

Index

- abstinence. *See also*
 withdrawal
 addiction treatment, 192–3
 cognitive tests, 72, 74, 77–8,
 79, 80, 81, 88
 personal choice, 227–8
 reversing receptor
 downregulation, 31, 60–1
 abstract thinking, 78, 114
 Acomplia (rimonabant). *See*
 SR141716
 acute effects, 14–27
 amygdala, 16–22
 basal ganglia and
 cerebellum, 22–4
 driving, 24–5
 hippocampus, 15–16
 addiction (dependence),
 32–40, 226
 cannabinoid deficiency state
 versus, 32
 cognitive functioning
 and, 72–3
 compassionate approach,
 164–72, 226–7
 conditional, 49
 discussion with users, 188–9
 early onset of use, and risk,
 49–50, 121
 genetic influences, 39
 harmful effects. *See* harmful
 effects of ongoing use
 lifetime rates, 50–1
 potential for, 49–50
 role of salience, 39–40
 scientific evidence, 33–6
 use of term, 33
 ADHD. *See* attention deficit
 hyperactivity disorder
 adolescent community
 reinforcement
 approach, 185
 adolescents. *See also* youth
 addiction risk, 49–50, 121
 brain development, 63,
 113–14
 compassionate approach,
 164–72
 executive deficits, 79–84
 harmful effects of ongoing
 use. *See* harmful effects of
 ongoing use
 long-term effects of THC
 exposure, 66–7, 145
 marijuana use, 47–9, 51,
 52, 53
 memory deficits, 74
 prohibition of marijuana
 use, 216–17
 psychological development,
 115–23
 reasons for using marijuana,
 114–15, 117–21, 168–9
 treatment programs, 184–96
 adult antisocial behavioral
 syndrome without
 childhood conduct
 disorder, 54
 Adult Use of Marijuana Act
 (AUMA), 193,
 215–16, 217
 2-AG (2-arachidonyl glycerol)
 cannabidiol
 interactions, 150
 discovery, 8
 fetal brain, 128
 functions, 10, 11–12
 head trauma, 140
 methods of raising levels,
 223–5
 neuroprotective
 properties, 148
 newborn feeding
 behavior, 18
 response to
 inflammation, 141
 age. *See also* early onset of use
 groups, marijuana use
 by, 47–9
 of onset of use, addiction
 risk by, 49–50
 prohibition of marijuana
 use by, 216–17
 aggressive behavior, 31–2, 36,
 38, 98–9
 Al-Anon Family Groups,
 165, 171
 alcohol
 driving and, 24, 25
 marijuana versus,
 209–10, 227
 parental use, 169, 170
 prohibition, 200–2
 use, 46–7
 Alzheimer's disease, 148
 ambivalence, 178, 179–80,
 189–90, 191
 American Academy of
 Pediatrics (AAP), 130
 American College of
 Obstetrics and
 Gynecology
 (ACOG), 130
 amotivational syndrome,
 100–1
 amygdala
 acute effects of marijuana,
 16–22
 cannabidiol actions, 151
 frontalization of function,
 113–14
 prenatal exposure and, 129
 regular and heavy users, 62,
 64, 97, 99
 amyotrophic lateral
 sclerosis, 148
 anandamide
 antipsychotic
 properties, 152
 basic neuroscience, 6
 cannabidiol
 interactions, 150
 discovery, 4–6
 extinction of fear
 responses, 147
 fetal brain, 128
 function, 10, 11–12
 methods of raising levels,
 223–5
 neuroprotective
 properties, 148
 structural similarity to
 THC, 6, 7
 synthesis and release, 7–8
 animal studies
 acute effects, 15–16, 17, 23
 addiction, 34–5

- brain structural changes, 65–7, 68
- cannabinoid deficiency, 30–1, 32
- endocannabinoid system, 16, 17, 21
- lack of motivation, 100
- Anslinger, Harry J. 202–3, 204
- anterior cingulate cortex (ACC), 89, 90, 91
- anti-drug legislation, 199–200
- anti-emetic effects, 138
- antisocial personality disorder (ASPD), 54–5, 66, 92–3
- anxiety
- cannabidiol for, 151–2
 - effects of marijuana, 17, 18–19, 222
 - marijuana abstinence, 36, 38, 188
- appetite
- cannabinoid deficiency state, 31
 - effects of marijuana, 17, 18
 - marijuana withdrawal, 36
- arachidonic acid, 7–8
- 2-arachidonyl glycerol. *See* 2-AG
- arguments, with patients, 179, 180–1
- athletes, 16, 24
- attention, 78, 79
- deficits, 73, 127
 - improvements, 72
- attention deficit hyperactivity disorder (ADHD), 54, 55, 66, 92–3, 114
- Australia, xiv, 106–7, 108
- authoritarian approaches, 170
- authority, parental, 168, 169–70
- autonomy, 116–17, 119
- awe, 20
- axons, 62, 67–8, 128–9
- Banys, Peter, 137, 212–13, 215
- basal ganglia, 22–4
- behavioral problems, prenatal exposure, 128
- binge drinking, 47
- birth weight, 126
- Blue Ribbon Commission on Marijuana Policy, 214–15
- Bolla, Karen, 90–1
- bone fractures, 139–40
- boredom, 32, 188
- Boston study, 107–8
- brain
- acute effects, 14–27
 - functional impact, 72–95, 97–110
 - marijuana and, overview, 221–5
 - negative feedback regulation, 10–12
 - structural changes, 60–70
- brain cancer, 142
- brain development, 62–3
- adolescent, 63, 113–14
 - fetal, 63, 127, 128–9
- breast cancer, 142
- breastfeeding, 129–30
- Budney, Alan, 33, 36–7, 98–9, 189
- Caldwell, Samuel R. 203
- California
- anti-drug legislation, 199–200
 - developing a treatment system, 193–6
 - legalization of marijuana, 137, 155, 211, 212–17
 - medical use of marijuana, 155–6
- California Healthy Kids Survey, 53
- California Medical Association, 213
- California Society of Addiction Medicine (CSAM), 194, 212–13
- Canada, xiv, 210
- cancer, 141–2
- cannabidiol (CBD), xviii, 148–55
- antianxiety effects, 151–2
 - anticancer effects, 142
 - anticonvulsant effects, 154–5
 - antipsychotic effects, 102, 103, 152
- bone healing/health, 139–40
- discovery, 3, 149
- mechanism of action, 150–1
- medicinal benefits, 151–5
- multiple sclerosis, 142–3
- neuroprotective effects, 64
- organ transplantation, 140, 154
- pain relief, 153
- post-traumatic stress disorder, 147
- preparations, 149–50, 153
- safety and side effects, 151
- sleep-inducing effects, 153
- stress response, 145
- stroke, 140
- THC interactions, 19, 149, 150
- THC ratios. *See* THC: CBD ratios
- cannabigerol (CBG), xviii, 149–50
- cannabinoid deficiency state, 30–3, 222–3
- addiction versus, 32
 - informing users about, 188–9
 - naturally occurring, 32–3
- receptor
- downregulation, 30–1
 - symptoms, 31–2
- cannabinoid hyperemesis syndrome (CHS), 126
- cannabinoid receptors
- cloning, 5
 - discovery, 4, 7
 - localization in brain, 5
 - type 1. *See* CB1 cannabinoid receptors
 - type 2 (CB2), 7
- cannabinoid tone, 10–11, 187–8, 223
- food intake and, 17
 - gastrointestinal effects, 144
 - healthy methods of raising, 223–5
 - memory effects, 16, 188
 - pharmacological methods of raising, 225
 - response to novelty, 20
- cannabinoids
- endogenous. *See* endocannabinoids
 - medicinal use, 137–58
 - plant-based (phytocannabinoids), xvii–xviii, 222
 - synthetic, 3, 226
- cannabis plant, xvi–xvii, 222
- cannabis use disorder (CUD), 32, 60 *See also* addiction
- compassionate approach, 164–72, 226–7
- diagnostic criteria, 35–6, 40
 - treatment of adolescents, 184–96
- Cannabis Youth Treatment Study, 185–6

- CB1 cannabinoid receptors, 7
 downregulation, 30–1,
 60–1, 188
 endocannabinoid actions,
 10–11, 12
 genetic variations in
 availability, 20–1, 32–3
 knockout mice, 16, 17
 localization in brain, 5
 newborn feeding
 behavior, 18
 novelty seeking
 behavior, 20–1
 presynaptic location, 9, 10
 THC and CBD actions,
 11, 150
- CB2 cannabinoid receptors, 7
- CBD. *See* cannabidiol
- CBG (cannabigerol), xviii,
 149–50
- cerebellum, 22–4
- change, stages of, 175–7
- chemical imbalance, 61
- chemistry, marijuana,
 xvii–xviii, 1–3
- chemotherapy, 138
- children, unintended
 exposure, 131
- chilling, 19, 64, 91, 151, 190
- Chinese immigrants, 199
- clinics, adolescent
 outpatient, 195
- cocaine, 1, 34
- cognitive behavioral treatment
 (CBT), 185
- cognitive deficits. *See also*
 memory
 after adolescent THC
 exposure, 66–7
 after prenatal exposure, 127
 multiple sclerosis, 143
 regular and heavy users,
 73–93
- cognitive dissonance, 180,
 189–90, 191
- Cognitive Failure
 Questionnaire, 75–6
- cold-water test, 65
- Colorado, 141, 155, 213, 214
- comfort foods, 17, 18
- comorbidities, 54–6
- Compassionate Use Act 1996,
 California, 137, 155, 211
- compensatory processes,
 76–7, 84, 87–92, 128
- concentration, 78
- conditional dependence, 49
- conduct disorder (CD), 54–5,
 66, 92–3
- constipation, 144
- consumption, marijuana. *See*
 marijuana use
- contracts, written, 170–1, 185
- coordination, motor, 23–4
- corpus callosum, 67, 68, 129
- cortex, brain, 62
- couchlock, 23, 100
- CP-55,940 (synthetic
 cannabinoid), 3, 4, 5
- cravings, withdrawal-
 related, 36–7
- crime, organized, 200–1
- criminalization of marijuana,
 203, 204–7, 209
- critical periods, 62–3
- CUD. *See* cannabis use
 disorder
- decision-making, 78, 90, 91
- decriminalization of marijuana,
 xiv, 137, 211–17
- delta-9-tetrahydrocannabinol.
See THC
- dependence. *See* addiction
- depression, 17, 36, 38
- Devane, William, 4, 5
- Di Clemente, Carlo, 175
- Di Marzo, Vincenzo, 7–8
- Diagnostic and Statistical
 Manual, 5th edition
 (DSM-5), 35–6
- diarrhea, 144
- diffusion tensor imaging
 (DTI), 67, 99, 129
- DiForti, Marta, 104–5
- Digit Symbol Substitution
 Test, 15, 79
- discomfort, physical, 36
- dopamine, 33–4, 40, 152, 223
- dopamine receptors, 129
- Dravet syndrome, 154
- driving, 24–5
- dropouts, school, 106–7
- Drug Enforcement Agency, 138
- Dunedin, New Zealand, 84–7,
 106, 107
- early onset of use
 addiction risk, 49–50, 121
 executive deficits, 79–86
 IQ decline, 86, 87
 memory deficits, 75, 77–8
- education, marijuana users, 40
- educational achievement,
 106–7, 108
- Efron, Dan, 1–2
- emotion, 97–9
- emotional regulation,
 18–19, 78
- empathy, 178–80
- Emperor Cookie Dough, xvii
- encouragement, 166
- endocannabinoid system, xv
 activation by THC, 6–7
 discovery, 3–6
 fetal brain development,
 127, 128
 function, 7–12
 future research, 226
 gastrointestinal system, 144
 informing users about,
 187–8
 negative feedback
 regulation, 10–12
 neuroprotective
 properties, 148
 neuroscience research,
 6, 7–12
 presynaptic structure, 11–12
 stress response modulation,
 145–6
- endocannabinoid tone. *See*
 cannabinoid tone
- endocannabinoids. *See also*
 2-AG; anandamide
 discovery, 4–6, 8
 fetal brain, 128
 methods of raising levels,
 223–5
 THC structural similarity,
 6, 7
- endorphins, 5, 18
- engagement, patient,
 178–80, 186
- entourage effect, 19
- epidemiology, 45–57, *See also*
 marijuana use
- Epidiolex, 154
- epilepsy, 154–5
- error awareness, 88–90, 91
- Error Awareness Task, 88–90
- Europe, marijuana use, 53
- European Monitoring Centre
 for Drugs and Drug
 Addiction
 (EMCDDA), 45
- Everyday Memory
 Questionnaire, 75–6

- executive functions, 78
 gabapentin therapy, 192–3
 impairments, 75, 78–92
 maturation, 113–14
 exercise, physical, 223–4
 extinction, aversive memories,
 21, 146–7
 extravagance, 99
- family support network, 185
 fatty acid amide hydrolase
 (FAAH), 144, 147,
 152, 225
 FDA. *See* Food and Drug
 Administration
 fear responses, extinction,
 146–7
 Federal Bureau of
 Narcotics, 202
 Fergusson, David, 106–7
 fetal brain development, 63,
 127, 128–9
 FightSaga website, 24
 Fisk, J. E. 75–6
 fMRI. *See* functional magnetic
 resonance imaging
 Fontes, Maria, 81–4
 Food and Drug
 Administration (FDA),
 xviii, 138, 140, 141,
 153, 154
 forgetting, 16, 21–2, 91
 fractures, bone, 139–40
 Fride, Esther, 18
 Frontal Assessment Battery,
 81, 82
 frontal lobes
 executive functions, 78, 79
 maturation, 113–14
 response inhibition, 88
 structural changes, 64–5, 67
 frontalization of amygdala
 function, 113–14
 functional magnetic resonance
 imaging (fMRI)
 cannabidiol effects, 151
 error unawareness, 90–1
 frontal lobe maturation,
 113
 go/no-go experiments, 88,
 89, 190
 Masked Faces study, 97, 98
 prenatal exposure and,
 127–8
 reward deficits, 100
 functional selectivity, 150
- GABA, 10, 222
 gabapentin, 192–3
 gastrointestinal illness, 143–4
 gender differences, 36, 65, 129
 Generation R study, 126
 genetic influences
 anandamide
 degradation, 147
 CB1 receptor availability,
 20–1, 32–3
 marijuana addiction, 39
 schizophrenia, 105–6
 glioblastoma multiforme, 142
 glutamate, 222
 go/no-go experiments,
 87–90, 190
 Goldman, David, xiv
 gray matter, 62, 63–7
 group therapy, 195
 Gruber, Staci
 early onset users, 83–4
 impulsivity, 99, 129
 Masked Faces protocol, 97,
 147, 151, 169, 190
 Gunjah Wallah Hasheesh
 Candy Company, 156–7
- Hanson, Karen, 81
 harm reduction, 141, 192, 210
 harmful effects of ongoing use,
 51, 169, 223
 adolescent psychological
 development, 113–23
 brain function, 72–95,
 97–110
 brain structure, 60–70
 practical impact, 106–8
 hasheesh, 200
 hashish, xvii, 2
 hashish candy, 156–7
 head trauma, 140
 Hearst, William Randolph,
 202, 203
 heavy marijuana users
 brain function changes,
 72–95
 brain structural changes,
 60–70
 school students, 53
 treatment of adolescent,
 184–96
 understanding and
 encouragement, 164–72
 Hebrew University of
 Jerusalem, 5–6
 hemp, industrial, xvii, 150
- Herkenham, Miles, 5, 9, 14
 Hester, Robert, 88–90, 169
 high. *See* acute effects
 hippocampus, 62
 acute effects, 9, 10, 15–16
 regular and heavy
 users, 63–4
 THC toxicity, 64
 volume and memory, 64
 Hirvonen, Jussi, 31
 history of marijuana, xvii,
 199–207
 HIV-1, 148
 Holder, Eric, 210, 214
 homeostasis, 10, 30
 Horwood, John, 50–1
 Howlett, Allyn, 4
 HU-210 (synthetic
 cannabinoid), 3
 Hughes, Caitlin, 210–11
 Huntington's chorea, 148
 hydra, 18
 hypothalamic–pituitary–
 adrenal (HPA) axis,
 145–6
 hypothalamus, 17, 18
- identity, 115, 119
 illicit drug use, 46
 immigrants, 199, 200–7
 impulse control, 78
 impulsivity, 87–92, 99, 129
 independence, 120
 industry, marijuana, 155–6,
 212, 217–18
 insomnia, 35, 36, 38
 intrusion errors, 15, 73
 Iowa Gambling Task (IGT),
 90–2, 190
 IQ, 86, 87
 irritability, 31, 36, 38,
 98–9, 188
- jazz musicians, 204
 judgment, 78
 Just Say No campaign, 53,
 122
 JWH compounds, 3
- Katona, Istvan, 8–9, 10
 Korsakoff's syndrome, 9
- lactation, 129–30
 learning
 acute intoxication,
 15–16, 21–2

- learning (cont.)
 after adolescent THC exposure, 66–7
 regular and heavy users, 73
 legalization of marijuana, xiv, 210–17
 developing a treatment system, 193–6
 future prospects, 227–8
 international trends, xiv, 210–11
 U.S. xiv, 137, 155, 211–18
 Lennox-Gastaut syndrome, 154
 Lewke, F. M. 152
 Licata, Victor, 202
 liking, versus wanting, 34
 listening, reflective, 179
 London cab drivers, 64
- Maastricht, Netherlands, 107
 MAGL (monoacylglycerol lipase) inhibitor, 225
 magnetic resonance imaging (MRI), 64, 67, 90
 Marijuana Tax Stamp Act (1937), 203, 204
 marijuana use, xiv, 45–57, 184
 after legalization, 211–12, 213, 214
 breastfeeding, 129
 by age group, 47–9
 by race, 205
 comorbidities, 54–6
 frequency and amount, 53, 54
 future, 226
 perceived versus actual, 51, 168
 perception of risk and, 51–3
 pregnancy, 125
 trends, 51, 52
 marijuana use disorder. *See* cannabis use disorder
 marketing, 149, 157, 216
 Marsicano, Giovanni, 21–2, 91, 146
 Martin, Billy, xv
 Martz, Meghan, 100–1
 Masked Faces protocol, 97, 98, 190
 massage, 224
 Maternal Health Practices and Child Development Study (MHPCD), 126, 127–8
- Matsuda, Lisa, 5
 meaning (of life), 117
 Mechoulam, Raphael, 1–3, 4–5, 222
 CBD studies, 3, 149, 153
 discovery of
 endocannabinoids, 5–6, 8, 144
 entourage effect, 19
 medical use of cannabis, 138, 139, 140
 medical marijuana, 137–58,
See also cannabidiol
 entourage effect, 19
 indications, 139–48, 155
 legalization, xiv, 137, 155, 211
 research directions, 7, 225–6
 scientific evidence, 138–9
 standards of practice, 155–7
 Medina, Krista Lisdahl, 79–81, 88
 meditation, 224–5
 Meier, Madeline, 84–6, 106
 memory, 15–16
 acute intoxication, 9, 15–16, 21–2, 73
 after adolescent THC exposure, 66–7
 after prenatal exposure, 127–8
 hippocampal volume and, 64
 informing users about, 188
 modulation, 16
 regular and heavy users, 73–8
 mental flexibility (set shifting), 78, 82, 83, 193
 methamphetamine, 40
 Mexican immigrants, 200–7
 microtubules, 67, 128–9
 Miller, William, 178, 181, 182
 Monitoring the Future (MTF) study, University of Michigan, 45, 51–3
 Montgomery, C. 75–6
 moral judgment, 209–10
 morphine, 1
 motivation, 100–1
 motivational enhancement therapy, 185
 motivational interviewing (MI), xiii–xiv, 174–83
 general principles, 178–82
 stages of change, 175–7
- understanding salience, 39–40
 motor effects
 acute intoxication, 22–4
 withdrawal, 31, 36
 motor homunculus, 22
 MRI. *See* magnetic resonance imaging
 multidimensional family therapy, 185
 multiple sclerosis (MS), 23, 138, 142–3
 munchies, 17, 18
 myelination, 63
- nabilone, 146
 N-acetylcysteine (NAC), 192
 naloxegol, 144
 naloxone, 18
 naltrexone, 17
 National Academies of Sciences, Engineering and Medicine, 138–9, 140, 141, 153
 National Institute of Alcohol Abuse and Alcoholism, 204
 National Institutes of Health (NIH), 1–2, 5
 National Survey on Drug Use and Health (NSDUH), 45, 46–9, 125
 nausea and vomiting, 125–6, 138
 negative feedback regulation, 10–12
 nerve tracts, 62, 67
 Nestor, Liam, 88–90, 169
 Netherlands, 107
 neurochemical imbalance, 61
 neurodegenerative disorders, 148
 neurodevelopment. *See* brain development
 neuroimaging, 64–5, 67, 68
 neurons, 9, 62, 221
 axons, 62, 67–8
 cell bodies, 62, 63–7
 inner skeleton, 67
 neuropsychological tests, 79, 81–2
 neurotransmitters, 4, 8
 negative feedback regulation, 10–12, 222
 ongoing marijuana use, 61

- New Zealand, 50–1, 84–7,
 106–7, 108
 newborn behavior, 18, 126–7
 Newsom, Gavin, 214, 215
 Nixon, Richard, 204
 non-judgmental stance, 39,
 178, 180, 191–2
 novelty, 19–20, 32
 deficit, 100
 seeking, 20–1, 99
 users' experiences, 187, 188
 virtual, 21
 NSAIDs (non-steroidal anti-
 inflammatory drugs), 153
 nucleus accumbens, 33–4,
 40, 100

 obesity, morbid, 17
 Olds, James, 33–4
 opiate receptors, 5
 opiate withdrawal, 40
 opioid overdose deaths, 141
 opium, 1, 199, 226
 optimism, 182
 O'Shaughnessy, W. B. 137
 osteoporosis, 139–40
 Ottawa Prenatal Prospective
 Study (OPPS), 126, 127–8

 pain relief, 138, 140–1, 153,
 157–8
 panic attacks, 102–3
 parents
 advice for, 164–72
 aggression towards, 31, 99
 alienation from, 120
 independence from,
 116–17, 120
 perceptions of child's drug
 use, 118
 treatment approaches, 185
 Parkinson's disease, 148
 pediatric exposure,
 unintended, 131
 peer group affiliation, 115–16
 peer pressure, 118
 personality, 19, 99
 PET (positron emission
 tomography) scans, 31
 phytocannabinoids,
 xvii–xviii, 222
 planning, 78
 pleasure center. *See* reward
 center
 Poison Laws, California,
 199, 201

 policy, marijuana, 199–207,
 209–18
 Portugal, 210–11
 post-traumatic stress disorder
 (PTSD), 146–8
 potency
 increase over time, xvii
 psychosis risk and, 103, 104
 powerlessness, 165, 168
 pregnancy, 125, 130
 prenatal exposure, 125–32
 initial impacts, 126–7
 long-term impacts, 126,
 127–8
 pragmatic clinical
 advice, 130
 prevalence, 125
 prevalence of use. *See*
 marijuana use
 prioritization, 78
 prison population, U.S. 204–5
 Prochaska, James, 175
 Prospective Memory
 Questionnaire, 76
 pruning, synaptic, 63, 65
 psychological development,
 115–23
 psychological problems, 128
See also anxiety;
 depression
 psychosis, acute, 101–6,
 109–10, 152
 puberty, 116
 public health policy, 210–17

 racial disparities, 205, 206
 racism, 199, 203
 reaction times, 23–4, 88
 Reagan, Nancy, 53, 122
 Reagan, Ronald, 53, 204–5
 receptors, 4
 cannabinoid. *See*
 cannabinoid receptors
 downregulation, 30–1,
 60–1, 188
 recreational marijuana,
 legalization, xiv, 137,
 211–17
Reefer Madness (film),
 203–4
 regular marijuana users, 184
 brain function changes,
 72–95
 brain structural changes,
 60–70
 school students, 53

 relapse, 177
 residential treatment, 195
 resistance, 181–2, 190–1
 response inhibition, 88–90, 99
 restlessness, motor, 31, 36
 retinal degeneration, 148
 Revive Therapeutics, 140
 reward center, 34, 40,
 100, 223
 Rey Adult Verbal Learning
 Test (RAVLT), 74–5
 rimonabant. *See* SR141716
 risk
 assessment, 87–92
 perceived, 53, 121–2
 risky behavior, 114–15, 119
 Rollnick, Stephen, 178
 Roosevelt, Franklin D. 201–2
 Rubino, Tiziano, 66

 salience, 39–40, 100–1, 166
 Sativex, 143
 SCG10 protein, 129
 schizophrenia, 101–6,
 109–10, 152
 school students. *See*
 adolescents
 school-based Student
 Assistance Programs
 (SAPs), 194, 195, 212, 217
 secondhand exposure,
 125–32
 self-monitoring, 78
 Semmelweis Medical
 University, Budapest, 8–9
 separation, from family, 117,
 119–20
 sequencing, 78, 79
 Sessions, Jeff, 209
 set shifting. *See* mental
 flexibility
 set, mental, 18
 setting, marijuana use, 18
 sexual maturation, 116
 sinsemilla, xvii
 skunk, 150, 152
 sleep
 benefits, 138–9, 153
 difficulties, 35, 36, 38
 Solowij, Nadia, 73–5
 SR 141716 (rimonabant)
 aggressive behavior, 32
 clinical use, 17
 GABA release, 10
 gastrointestinal effects, 144
 memory effects, 16, 21, 146

- SR 141716 (cont.)
 newborn feeding
 behavior, 18
 precipitating
 withdrawal, 34–5
 schizophrenia, 152
- SSRIs (selective serotonin
 reuptake inhibitors), 32,
 61, 152
- stages of change model, 175–7
- statistics, mistrust of, 45
- Stella, Nephi, 8
- Stevens, Alex, 210–11
- stress, 17, 145–6
- stroke, 140
- Stroop test, 82, 83
- Student Assistance Programs
 (SAPs), 194, 195, 212,
 215, 217
- Substance Abuse and Mental
 Health Services
 Administration
 (SAMHSA), 185–6
- substance use disorder
 (SUD), 54–5
- suckling, newborn, 18
- synapses, 4, 9, 62
 formation of new, 63, 67
 pruning, 63, 65
 THC exposure in
 adolescence and, 66
- synesthesia, 20
- synthetic cannabinoids, 3, 226
- Tapert, Susan, 87–8, 128, 190
- tax revenues, 193, 195–6, 212,
 213, 215, 217
- temperament, 20–1, 97–9
- terpenes, xvii–xviii
- Terranova, J. P. 15–16
- tetrahydrocannabinol.
See THC
- THC, xviii
 acute effects, 14–27
 anticancer effects, 142
 brain structural effects,
 64, 65–6
 breast milk, 129–30
 cannabidiol interactions,
 19, 149, 150
 cognitive effects, 73
 discovery, 2–3
 fetal brain development
 and, 129
 long-term effects of
 adolescent exposure,
 66–7, 145
 mechanism of action, xv,
 3–4, 6–7, 150, 222–3
 meconium positivity, 125
 multiple sclerosis, 142–3
 placental transfer, 125–6
 post-traumatic stress
 disorder, 146–7
 precipitated
 withdrawal, 34–5
 products with high levels,
 xvii, 150
 psychotic effects, 102, 104
 stress response, 145
 structural similarity to
 anandamide, 6, 7
 structure, 2–3
 synthetic analogs. *See*
 synthetic cannabinoids
 users' understanding of, 187
- THC: CBD ratios, 19
 cannabis plant strains, 150
 motor effects and, 23
 psychosis and, 103, 152
 therapeutic alliance, 178, 191
- thin-layer chromatography
 (TLC), 6
- time, distorted estimates, 23
- tobacco
 addictive strength, 49
 consumption, 46, 53
 withdrawal, 36–7
- tolerance, 36
- Tortoriello, Giuseppe,
 129, 130
- tracking, 72
- Trail Making test, 79, 80
- transcendence, 117, 120–1
- transplantation, organ,
 140, 154
- traumatic brain injury, 140
- treatment
 adolescent cannabis use
 disorder, 184–96
 public health policy, 210
- tremor, 23, 142, 143
- understanding, addicted child,
 166, 168–9
- United States
 history of marijuana policy,
 199–207
 legalization of marijuana,
 xiv, 137, 155, 211–18
 marijuana use, 46–53, 184
 prenatal exposure, 125
 War on Drugs, 155, 204–7,
 209, 210
 use, marijuana. *See*
 marijuana use
 values, 115
 Van Laere, Koen, 20–1,
 32–3, 99
 violence, 98
 Volstead Act, 201
 vomiting, 125–6, 138
 wanting, versus liking, 34
 War on Drugs, 155, 204–7,
 209, 210
 Washington State, 213
 Weizmann Institute of
 Science, Israel, 1, 2
 Wesley, Michael, 91–2
 white matter, 62, 67–8, 99
 WIN 55,212 (synthetic
 cannabinoid), 10
 Wisconsin Card Sort test,
 81–2, 83, 85
 withdrawal, 33, 36–8, 40 *See*
also abstinence
 aggressive behavior,
 38, 98–9
 medical treatment, 192–3
 practical importance, 37–8
 precipitated, in
 animals, 34–5
 reports by users, 35
 symptoms, 36, 40, 192
 tobacco withdrawal
 versus, 36–7
- youth. *See also* adolescents
 addiction rates over
 time, 50–1
 addiction risk, 49–50
 marijuana use, 47–9, 51,
 52, 53
 marketing of marijuana
 to, 216
 response to legalization,
 213, 214
 support and protection,
 212–13, 214–15, 217
 Youth First report, 212–13