

Index

A

adaptation, 21 (table)

affective test

behavior, 101

biases, 108

case studies, 109–112

convenience samples, 102

demographics, 101

ethical considerations, 108–109

evaluation format, 106

execution, 104–106, 105 (table)

five essential decisions before,
99–100, 100 (figure)

information given to test
respondent for, 106

number of participants, 104, 105
(table)

number of products, 104–106

orientation and training of
respondents, 11

psychographics, 102

respondents, 8–10

selection criteria, 8

test location, 103

test questionnaire, 107–108

timing for, 103–104

venue for, 102–103

whom to include in, 100–102

air temperature control, 4

alternative forced choice test

3-AFC, 36–38

2-AFC, 38–40

alternative hypothesis, 119

duo-trio test example with, 127

one-tailed binomial test with, 129

symbol for, 118

two-tailed binomial test with, 129

analysis of variance (ANOVA)

basic ideas of, 143

critical values for F-distribution,
144–149 (table)

least significant difference with,
150, 152 (figure)

mean squared error with, 150

quantitative descriptive analysis
using, 87

two-factor experiment example,
143, 150

analytical tests

discriminative ability for, 6–7

elimination of appearance and
other factors in, 18–19

orientation and training of
respondents, 10

panel size for, 7

respondents, 5–7

A/not-A test, 40

assessors

control, 44

discrimination tests number and, 45

discrimination test task of, 26–27

multiple standards test using, 41

quantitative descriptive analysis, 86

spectrum descriptive analysis, 89

texture profile method, 85

threshold methods and

qualifications for, 73–74

attributes evaluation, 53

B

- behavior, 101
- bias, 20
 - affective test, 108
 - physiological factors, 21 (table)
 - positional, 22 (table)
 - psychological factors, 21–22 (table)

bipolar scales, 58

- body lotions texture profile case study
 - method, 85–86
 - objective, 85
 - recommendations, 86
 - results, 86

C

capriciousness versus timidity, 22 (table)

case studies

- affective test, 109–112
- body lotions texture profile case, 85–86
- cheese sauce 2-AFC case, 38–40
- coffee same-different test case, 28–29
- cookie tetrad test case, 30–31
- fabric softener 3-AFC case, 36–38
- flavor profile method, 82–84, 83 (figure)
- JAR scale, 67–68, 68 (table)
- pie triangle test case, 32–33
- potato chip duo-trio test, 34–35
- QDA method, 87–89
- SDA method, 90–92
- strawberry yogurt DOD and DFC tests case, 43
- texture profile method
 - case, 85–86
 - T-I method, 93–94, 93 (figure)

characterization of difference, 47

check-all-that-apply (CATA), 135–136

cheese sauce 2-AFC case, 38–40

chi-square test

- CATA example, 135–136

consumer preference data

- example, 134

critical values for one-sided upper-tailed tests, 132–133 (table)

formula for, 132

multiple location test example, 134–135

rank order data example, 136–137

same-different test results

- analyzed using, 29, 136

test description, 131–134

Civille, Gail, 89

clock watching, 20

codes, for samples, 14

coffee same-different test case study

- method, 28
- objective, 28
- recommendations, 29
- results, 28–29

comfort, testing room, 5

complex sorting tasks, 46

confidence interval, 126

consumer research elements, 99–100, 100 (figure)

contrast effect, 22 (table)

convenience samples, 102

cookie tetrad test case study

- method, 30–31
- objective, 30

critical values

chi-square test, one-sided upper-tailed tests, 132–133 (table)

F-distribution, 144–149 (table)

one-tailed binomial distribution, 122–124 (table)

student's t-test, one-sided upper-tailed hypotheses, 138–139 (table)

two-tailed binomial distribution, 121–122 (table)

cross-adaptation, 21 (table)

cross-potential, 21 (table)

cues, 14

D

- day dreaming, 20
- degree of difference (DOD) test, 42–43, 47
- degrees of freedom, 126
- demographics, 101
- descriptive analysis
 - development of, 79
 - flavor profile method, 81–84, 83 (figure)
 - language use with, 80
 - quantitative descriptive analysis, 86–89
 - spectrum descriptive analysis, 89–92
 - temporal dominance of sensations, 80, 92
 - temporal methods, 92–94, 93 (figure)
 - temporal order of sensations, 80, 92
 - texture profile method, 84–86
 - time-intensity, 80, 92–94, 93 (figure)
 - use of, 79
- difference from control (DFC) test, 42–43
- difference threshold, 72
- dilution techniques, 75
- discrimination tests, 6–7
 - analysis, 46
 - A/not-A test, 40
 - assessor for, 26–27
 - combined overall difference and specified attribute, 42–45
 - complex sorting tasks with, 46
 - degree of difference test, 42–43, 47
 - difference from control test, 42–43
 - duo-trio test, 33–35, 130
 - expectation effect with, 44–45
 - experimental design of, 43
 - extensions of, 46
 - false alarm risk with, 27
 - forced-choice different tests, special cases, 47–48
 - interpretation of results, 46–47
 - method selection for, 45
 - methods in, 25–48
 - miss risk with, 27
 - multiple standards test, 40–42
 - nature and type of samples for, 45–47
 - no preference/no difference, 128
 - null hypothesis tested for, 26
 - number of assessors for, 45
 - one-tailed binomial test, 129
 - overall difference and unspecified attribute tests, 45–46
 - overall difference tests, 27–28
 - paired comparison test, 128–129
 - question answered by, 25
 - reasons for, 25
 - replicated, 130
 - same-different test, 27–29, 136
 - samples presentation order with, 43–44
 - sensitivity of, 27
 - sensory, 128–131
 - specified attribute difference test methods, 36–42
 - tetrad test, 30–31, 130
 - 3-alternative forced choice test, 36–38
 - Thurstonian discriminial distances, 130–131
 - triangle test, 6, 32–33, 130
 - 2-alternative forced choice test, 38–40
 - two-out-of-five test, 40–42
 - two-tailed binomial test, 128–129
 - types of, 27
- Duncan multiple range test, quantitative descriptive analysis using, 87
- Duncan's test, 153
- duo-trio test (ASTM E2610), 130
 - application of, 33–34

- case study, 34–35
- hypothesis testing example using, 126–127
- recommendations, 35
- samples presentation order with, 43–44
- triangle test compared with, 33–34

E

- end anchors, 58
- enhancement, 21 (table)
- error
 - of central tendency, 22 (table)
 - expectation, 21 (table)
 - of habituation, 21 (table)
 - mean squared, 150
 - null hypothesis with, 119–120
 - position, 19
 - standard error of mean, 118
 - statistical, 119–120
 - stimulus, 21 (table)
 - time, 19, 22 (table)
 - Type I, 119
 - Type II, 120
- expectation effect, 44–45
- expectation error, 21 (table)
- experimenter, attitudes, 14–15

F

- fabric softener 3-AFC case study
 - method, 36–37
 - objective, 36
 - results, 37–38
- false alarm risk, 27
- F-distribution critical values, 144–149 (table)
- flavor profile method
 - case study, 82–84, 83 (figure)
 - panel sessions, 81–82
 - respondents, 81
- forced-choice different tests

- characterization of difference, 47
 - preference test, 38, 47–48
 - special cases of, 47–48
 - 3-alternative forced choice test, 36–38
 - 2-alternative forced choice test, 38–40
- Freidman tests, rank order data analysis with, 52, 64

G

- General Foods Corp., 84
- geometric mean, 116–117
- graphic scale, 54
 - examples of, 55 (figure)
 - length of, 57
- group effect, 22 (table)

H

- halo effect, 22 (table)
- hedonics evaluation, 53
- Home Use Test (HUT), 18
- Honestly Significant Difference (HSD), 152–153
- humidity control
 - odor control with, 4
 - samples presentation with, 18
- hypothesis testing
 - alternative hypothesis, 119
 - confidence interval, 126
 - degrees of freedom, 126
 - duo-trio test example, 126–127
 - null hypothesis, 119
 - sample size, 126
 - statistical errors, 119–120
 - statistical significance, 120–127, 121–125 (table)

I

- interval data, 52, 117

J

- just-about-right (JAR) rating scale
 - case study, 67–68, 68 (table)
 - example of, 66 (figure)
 - use of, 66
- just noticeable difference (JND), 72

L

- labeled affective magnitude scale (LAMS), 61
- labeled magnitude scale (LMS), 61, 62 (figure)
- laboratory
 - air temperature and humidity control, 4
 - layout, 4
 - lighting, 5
 - location, 3–4
 - odor control, 4
- lack of motivation, 22 (table)
- least significant difference (LSD)
 - ANOVA with, 150, 152 (figure)
 - multiple comparison tests with, 151–153, 152 (figure)
- lighting, laboratory, 5
- liking rating scales, 57
- Little, Arthur D., 81
- location
 - affective test venue, 102–103
 - consumer research, 100, 100 (figure)
 - testing laboratory, 3–4
- logical error, 21 (table)

M

- magnitude estimation, 60–61
- McNemar test, 67, 135
- mean, 117
 - geometric, 116–117
 - standard error of, 118
- mean squared error (MSE), 150

- median, 117
- method of constant stimuli, 74–75
- method of limits, 75
- mind-set of test subject, 20
- miss risk, 27
- motivation
 - lack of, 22 (table)
 - of respondents, 11–12, 20
- multicomponent soups or cereals, 41
- multiple comparison tests, 150
 - Duncan's test, 153
 - Honestly Significant Difference, 152–153
 - least significant difference, 151–153, 152 (figure)
 - Student-Newman-Kuels method, 153
 - threshold determination, 153
- multiple location test, 134–135
- multiple standards test, 40–42
- mutual suggestion, 22 (table)

N

- nominal data, 51, 117
- null hypothesis
 - discrimination tests with, 26
 - duo-trio test example with, 127
 - errors with, 119–120
 - hypothesis testing with, 119
 - one-tailed binomial test with, 129
 - power of hypothesis test with, 120
 - symbol for, 118
 - two-tailed binomial test with, 129
- numerical scale, 55, 55 (figure)

O

- odor control, laboratory, 4
- odor stimuli, physiological sensitivity, 13
- one-tailed binomial test, 129
- order of presentation effects, 22 (table)
- ordinal data, 51–52, 117

orientation and training, of
 respondents, 10–11
 overall difference and unspecified
 attribute tests, 45–46
 overall difference tests, 27–28

P

paired comparison preference tests, 20
 paired comparison test, 128–129
 paired t-test, 140–141
 panel size, 7
 pattern effect, 22 (table)
 pet food component shapes, 64, 65
 (table)
 physical conditions, of testing, 3–5
 physiological factors influencing
 sensory verdicts, 21 (table)
 physiological sensitivity
 odor stimuli, 13
 respondents, 12–13
 taste stimuli, 13
 time dependence, 12
 pictorial scale, 56, 56 (figure)
 pie triangle test case
 method, 32
 objective, 32
 recommendations, 33
 results, 33
 point estimate, 117
 population parameter, 117
 positional bias, 22 (table)
 position error, 19
 potato chip duo-trio test case
 method, 34–35
 objective, 34
 results, 35
 preference test
 forced-choice different tests
 followed by, 38, 47–48
 inadequate number of
 respondents with, 9
 ordinal data with, 52

paired comparison, 20
 sample preparation for, 16
 test questionnaire, 108
 probability distribution, 117
 psychographics, 102
 psychological control
 clues for, 14
 experimenter in, 14–15
 respondents, 13–15
 sample codes for, 14
 psychological experimentation, time
 error of, 19
 psychological factors influencing
 sensory verdicts, 21–22 (table)
 p-value, 117

Q

quantitative descriptive analysis (QDA)
 assessors, 86
 case study, 87–89
 development of, 86
 training for, 87

R

random sample, 117
 rank order
 chi-square test applied to, 136–137
 data analysis for, 63–65, 65 (table)
 Friedman's test for analysis of, 64
 just-about-right, 66–68, 66
 (figure), 68 (table)
 pet food component shapes in, 64,
 65 (table)
 samples for, 20
 scaling with, 61–68, 65 (table), 66
 (figure), 68 (table)
 rating scales
 applications, 53–54
 end anchors on scales, 58
 graphic scale, 54, 55 (figure), 57
 just-about-right, 66–68, 66
 (figure), 68 (table)

- length of, 57
 - liking, 57
 - numerical scale, 55, 55 (figure)
 - pictorial scale, 56, 56 (figure)
 - scale of standards, 56, 56 (figure)
 - scope, 54
 - special considerations for, 58–59
 - types of, 54–56, 55 (figure), 56 (figure)
 - unipolar and bipolar scales, 58
 - verbal scale, 54, 55 (figure)
 - ratio data, 52, 117
 - recognition threshold, 72
 - reliability of results, 127–128
 - replicated discrimination testing, 130
 - respondents
 - affective tests, 8–10
 - analytical tests, 5–7
 - flavor profile method, 81
 - information given to, 106
 - interpretation of results effected by, 9–10
 - mind-set of, 20
 - motivation, 11–12, 20
 - opinions evaluation, 53–54
 - orientation and training, 10–11
 - physiological sensitivity, 12–13
 - preference test with inadequate number of, 9
 - psychological control, 13–15
 - selection criteria, 8
 - selection process, 5–6
 - test sensitivity as function of number of, 26
 - α -risk, 27
 - β -risk, 27
- S**
- same-different test (ASTM E2139), 27
 - case study, 28–29
 - chi-square analysis for, 29, 136
 - samples
 - amount of, 18
 - caution with, 16
 - codes, 14
 - convenience, 102
 - cooking instructions for, 17
 - definition, 117
 - discrimination tests, nature and type for, 45–47
 - discrimination tests, presentation order of, 43–44
 - elimination of appearance and other factors in, 18–19
 - humidity control in, 18
 - hypothesis testing and size of, 126
 - number of, 19–20
 - order of presentation for, 19
 - preparation, 16–17
 - presentation, 18–22
 - rank order tests, 20
 - selection, 16
 - shelf-life with, 16
 - statistical significance with size of, 126
 - temperature in, 18
 - threshold methods preparation of, 73
 - scale of standards, 56, 56 (figure)
 - scaling
 - applications, 53
 - data divisions, 51–52
 - end anchors, 58
 - just-about-right, 66–68, 66 (figure), 68 (table)
 - length of, 56–57
 - LMS scaling method, 61, 62 (figure)
 - magnitude estimation, 60–61
 - rank order, 61–68, 65 (table), 66 (figure), 68 (table)
 - rating scale, 53–61, 55 (figure), 56 (figure), 62 (figure)
 - unipolar and bipolar scales, 58
 - sensory evaluation
 - defined, 1

- science of, 1
- three questions related to, 1
- sensory testing
 - affective testing, 8–11, 99–112, 100 (figure), 105 (table)
 - alternative forced choice test, 36–40
 - descriptive analysis, 79–94, 83 (figure), 93 (figure)
 - discrimination test in, 6–7, 25–48, 128–131
 - physical conditions for, 3–5
 - physiological factors influencing, 21 (table)
 - psychological factors influencing, 21–22 (table)
 - requirements for, 3–15
 - samples of materials for, 16–22, 43–47, 73, 102, 117, 126
 - scaling, 51–68, 55 (figure), 56 (figure), 62 (figure), 65 (table), 66 (figure), 68 (table)
 - statistical procedures, 115–153, 116 (table), 121–125 (table), 133 (table), 138–139 (table), 144–149 (table), 152 (figure)
 - threshold methods, 71–76, 73 (figure)
- sensR, 131
- Sidel, Joel, 86
- specified attribute difference test
 - methods, 36–42
- spectrum descriptive analysis (SDA)
 - assessors for, 89
 - case study on, 90–92
- Spider graphs, quantitative descriptive analysis using, 87
- standard deviation, 117–118
- standard error of mean, 118
- statistic, 118
- statistical errors, 119–120
- statistical procedures, 115
 - analysis of variance, 143–150, 144–149 (table)
 - chi-squared test, 131–137, 133 (table)
 - hypothesis testing, 119–127, 121–125 (table)
 - Illustrative examples, 116 (table)
 - limitations and qualifications of, 127–128
 - multiple comparison tests, 150–153, 152 (figure)
 - reliability of results, 127–128
 - sensory discrimination testing, 128–131
 - significance, 120–127, 121–125 (table)
 - student's t-test, 137–143, 138–139 (table)
 - symbols, 118
 - terms, 116–118
 - theoretical basis for, 128
 - threshold determination, 153
- statistical significance, 120
 - confidence interval, 126
 - critical values for one-tailed
 - binomial distribution, 122–124 (table)
 - critical values for two-tailed
 - binomial distribution, 121–122 (table)
 - degrees of freedom, 126
 - determining, 127
 - duo-trio test example, 126–127
 - minimum number of choices for, 124–125 (table)
 - multiple tests of, 127
 - sample size, 126
- stimulus error, 21 (table)
- Stone, Herb, 86

strawberry yogurt DOD and DFC tests
 case, 43
 Stuart-Maxwell test, 67, 136
 Student-Newman-Kuels (SNK)
 method, 153
 student's t-test, 137–143
 critical values for one-sided upper-
 tailed hypotheses, 138–139 (table)
 paired t-test, 140–141
 t-test of average against fixed
 value, 142–143
 unpaired t-test, 139–140
 z-test for proportions, 141–142
 subscripts, 118
 suppression, masking, 21 (table)
 symbols, 118
 synergy, 21 (table)

T

taste stimuli, physiological sensitivity, 13
 temperature control, samples
 presentation, 18
 temporal dominance of sensations
 (TDS), 80, 92
 temporal methods, 92–94, 93 (figure)
 temporal order of sensations (TOS),
 80, 92
 terminal threshold, 72
 test prototype, 44
 tetrad test (ASTM E3009), 6, 30–31, 130
 texture profile method
 assessors selection for, 85
 case study, 85–86
 development of, 84
 principle of, 84
 training and testing for, 85
 3-alternative forced choice test
 (3-AFC), 36–38
 threshold
 absolute, 71
 determination, 153

 difference, 72
 measuring, 72–76
 recognition, 72
 terminal, 72
 threshold methods
 assessors qualifications for, 73–74
 controlling conditions for, 72–73
 definitions, 71–72
 dilution techniques, 75
 individual or group, 74
 measurement, 72–76
 method of constant stimuli, 74–75
 method of limits, 75
 probabilistic nature in, 73 (figure)
 samples preparation, 73
 standard practices for measuring,
 76
 traditional notion in, 73 (figure)
 types of, 71–72
 Thurstonian discriminial distances,
 130–131
 time error, 19, 22 (table)
 time-intensity (T-I), 80, 92
 Tragon Corporation, 86
 transfer testing, 17
 triangle test (ASTM E1885)
 case study, 32–33
 duo-trio test compared with,
 33–34
 limitations, 32
 samples presentation order with,
 43–44
 t-test
 of average against fixed value,
 142–143
 paired, 140–141
 student's, 137–143, 138–139
 (table)
 unpaired, 139–140
 2-alternative forced choice test
 (2-AFC), 38–40

two-out-of-five test, 40–42
two-tailed binomial test, 128–129
Type I error, 119
Type II error, 120

U

unipolar scales, 58
unpaired t-test, 139–140

V

variance, 118. *See also* analysis of
variance
verbal scale, 54, 55 (figure)