SPECIALITY COFFEE ASSOCIATION OF EUROPE
GOLD CUP RESEARCH

EUROPEAN EXTRACTION PREFERENCES IN BREWED COFFEE

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OVERVIEW

In 2010 the Speciality Coffee Association of Europe embarked on a study to ascertain coffee extraction preferences exhibited by consumers of filter coffee. This was the first public study of its kind since the publication of data in the United States of America in the 1960's, under the auspices of the Coffee Brewing Centre. The data from the Coffee Brewing Centre indicated ideal coffee extraction is when between 18% and 22% of ground coffee is dissolved in hot water, yielding between 1.15% and 1.35% solubles concentration, or strength, in the final brew.

This specification of correctly brewed coffee has been adopted by various international coffee associations since, amongst them the Norwegian Coffee Association (NCA) formed in 1975, the Speciality Coffee Association of America (SCAA) formed in 1982 and the Speciality Coffee Association of Europe (SCAE) formed in 1998.

While the definition of correct strength, being the concentration of dissolved coffee solids in the final brew, differs by association, all teach the common specification of correct extraction being achieved when between a minimum of 18% and a maximum of 22% is extracted from the bean and dissolved in the coffee brew. To yield below 18% was deemed an underdeveloped coffee and to yield more than 22% was deemed to overdevelop the coffee.

The objective of the SCAE study was to establish extraction preference through blind tasting. This was achieved by fixing the coffee strength of five samples of the same coffee and presenting five different extractions.

ACKNOWLEDGEMENTS

This research, led by the Speciality Coffee Association of Europe Gold Cup Programme would not have been possible without the kind participation of our industry sponsors, namely:

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CONTENTS

EXPERIMENT DESIGN

The SCAE set out to use the existing Coffee Brewing Control Chart as a point of reference. (See Appendix 8 for the CBC version of the chart and Appendix 9 for the one used by SCAE). The SCAE targeted a fixed strength, being 1.33% across five different samples of coffee, with each having a different extraction yield, namely 16%, 18%, 20%, 22% and 24%. The coffee would be brewed using freshly ground coffee and an automatic batch coffee brewer to ensure consistent delivery at each tasting session.

The coffee and equipment used were to SCAE set guidelines.

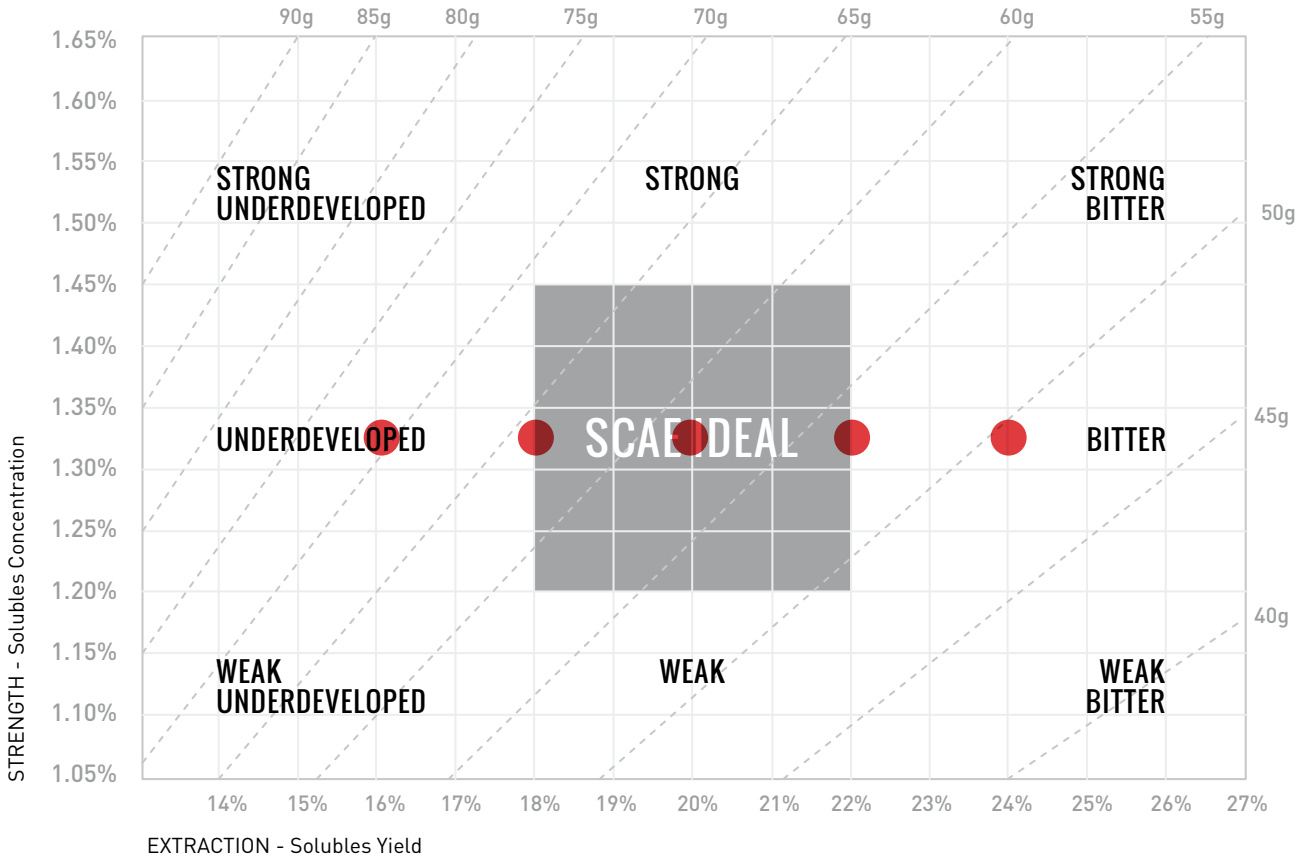


Fig A. Five different extractions at consistent strength for sensorial evaluation.

COFFEE:

The coffee used had to meet the following criteria:

1. Washed single origin Arabica coffee of speciality grade.
2. Roasted no more than 8 days before the tasting session.
3. The coffee was to be from one roast batch.
4. Roast profile was a medium roast, measured via the Agtron scale of 58 on whole bean and 63 on ground, +/-1 point (or the equivalent on an alternative scale).
5. The roast was completed in no less than 8 minutes and no more than 12 minutes.
6. The coffee was air-cooled (not water quenched).

WATER:

The brew water used had to meet the following criteria:
1. Hardness – the on site water could fall between 100 and 175 parts per million (ppm).
2. The water used could not vary outside of 10 ppm for the duration of the trial.
3. A taste and odour filter was used.

GRINDERS:

The grinders used had to meet the following criteria:
1. Deliver a 'filter grind', whereby a setting can be achieved to yield at least 45% of the particle distribution to be between 600 and 800 microns.
2. Be repeatable for at least 10 cycles.

BREWERS:

The brewers used had to meet the following criteria:
1. Brew capacity of at least 3 litres.
2. Temperature profile:
   a. Deliver a water temperature of between 92°C and 96°C for 90% of the brew cycle.
   b. Preferable tolerance of the chosen brew temperature is +/- 1°C.
3. Turbulence – deliver an equal wetting on the coffee bed (this was inspected visually).
4. Deliver a measurable repeatable performance over 10 cycles.

THE SET UP:

One grinder was sufficient to run each session. Five brewers were required to run each session.
The inventory for the trials included:
1. At least one grinder.
2. Five brewers to meet the specification set.
3. Roasted coffee.
4. Sample tasting cups.
5. Coded labels to indicate each cup's extraction.
6. Coded 'trays' to vary the presentation of the coffees to the participants.
7. A coffee refractometer to measure the totally dissolved solids in each brew.
8. Participant questionnaires.

METHODOLOGY:

1. The five coffees were 'dialled in', meaning each brew was checked to ensure they were yielding 1.33% coffee solids at the five different extractions of 16%, 18%, 20%, 22% and 24%. This was achieved by varying:
   a. The dry coffee to fresh water brew ratios.
   b. The grind setting on the grinder.
2. Each hour, three litres of each brew was prepared using freshly ground coffee.
3. Each extraction rate was validated using the coffee refractometer.
4. The coffees were held in thermally insulated urns for a maximum of one hour.
5. The cycle was repeated hourly.
6. Each brew was labelled with a non-sequential three digit code, which would be meaningless to the participant.
7. Each participant would receive a sample of approximately 60ml of each of the five coffees at the same time, arranged in a random order on the tasting trays (see fig. B).
8. The participant was then asked to score the coffees as per a supplied sheet (see fig. C).

Fig B: SCAE Gold Cup tasting 'tray' sample.

GOLD CUP RESEARCH MAASTRICHT JUNE 2011

Age
(Circle one as appropriate)
‹ 25
25 - 35
35 - 44
45 - 55
› 55+ years

Gender
(Circle one as appropriate)
Male
Female

How many cups of coffee do you drink per day
(Circle one as appropriate)
1 - 2 cups per day
3 - 5 cups per day
› 5+ cups per day

Which of the following do you usually add to black coffee?
(Circle all that apply)
Brown sugar
White sugar
Artificial sweeteners
Milk
Cream
Soya
Non-dairy creamer
Other
Nothing

What style of coffee do you usually drink?
(Circle all that apply)
Filter coffee
Instant
Espresso
Cappuccino
Latte
Stove top
Cafetière/French Press

Instructions:
- Please taste coffees in the tasting order you have been given.
- Write the product code in the space given.
- Indicate your likes/dislike for each coffee by ticking one box per now only.
- If you are unsure after reading this, please ask the server for clarification before starting.

Please insert code

Product Code	Dislike Extremely	Dislike Moderately	Dislike Slightly	Like Slightly	Like Moderately	Like Extremely
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Fig. C: SCAE Gold Cup participant preference form.

RESEARCH LOCATIONS

The research was conducted using the same protocol in Dublin in Ireland, Cologne in Germany, Maastricht in The Netherlands and Milan in Italy between February 2011 and October 2011.

The number of samples taken was:

Location	Gross
Dublin	188
Maastricht	90
Milan	232
Cologne	131
Total	**641**

FINDINGS

Each research location gave us demographic information about the participants along with the preference data.

The preference data received is presented in this section as follows. Scores for each extraction % were weighted. Extreme like and dislike were multiplied by 8 and -8, moderate like and dislike were multiplied by 2 and -2, and slight like and dislike by 1 and -1. For each extraction % a sum of the resulting values was calculated and plotted. Bars below the ordinance indicate more negative preferences (i.e. dislikes).

The findings of the research were as follows:

DUBLIN, IRELAND. FEBRUARY 2011

THE DUBLIN AUDIENCE DEMOGRAPHIC:

A predominantly male audience between 25 and 45 years of age, approximately 78% of the Dublin participants consumed roast and ground coffee daily, with 63.1% of the total consuming filter or French press coffee. The large majority, 91.1% consume espresso based beverages while a significant majority, 73.8%, add either a sweetener or milk or a combination to their coffee.

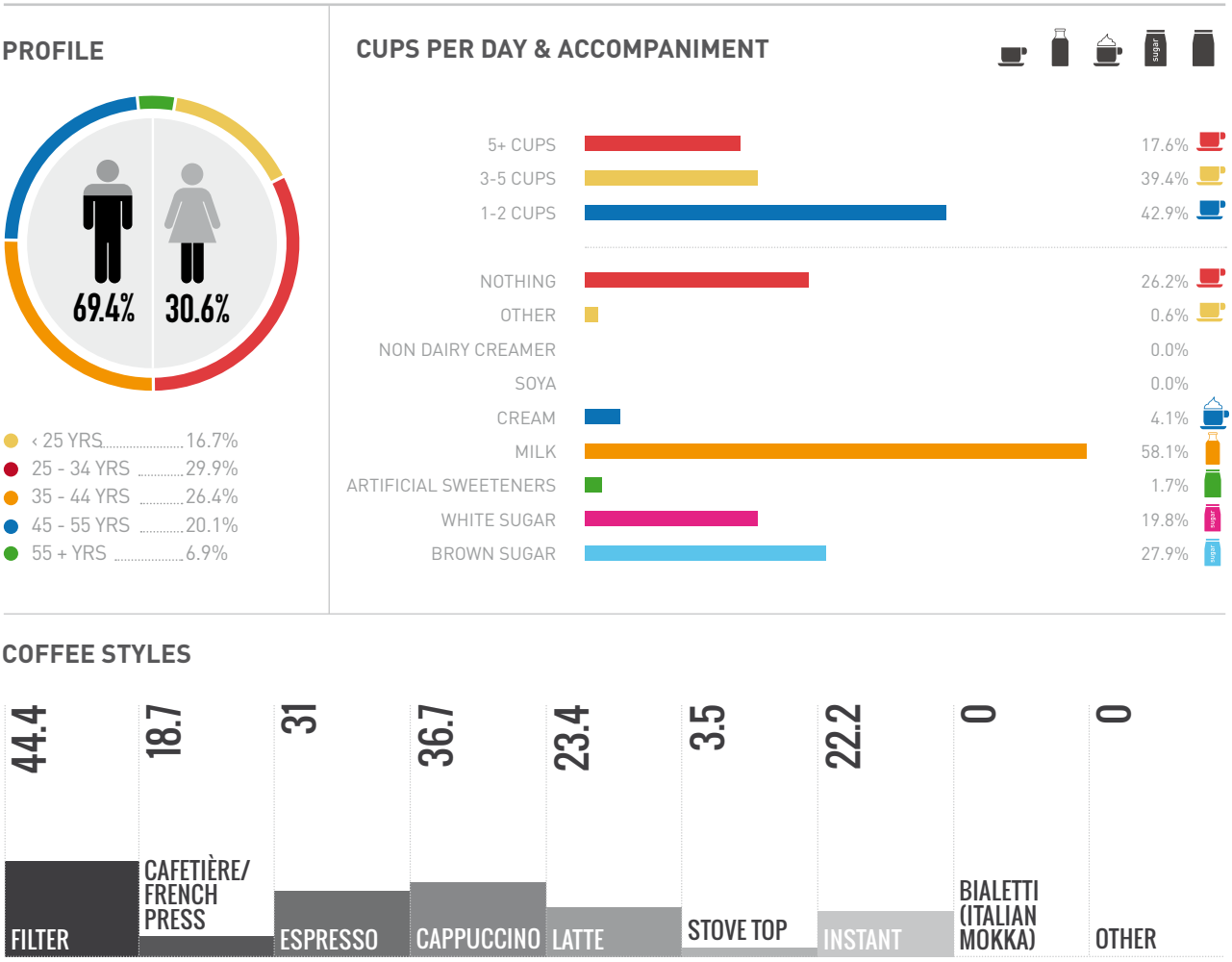


Fig. D. Demographic breakdown of Dublin participants.
Note: Coffee styles total more than 100% as many participants consume coffee from a range of preparation methods.

The majority of Dublin participants preferred a 20% extraction, with 66.1% of participants either liking slightly, liking moderately or liking extremely this extraction rate. Thereafter the 22% extraction was most preferred.

The extraction with most scores for like extremely was also 20%.

Interestingly, the brew which scored highest in the 'dislike extremely' category was the 18% extraction.

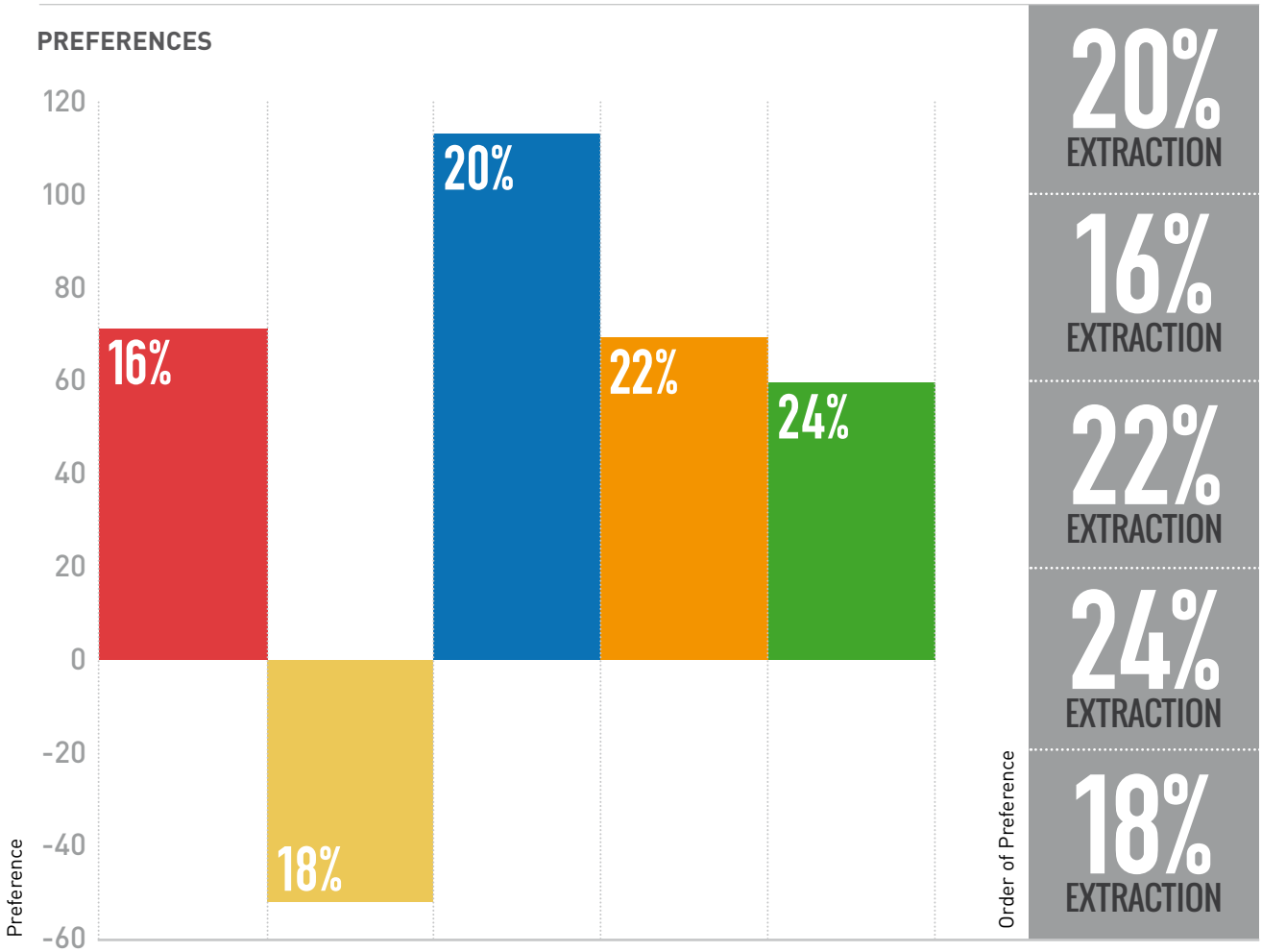


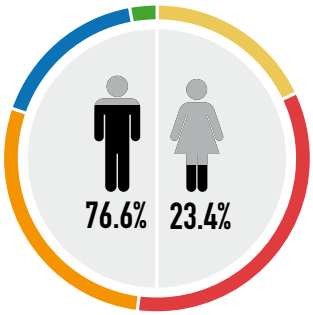
Fig E. Gold Cup preferences Dublin.

MAASTRICHT, THE NETHERLANDS. MAY 2011

THE MAASTRICHT AUDIENCE DEMOGRAPHIC:

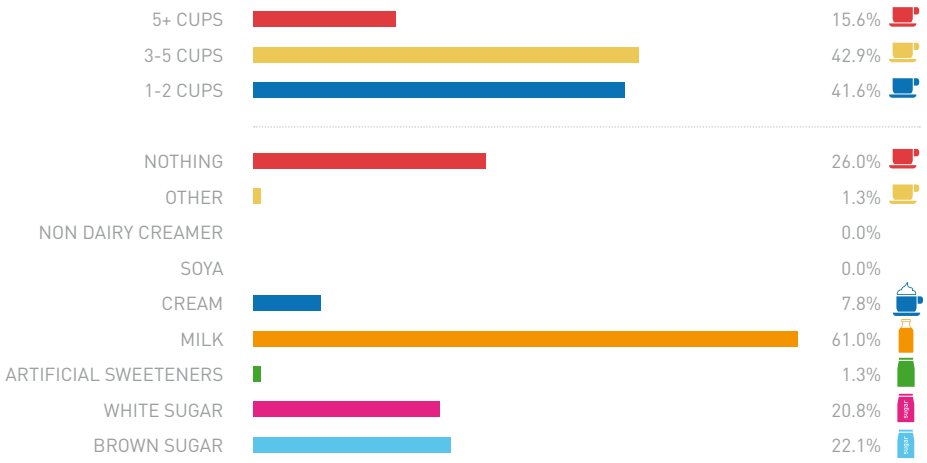
A predominantly male audience between 25 and 45 years of age, approximately 79% of the Maastricht participants consumed roast and ground coffee daily. While 58.5% of the total consumed filter or French press coffee, 93.6% consume espresso based beverages. Again, a significant majority, 74% add either a sweetener or milk or a combination to their coffee.

PROFILE



- < 25 YRS 18.2%
- 25 - 34 YRS 33.8%
- 35 - 44 YRS 28.6%
- 45 - 55 YRS 16.9%
- 55 + YRS 2.6%

CUPS PER DAY & ACCOMPANIMENT



COFFEE STYLES

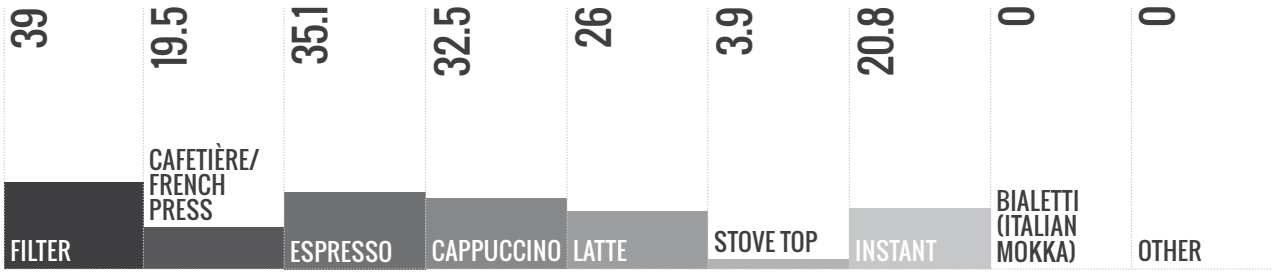


Fig. F. Demographic breakdown of Maastricht participants.
Note: Coffee styles total more than 100% as many participants consume coffee from a range of preparation methods.

The majority of Maastricht participants preferred a 22% extraction, with 70.2% of participants liking slightly, liking moderately or liking extremely this extraction rate. Thereafter, the 20% extraction was preferred.

The extraction with most scores for liking extremely was split evenly between 20% & 22%.

Again, the brew which scored highest in the 'dislike extremely' category was the 18% extraction.

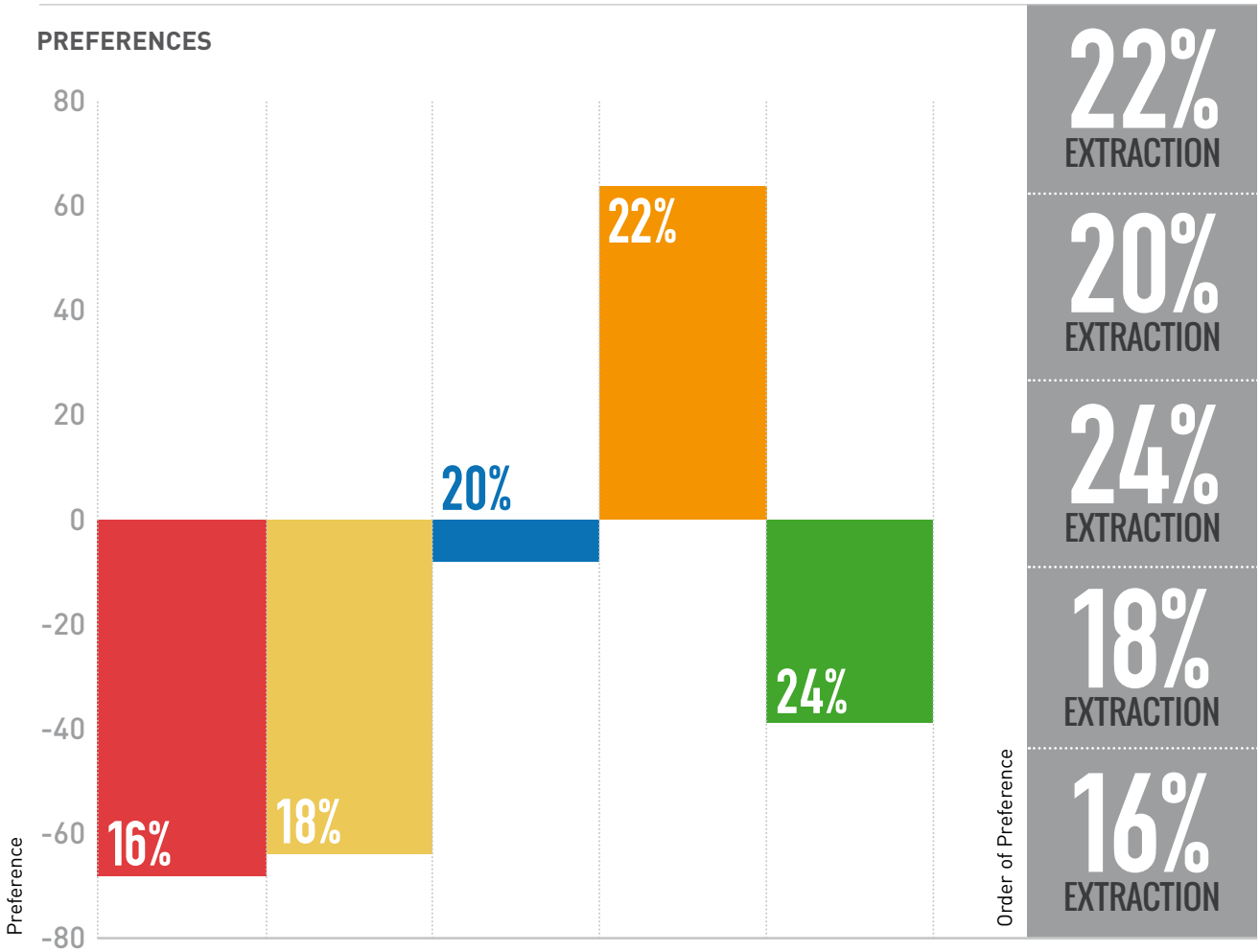


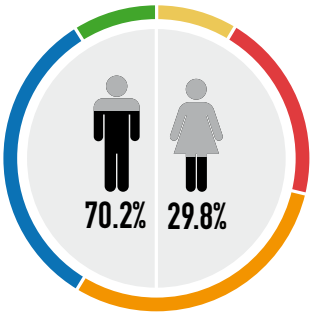
Fig G. Gold Cup preferences Maastricht.

COLOGNE, GERMANY. JUNE 2011

THE COLOGNE AUDIENCE DEMOGRAPHIC:

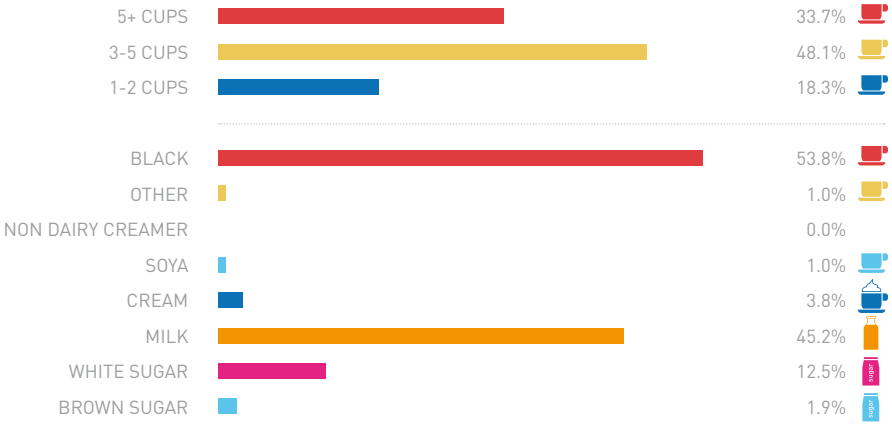
A predominantly male audience between 35 and 55 years of age, approximately 97% of the Cologne participants consumed roast and ground coffee daily. While 47.2% of the total consumed filter or French press coffee, 79.8% consume espresso based beverages, of which the majority drink espresso. In Cologne, the majority, 53.8% add neither a sweetener nor milk to their coffee.

PROFILE



- < 25 YRS 8.7%
- 25 - 34 YRS 20.2%
- 35 - 44 YRS 29.8%
- 45 - 55 YRS 32.7%
- 55 + YRS 8.7%

CUPS PER DAY & ACCOMPANIMENT



COFFEE STYLES

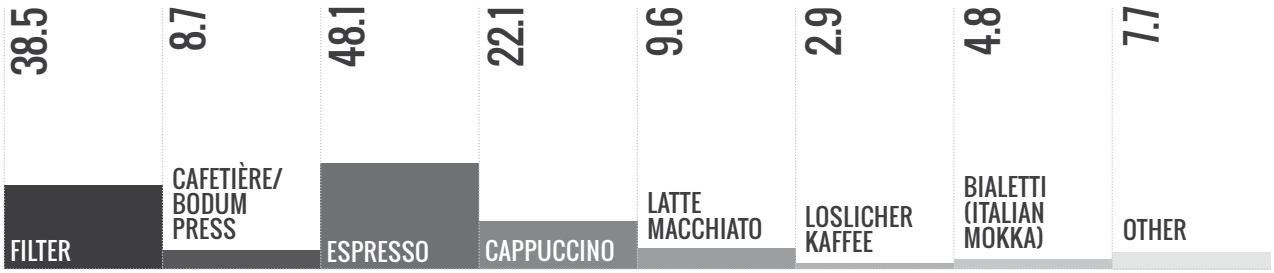


Fig. H. Demographic breakdown of Cologne participants.
Note: Coffee styles total more than 100% as many participants consume coffee from a range of preparation methods.

The majority of Cologne participants preferred a 22% extraction, with 62.1% of participants liking slightly, liking moderately or liking extremely this extraction rate. Thereafter, the 24% extraction was preferred.

The extraction with most scores for liking extremely was 22%.

The brew which scored highest in the 'dislike extremely' category was the 16% extraction, with a significant majority, 70.2%, disliking slightly, disliking moderately or disliking extremely this extraction rate.

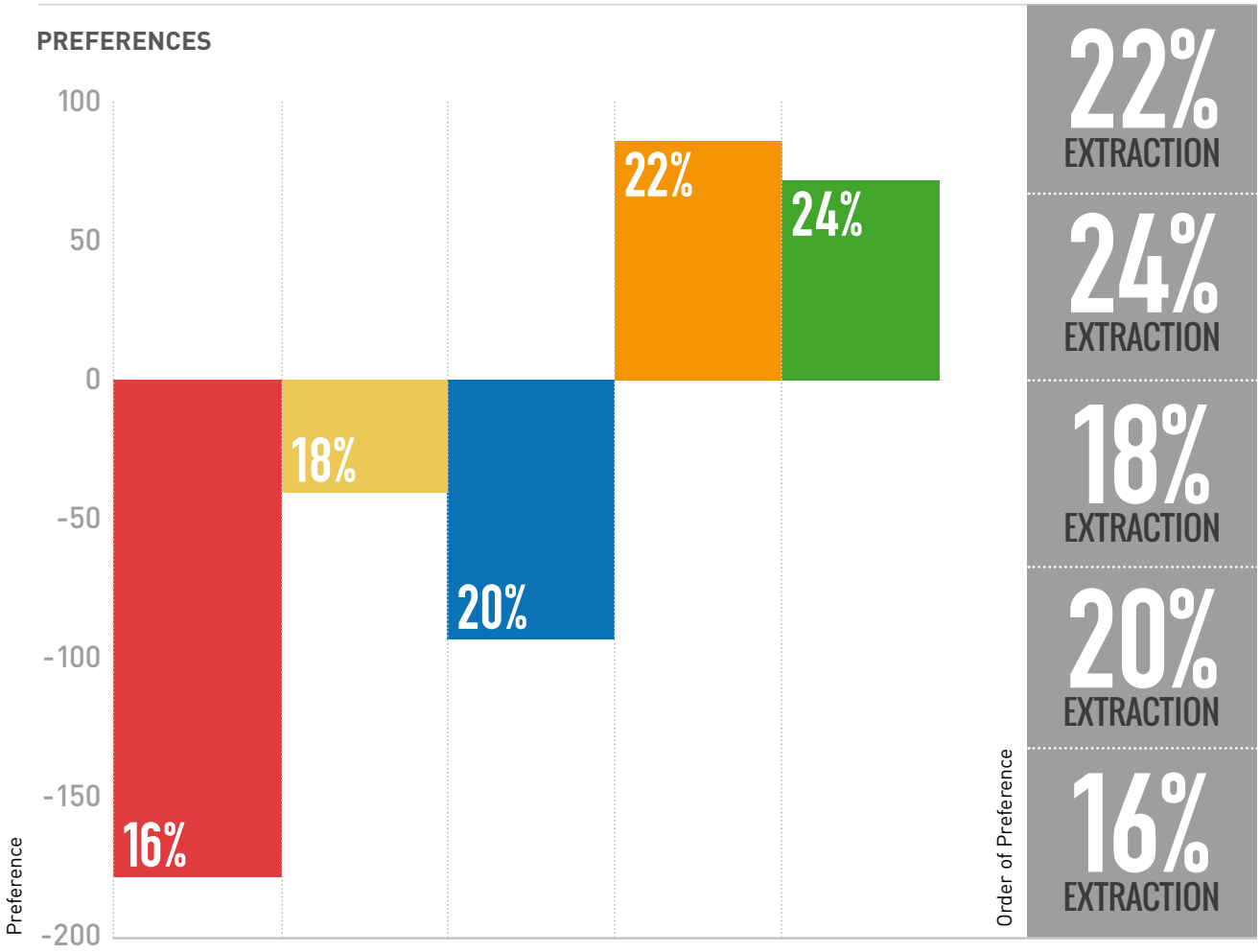


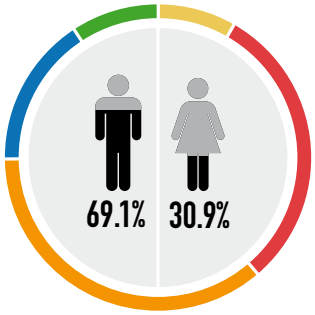
Fig I. Gold Cup preferences Cologne.

MILAN, ITALY. OCTOBER 2011

THE MILAN AUDIENCE DEMOGRAPHIC:

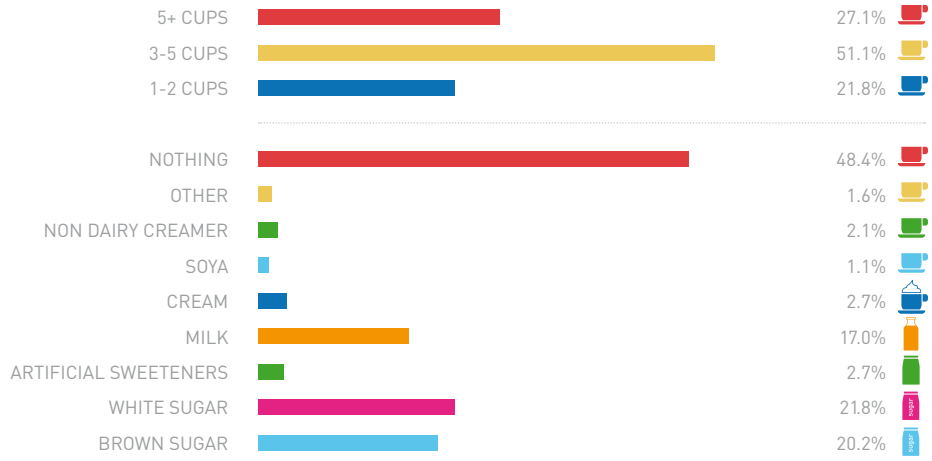
A predominantly male audience between 25 and 45 years of age, approximately 96% of the Milan participants consumed roast and ground coffee daily. While 37.2% of the total consumed filter or French press coffee, an expected 100% of participants consume espresso based beverages, of which the large majority, 80.9%, drink espresso. In Milan, a small majority, 51.6% add either a sweetener or milk or a combination of additives to their coffee.

PROFILE



- ‹ 25 YRS 8.5%
- 25 - 34 YRS 30.3%
- 35 - 44 YRS 36.2%
- 45 - 55 YRS 16.0%
- 55 + YRS 9.0%

CUPS PER DAY & ACCOMPANIMENT



COFFEE STYLES

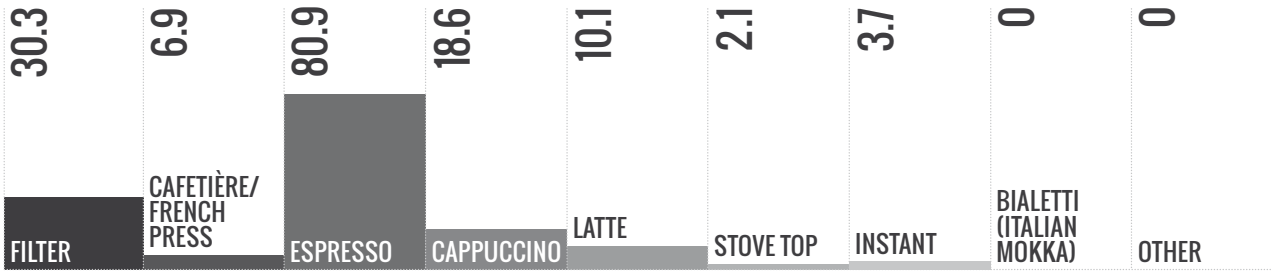


Fig. J. Demographic breakdown of Milan participants.
Note: Coffee styles total more than 100% as many participants consume coffee from a range of preparation methods.

A majority of Milan participants preferred the 24% extraction, with 54.8% of participants liking slightly, liking moderately or liking extremely this extraction rate. Thereafter, the 20% extraction was preferred.

The extraction with most scores for liking extremely was 24%. This is probably a reflection upon the large majority, 80.9%, drinking espresso as a general consumption preference – as a 24% extraction is going to be sensorially the most intense of the brew extractions on offer.

The brew which scored highest in the 'dislike extremely' category was the 18% extraction.

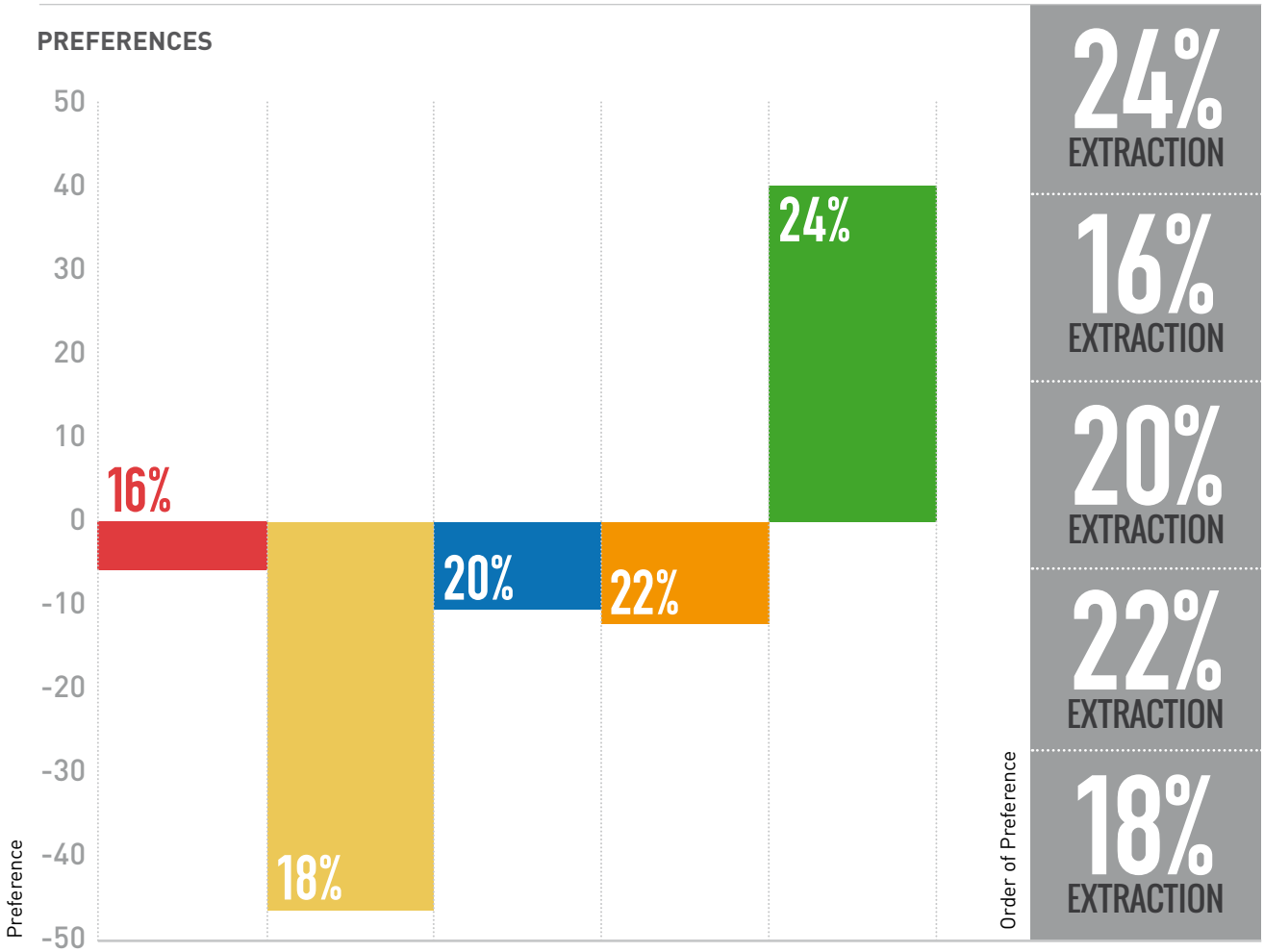


Fig K. Gold Cup preferences Milan.

COMBINED FINDINGS

On a top level overview, 62% of all participants liked extraction ranges 18-22%, be it slightly, moderately or extremely. This tends to confirm the Gold Cup standard as being correct. However, one would have expected a tighter bell curve concentrating more on that 18-22% range based on the conviction with which that standard is taught worldwide.

The concentration of preferences, 43.8% of participants, lies between 20% and 22%.

Fig. L. Gold Cup preferences of the total data set.

Looking at the data as a complete set a little deeper, if we examine the data spread (see fig. M) we will see the central mark is the median, the edges of the box are the 25th and 75th percentiles and the whiskers are the most extreme data points.

Here we see 22% proved the most popular. While this is within the Gold Cup range, it is a little surprising and revealing that this preference is at odds with the niche end of the high grade speciality coffee market, which currently cites 19%-20% as the correct extraction range.

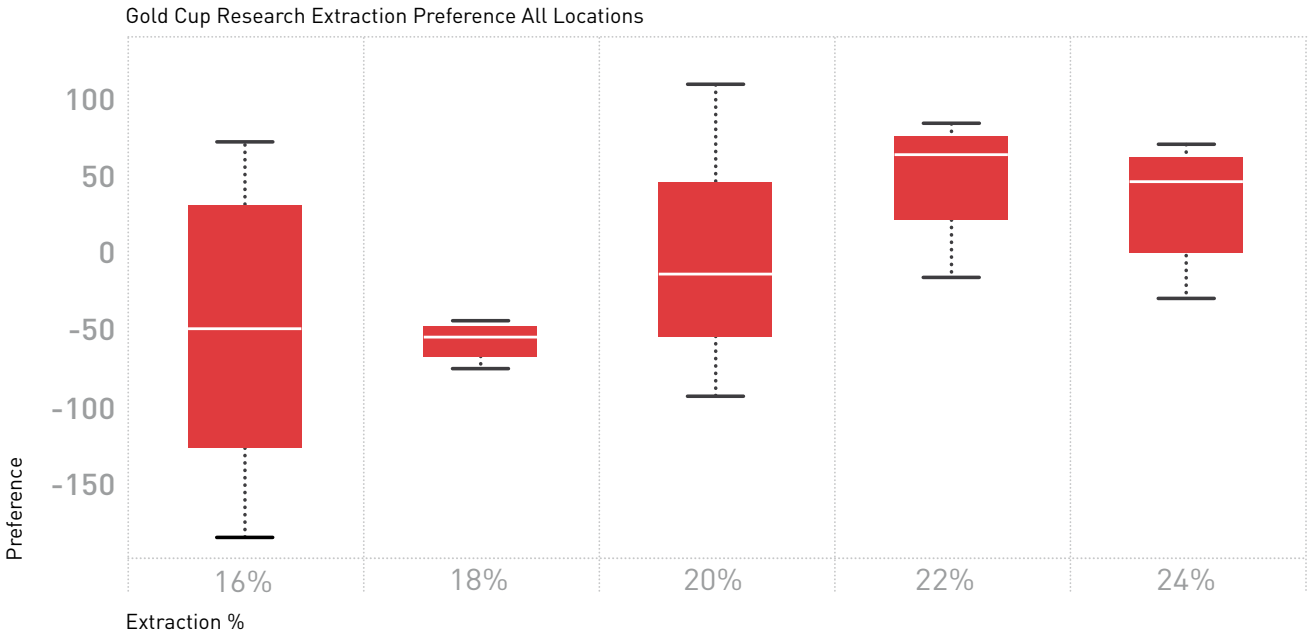


Fig. M. Gold Cup preferences of the total data set.

CONCLUSION

In conclusion, the work published in the 1960's by the Coffee Brewing Centre is both upheld and confirmed as remaining valid fifty years later. However, current teaching practice and global publications would lead the market to believe 18-20% are the limits of acceptability, whereas this data would indicate preferences don't start and stop at 18% and 22% but rather meet the majority of preferences within this range. We suspect, faced with a decision to be taken when publishing the original coffee brewing guides in the 1960's, the Coffee Brewing Centre had to decide amidst data similar to our own where to start and stop the acceptable range and chose 18% and 22% accordingly.

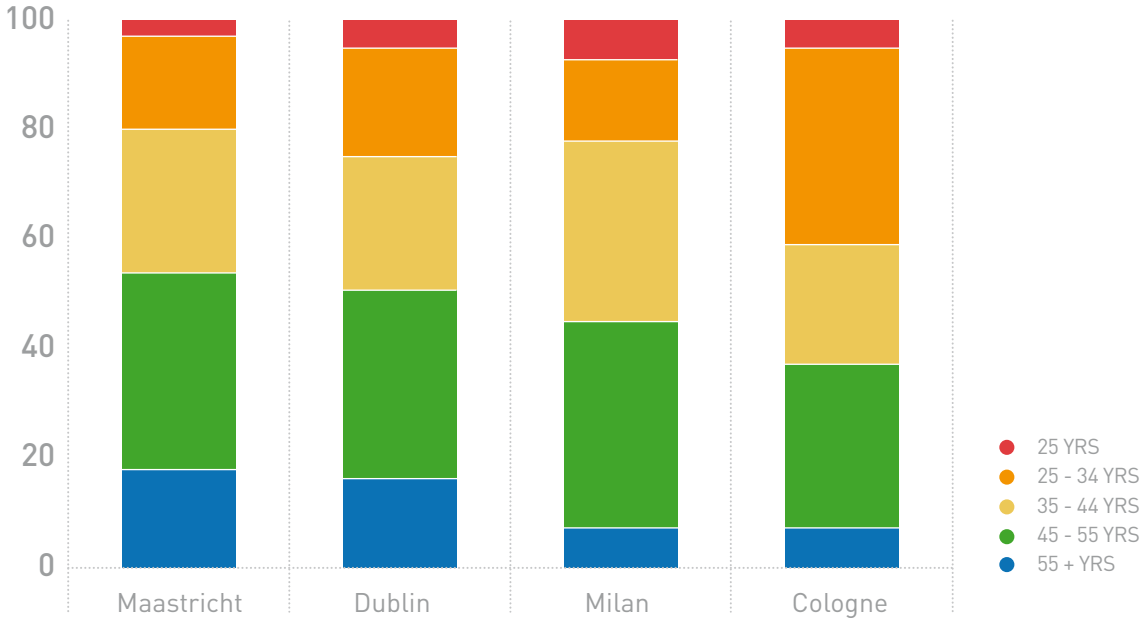
Paul Stack
SCAE Gold Cup Programme Leader 2008-2012.
June 2013.

APPENDICES

1. Age demographic of participants.
2. Gender demographic of participants.
3. Coffee types consumed.
4. Coffee consumption by volume per participant.
5. Consumption of additives in coffee.
6. Tasting tray.
7. Participant questionnaire.
8. 1965 Coffee Brewing Control Chart by Coffee Brewing Centre.
9. 2007 Coffee Brewing Control Chart by SCAE.

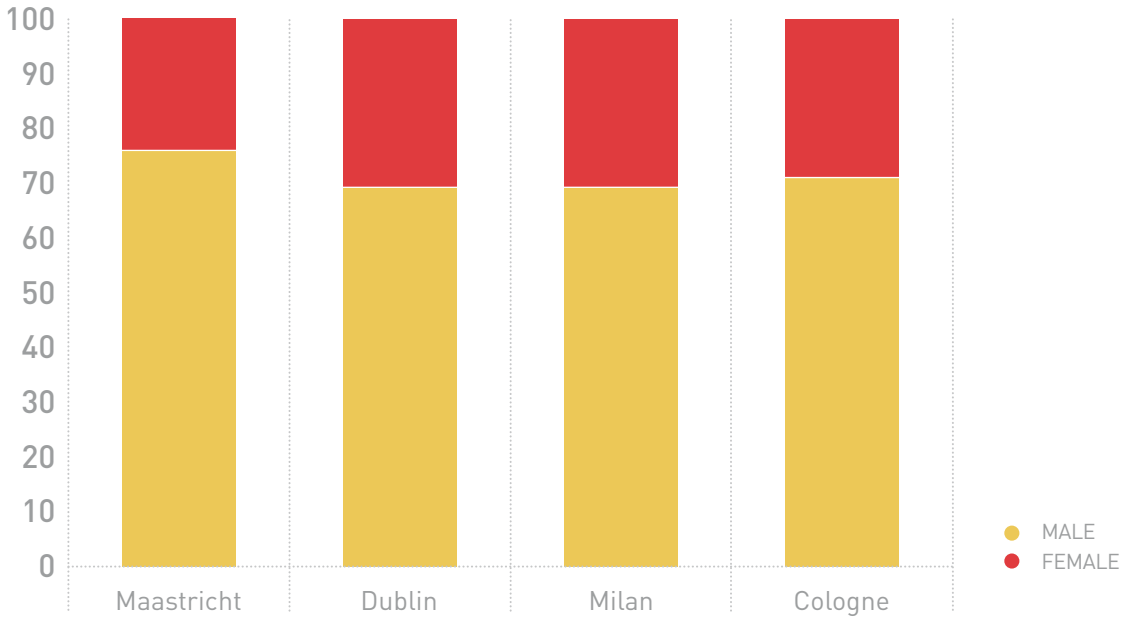
APPENDIX 1

Age Distribution of Gold Cup Research Participants.



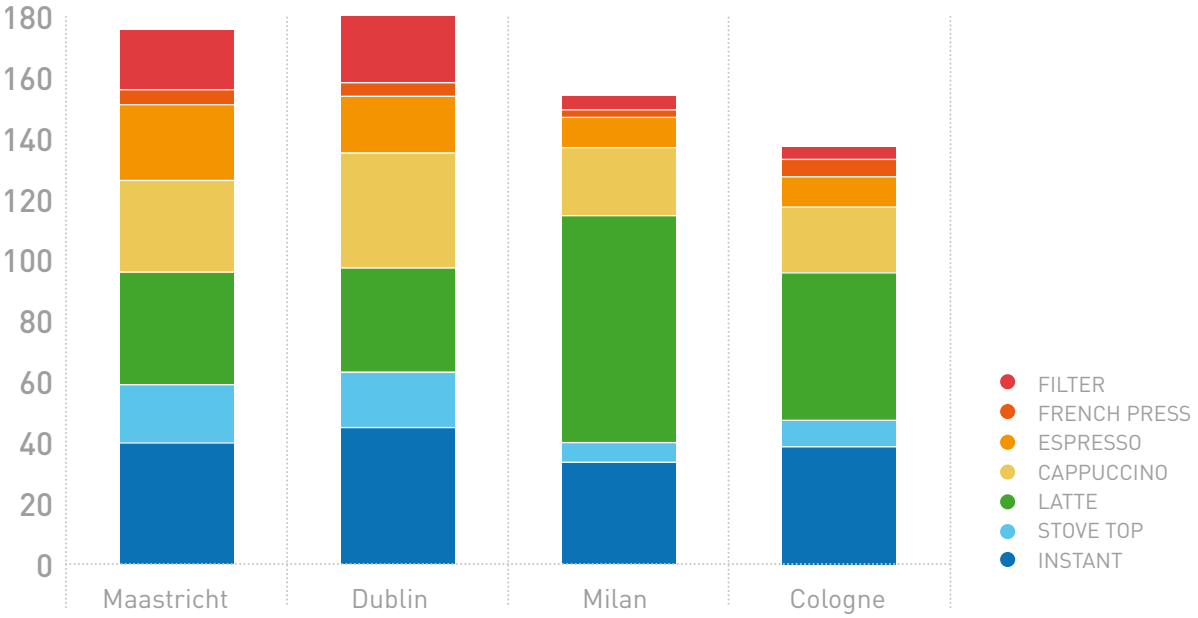
APPENDIX 2

Gender Distribution of Study Participants.



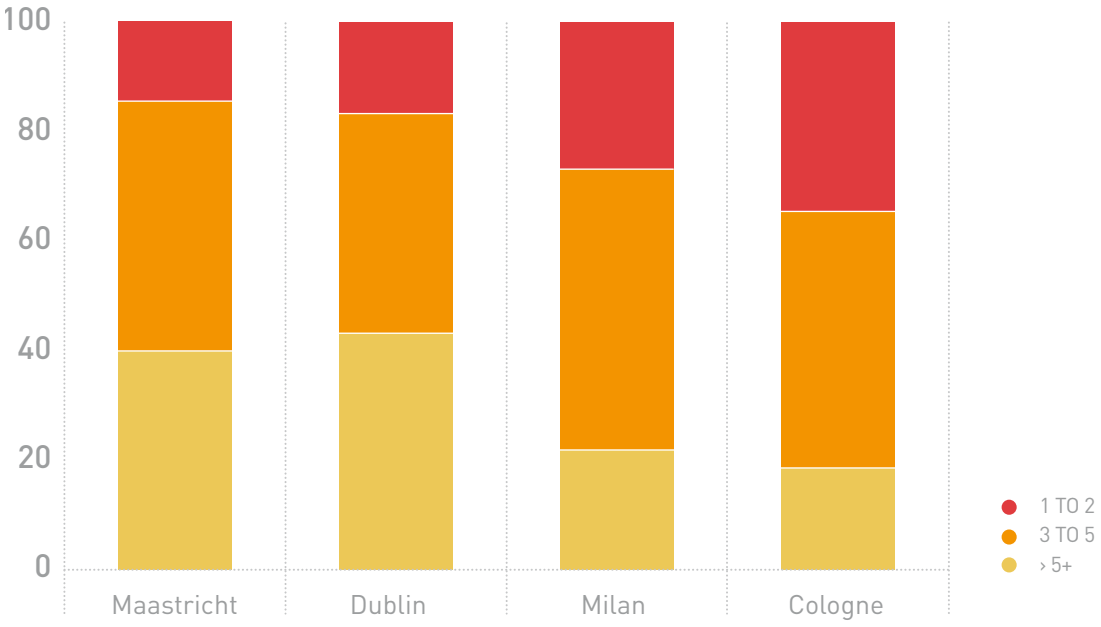
APPENDIX 3

Preferred Coffee Beverage.



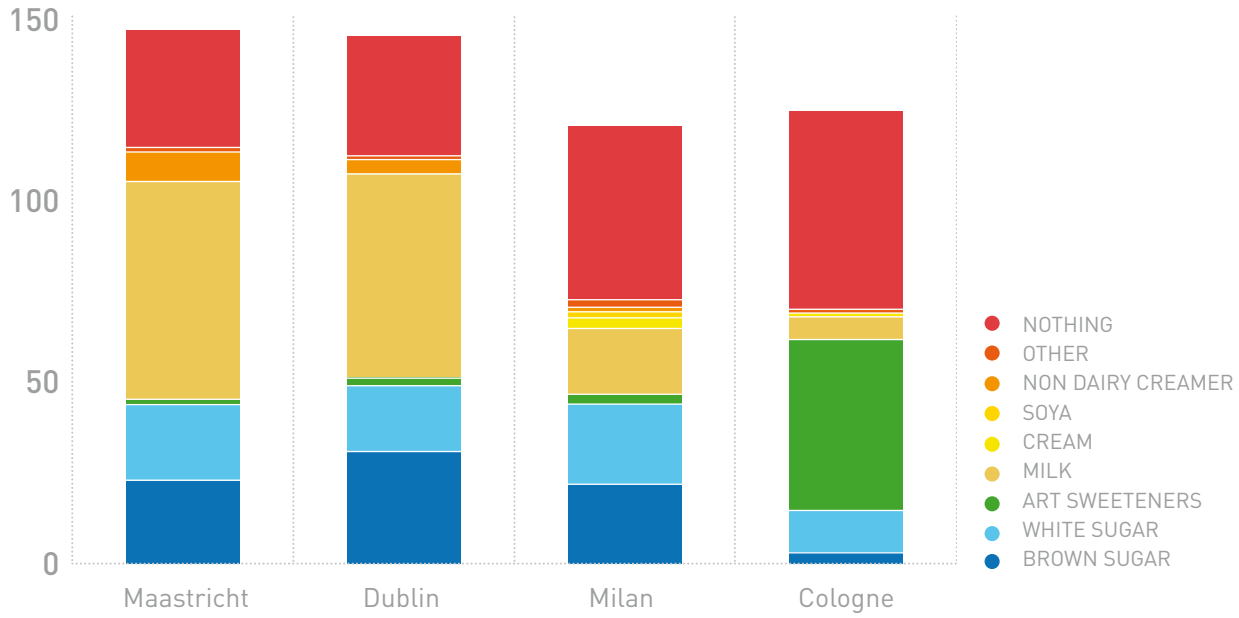
APPENDIX 4

Cups Per Day.



APPENDIX 5

Consumption of additives in coffee.



APPENDIX 6

Tasting tray.

APPENDIX 7

Participant questionnaire.

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Age
(Circle one as appropriate)
‹ 25
25 - 35
35 - 44
45 - 55
› 55+ years

Gender
(Circle one as appropriate)
Male
Female

How many cups of coffee do you drink per day
(Circle one as appropriate)
1 - 2 cups per day
3 - 5 cups per day
› 5+ cups per day

Which of the following do you usually add to black coffee?
(Circle all that apply)
Brown sugar
White sugar
Artificial sweeteners
Milk
Cream
Soya
Non-dairy creamer
Other
Nothing

What style of coffee do you usually drink?
(Circle all that apply)
Filter coffee
Instant
Espresso
Cappuccino
Latte
Stove top
Cafetière/French Press

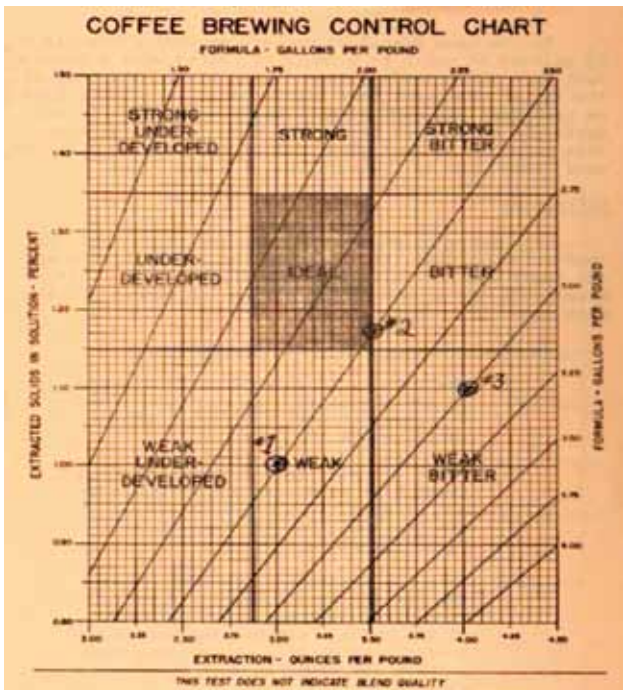
Instructions:
- Please taste coffees in the tasting order you have been given.
- Write the product code in the space given.
- Indicate your likes/dislike for each coffee by ticking one box per now only.
- If you are unsure after reading this, please ask the server for clarification before starting.

Please insert code

Product Code	Dislike Extremely	Dislike Moderately	Dislike Slightly	Like Slightly	Like Moderately	Like Extremely
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

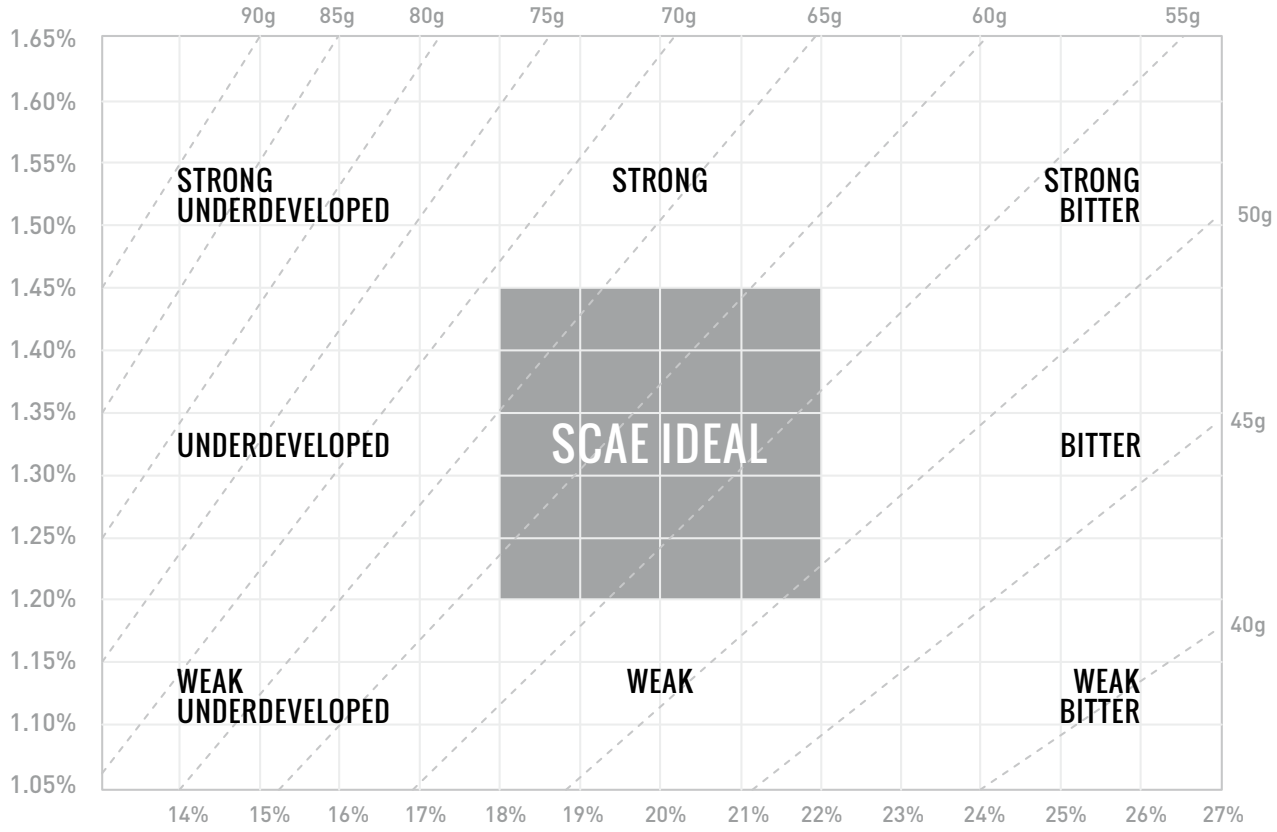
APPENDIX 8

1965 Coffee Brewing Control Chart from Coffee Brewing Centre.



APPENDIX 9

2007 Coffee Brewing Control Chart from SCAE.

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