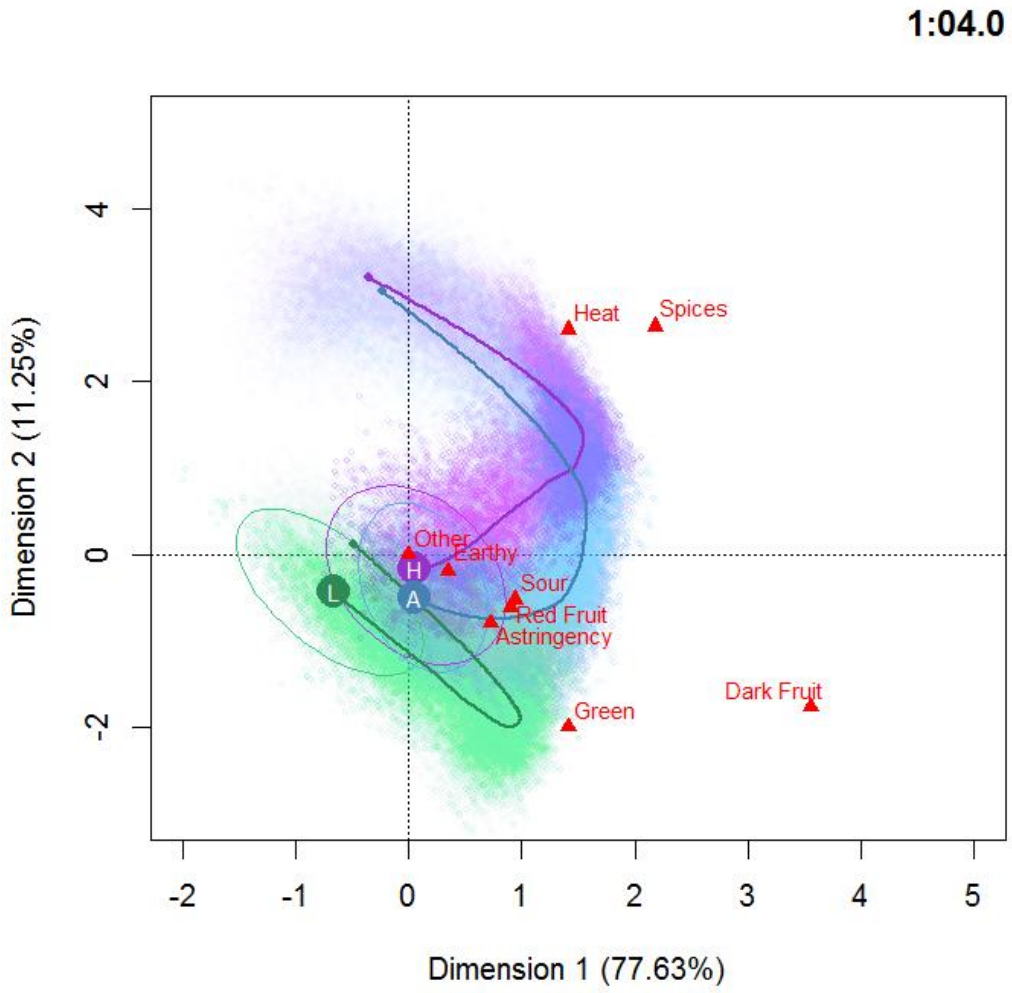

Heat
Spices
H
L
A
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.25%)
Dimension 1 (77.63%)
-2
-1
0
1
2
3
4
5

What is the evolution of attributes for the three wine treatments?

High alcohol

Low alcohol

Adjusted (Low-to-High) alcohol


1:04.0
Heat
Spices
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
H
A
L
Dimension 2 (11.25%)
Dimension 1 (77.63%)
-2
-1
0
1
2
3
4
5
-2
0
2
4

Is the evolution for Sip 1 different from the evolution for Sip 2 for any of the wine treatments?

High alcohol

Sip 1 H1

Sip 2 H2

Low alcohol

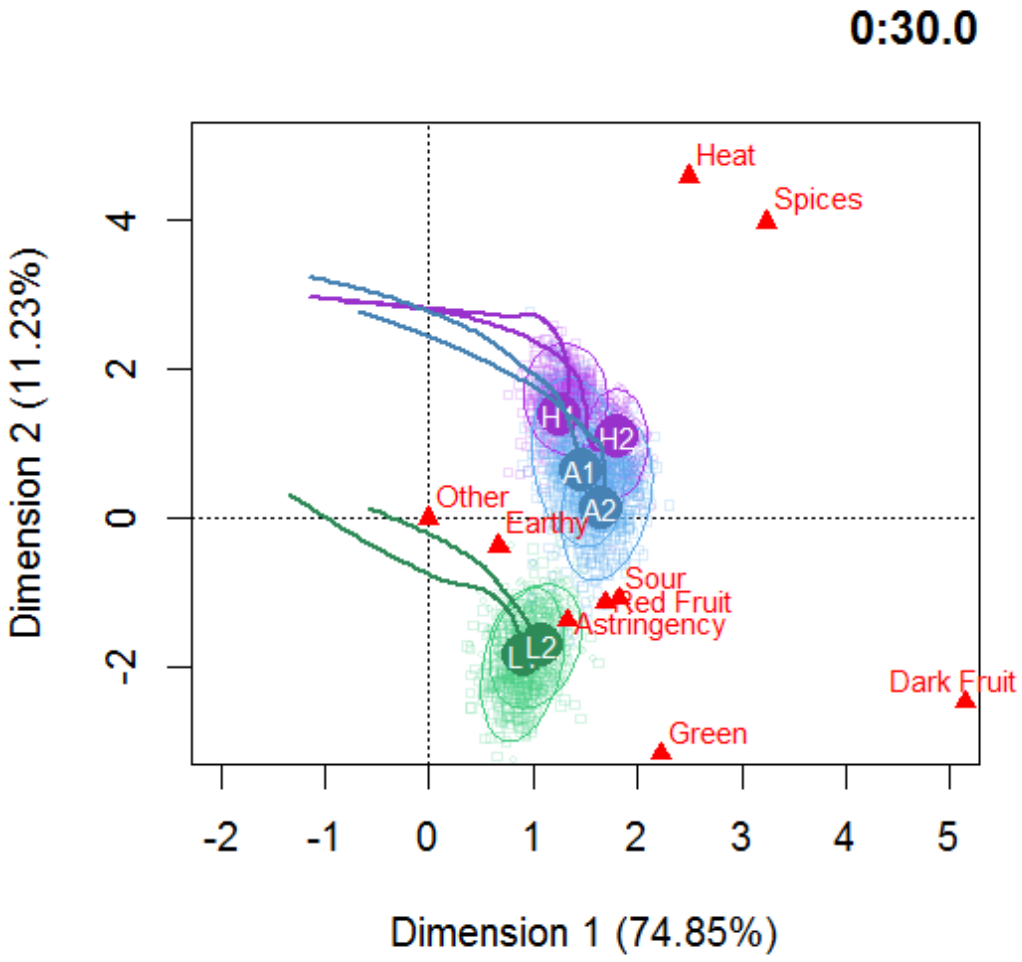
Sip 1 L1

Sip 2 L2

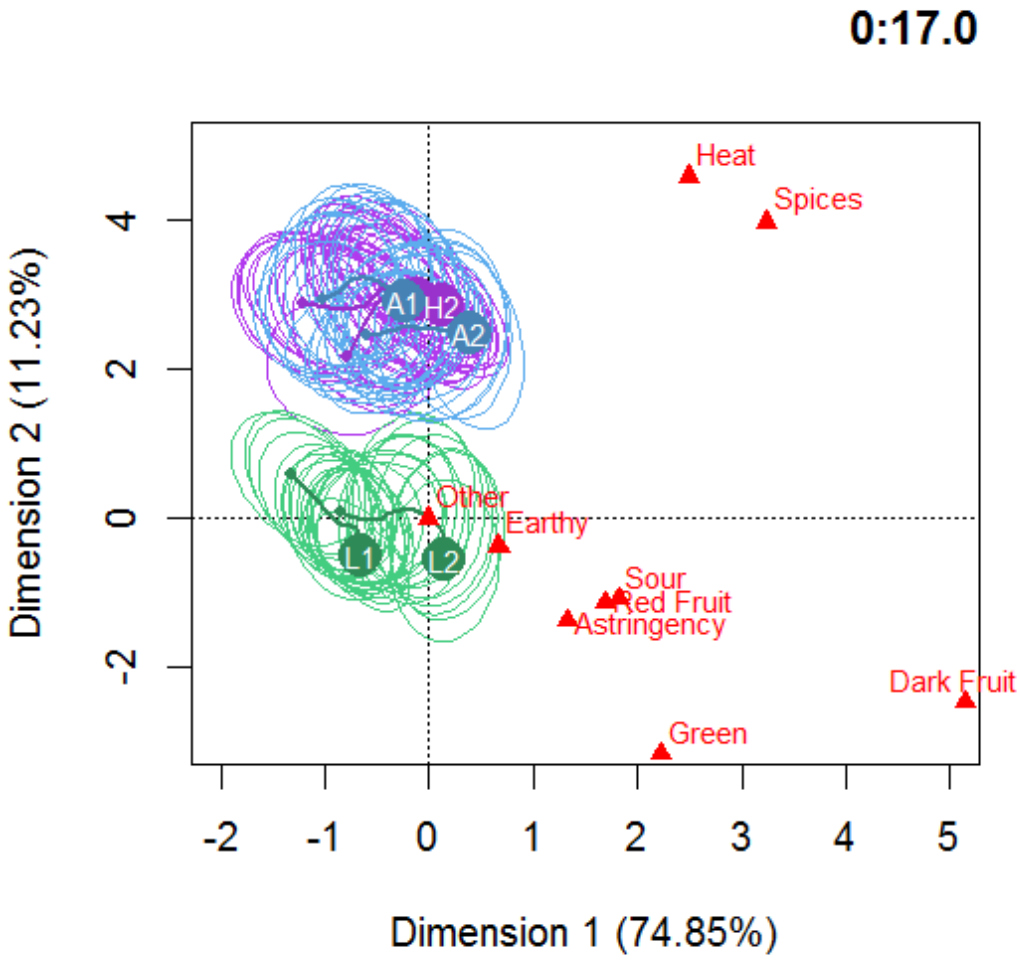
Adjusted (Low-to-High) alcohol

Sip 1 A1

Sip 2 A2


0:30.0
Heat
Spices
H1
H2
A1
A2
Other
Earthy
Sour
Red Fruit
Astringency
L1
L2
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
-2
-1
0
1
2
3
4
5

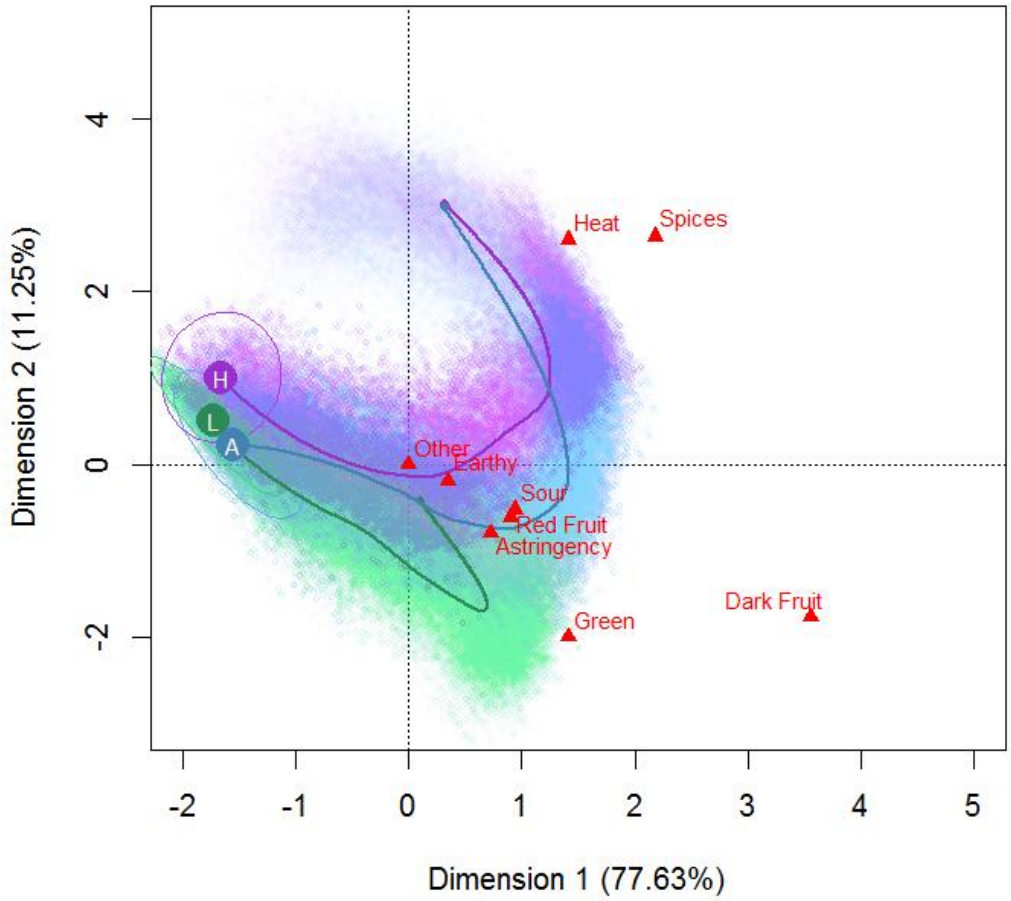
Another view…


0:17.0
Heat
Spices
A1
H2
A2
Other
Earthy
L1
L2
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.23%)
Dimension 1 (74.85%)
-2
0
2
4
-2
-1
0
1
2
3
4
5

TCATA Product Contrails

- Assist with interpretation
- Assist with hypothesis generation
- Give a better sense of uncertainty

1:40.0


Heat
Spices
H
L
A
Other
Earthy
Sour
Red Fruit
Astringency
Dark Fruit
Green
Dimension 2 (11.25%)
Dimension 1 (77.63%)
-2
-1
0
1
2
3
4
5

TCATA Publications

- Castura et al. (2016). Temporal Check-All-That-Apply (TCATA): A Novel Temporal Sensory Method for Characterizing Products. *Food Quality and Preference*, 47A, 79-90. http://dx.doi.org/10.1016/j.foodqual.2015.06.017

- Ares et al. (2016). Comparison of TCATA and TDS for dynamic sensory characterization of food products. *Food Research International*, in press. http://dx.doi.org/10.1016/j.foodres.2015.10.023.

- Boinbaser et al. (2015). Dynamic sensory characterization of cosmetic creams during application using Temporal Check-All-That-Apply (TCATA) questions. *Food Quality and Preference*, 45, 33–40. http://dx.doi.org/10.1016/j.foodqual.2015.05.003

- Oliveira et al. (2015). Sugar reduction in probiotic chocolate-flavored milk: Impact on dynamic sensory profile and liking. *Food Research International*, 75, 148-156. http://dx.doi.org/10.1016/j.foodres.2015.05.050

Thank you for your attention!

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AfroSense 2015
STIAS Conference Centre, Stellenbosch, South Africa
23-26 November 2015