Subject Index

Abstract reasoning, 132–133
Academic achievement, 87–88
teacher empathy and, 88–89
Accurate empathy, 57. See also Empathic accuracy
benefits and limitations of, 154–156
Acquaintanceship effect, 64
Actualizing tendency, 102
organismic influence of, 102–103
Adolescent adjustment, empathic accuracy in peer relations and, 63
Aesthetic empathy, 6, 7
Affective component of empathy, 153–154. See also Empathy, components/dimensions
Affective empathy, 6, 215, 218–220, 226, 227. See also Emotional contagion; Emotional empathy; Simulation
Affective mentalizing, 223. See also Mentalizing
Affective resonance, 71, 77, 184, 185, 200, 201. See also Empathic resonance
Affective responsiveness, 87
Affective sharing, 109, 185, 189
Affinity continuum, 160–161
Agency, sense of, 206
Aggression, 86–87. See also Anger; Violent husbands
regulation of, 86
Alexithymia, 160
Altruistic behavior, 85, 203. See also Imitation, prosocial effects of being imitated
Altruistic concern, 161
Altruistic motivation, 9
Amygdala, 128, 141, 174, 228
cognitive empathy and, 224
conditioning and, 144
emotion representation and, 188
facial expressions and, 140, 141, 174, 201, 207
fear and, 140, 141, 204
and mediation of emotional experiences, 227
morality and, 144
pain and, 77
selective sociality, neuropeptides, and, 178, 179
sex differences and, 179
simulation and, 226, 228
Analogical reasoning, 209
Anger, emotional empathic responses to and reasoning about conventions, 145–146
Anger-mediated aggressive behavior, 87
Angry expressions, 141
Animals. See also Evolution
empathy and emotional contagion in, 25, 71, 169
Anterior attention system, 74
Anterior cingulate cortex (ACC), 38, 77, 78, 127, 186, 189, 201, 224–227
Anterior insula, 38, 77, 186, 187, 189, 190, 201, 225. See also Insula
Anterior paracingulate cortex, 141
Anterior temporal cortex, 128
Antisocial behavior, 143–144
regulation of, 86
Anxiety. See also Fear
- social, 224, 225 (see also Social phobia)

Appearance displays, empathic responses to, 147–148

Appraisal theory, 202

Approach-avoidance reactions, 176, 177

“As if” condition, 103, 125, 126

Asperger syndrome (AS), 219, 224, 225

Attachment processes, 78–79

Attentional disengagement, 61

Attentional resources, 141

Audience design hypothesis, 47, 52

Audition and social communication, 172

Auditory communication, 172

Auditory mirror neuron systems, 131

Autism, 26, 60, 146–147, 180, 190–192, 224, 225

Automatic imitation, 32

Automatic mimicry, 200

Automatic/uncontrolled vs. deliberative/reflective/controlled empathic reactions, 157

Automatic vigilance, 113

Autonomic nervous system (ANS) activity.
- See also Evolving autonomic and social nervous system

Balanced Emotional Empathy Scale (BEES), 189

Basal ganglia, 205

Belief-reasoning errors, 220

Bilateral insulae, 77

Bilateral insular cortices, 204

Bipolar disorder, 145, 224, 225

Body-oriented perspective. See Embodied empathy

Borderline personality disorder (BPD), 61, 224, 225

Brain damage and empathic abilities, 217–219.
- See also specific regions of brain

Brow muscle region, 21

“Burnout,” 156

Canonical neurons, 24

Caregiving, interest in, 153

Caring, 86

“Chameleon effect,” 184

Cheek muscle region, 21

Cingulate cortex, 201, 226. See also Anterior cingulate cortex

Citizen Curriculum, 91

Classroom, empathy-stimulating experiences in,
- 90. See also Student empathy, fostering

Client-centered therapy, 109–110. See also Psychotherapy; Rogerian empathy

Cognitive-affective model of empathy, 85, 86, 91

Cognitive appraisal and reappraisal, 207

Cognitive-behavioral therapies, 120

Cognitive capacities related to empathy,
- 132–133

Cognitive component of empathy, 153.
- See also Cognitive empathy; Empathy, components/dimensions

Cognitive-emotional empathy, 133

Cognitive empathy, 4, 7, 33, 218, 224.
- See also Projection; Theory of mind

Cognitive flexibility, 132, 133, 217–219

Cognitive mentalizing, 223. See also Mentalizing

Cognitive perspective taking. See Perspective taking
Emotion “catching,” 5, 6, 20. See also Emotional contagion

ways emotions can be caught, 20–26

Emotion matching, 5, 6

Emotion regulation, 73, 115, 119, 189, 206–207, 216. See also Self-regulation

Emotions, primary vs. secondary, 132

Empathic ability, 60, 65. See also Empathic accuracy

Empathic accuracy, 4, 57, 67–68, 115, 156.

See also Pain assessment, accuracy in

cognitive psychology and, 62

collections of different information channels to, 62

defined, 57
developmental psychology and, 62–63

individual differences in perceivers’, 59

physiological psychology and, 65–66

social psychology and, 64–65

Empathic accuracy construct, “theory neutral”

nature of, 67

Empathic accuracy measures, 58–59, 155.

See also Empathy, measurement of performance vs. self-report, 66

reliability and validity, 67

Empathic accuracy model, 65

Empathic accuracy research

appeal and integrative potential of, 66

flexibility in, 66

Empathic accuracy research paradigm, 58

alternative research paradigms, 58–59

Empathic attunement in therapy, 114, 116

functions, 118–119

Empathic communication, 85, 125, 134

Empathic distress, 7

Empathic distress reaction, inborn rudimentary, 7

Empathic failures, 115. See also Empathic accuracy

“Empathic guesses,” 108, 109

Empathic immersement, deep, 117

Empathic inference, 57

Empathic motivation, 65

Empathic processing, 215, 227–228.

See also specific topics

Empathic resonance, 134. See also Affective resonance; Resonating

in psychotherapy, 114–118, 125

Empathic responding, modulation of, 206–209

Empathic understanding, 102–104, 109, 119, 134, 155

Empathic Understanding Responses, 101

Empathy

as answer to two different questions, 3–4, 8–11

components/dimensions of, 91, 103, 117–118, 133, 153–154 (see also Cognitive-affective model of empathy)

conditions for (see under Psychotherapy)

consequences of showing, 33–34

(see also Imitation)

definitions/uses of the term, 19, 31, 43, 71, 85, 103, 104, 125, 126, 139, 183–185

concept 1: knowing another’s internal state, 4, 8–11

concept 2: adopting the posture/expression of an observed other, 4, 8–10

concept 3: coming to feel as another feels, 5–6, 9–11 (see also Emotional contagion)

concept 4: intuiting/projecting oneself into another’s situation, 6, 7, 9, 10

concept 5: imagining how another is thinking/feeling, 7, 9–11

concept 6: imagining how one would think/feel in the other’s place, 7, 9, 10

concept 7: feeling distress at witnessing another’s suffering, 7–11

concept 8: feeling for another who is suffering, 8–11

implications, 8–11

evolutionary history and the capacity for, vii

factors modulating, 132–134

function of, 86–88

levels of, 71

lost in translation, 31–32

measurement of, 105, 189 (see also Empathic accuracy measures)
models of
cognitive-affective model, 85, 86, 91
neural model, 226
perception-action model, 33
naturalness of, 52–53
origin and history of the term, vii, 6, 31, 57
phases in the process of, 125 (see also Empathy
   cycle)
   as process vs. state, 104
skills required for, 19 (see also Rogerian
   empathy)
training for (see Training)
types of, 6, 7, 133 (see also specific types)
ultimate criterion for determining, 104
Empathy cycle (EC), 114
Empathy deficits, psychopathologies marked by,
   199
Empathy induction techniques, 143
Empathy Quotient, 189
Empathy-related responding, 71–74
Encephalization, 78
Ethnically diverse student populations, 89
Ethnic prejudice. See Prejudice
Evolution
   of social awareness in mammals, 173–175,
      179–180
   of social behaviors, 169–170, 179–180
Evolving autonomic and social nervous system,
   170–171
   connecting the head and heart, 172
   evolution of head and face, 172
Executive functioning, 76, 217
Executive processes, 74–75
Expectancy violation, 38
External frame of reference, 102
Eye gaze, 174, 224

“Face-heart” connection, 172, 173, 177
Facial expressions, 22, 140, 173, 174, 200–201,
   219
amygdala and, 140, 141, 174, 201, 207
emotional contagion and, 32, 225
Facial feedback, 22–23

Facial feedback hypothesis, 22
Facial mimicry, 20–21
False belief tests, first- and second-order, 219, 220
Fantasizing, capacity for, 131
Fantasy, 188, 189, 218
Fear, 140, 141, 178, 204. See also Anxiety; Social
   phobia
Feedback, 22, 26, 60
Feedback training, 60
Field dependence vs. independence, 36–37
Fight/flight and freeze behaviors, 174
Flexibility. See Cognitive flexibility; Mental
   flexibility
Formative tendency, 102
Freudian theory, empathy in, 101
Frontal cortex. See Medial frontal cortex
Frontal gyrus, inferior, 187, 226–228
Frontal lobes, role in emotion regulation and
   social cognition, 216–217
Frontotemporal lobar degeneration (FTLD), 223
Fusiform gyrus, 174
Gage, Phineas, 216
Gender and empathic ability, 60
Gender differences, 180
   in empathic accuracy, 64–65
   in sociality and empathy, mechanisms for,
      178–179
“Grasping” metaphor, 118
Guilt, 147, 148
Gyrus
   fusiform, 174
   inferior frontal, 187, 226–228
Helping behavior, effective, 155, 156
Hidden Figures Test, 37
Humanistic therapists, 125, 130. See also
   Client-centered therapy; Rogerian empathy
Humanity, principle of, 44
Human Relations Training, 101
Hypothalamic-pituitary-adrenal (HPA) axis, 172,
   174
Hypothalamus, 128, 177
Identification, 160
vs. empathy, 125
Imagery, mental, 203
“Imagine him” perspective, 7
“Imagine other” perspective, 7, 204
“Imagine-self” perspective, 7, 204
Imagining, 129, 203
vs. observing, 127
Imitation, 31, 190. See also Mimicry
automaticity, 32
behavioral consequences, 35
conscious forms, 32
covert vs. overt, 129
empathy and, 4, 31, 33–34, 38 (see also
Empathy, definitions/uses of the term,
concept 2; Mimicry)
near correlates of being imitated, 38
prosocial effects of being imitated, 34–36
social neuroscience of being imitated, 37–38
spontaneous social, 184
Immobilization, 171
Individuating information, 48
Inferior frontal gyrus, 187, 226–228
Inferior parietal cortex, right, 72, 127
Inferior parietal lobe, 186
right, 127
Inferior parietal lobule, 187
Information-processing mechanisms underlying
empathy, viii
Inhibition of aggression, 87
Inhibitory control, 204
Insula, 127, 140, 187, 188, 201, 204, 207,
225–228. See also Anterior insula; Bilateral
insular cortices
Intention, 174
Internal frame of reference, 102–104
Internalizing problems, 63
Interoceptive monitoring, 205
Interpersonal behavior and cognitive style, 37
Interpersonal competence, 183, 184, 188,
190–191. See also Social skills
Interpersonal priming, 115
Interpersonal Reactivity Index (IRI), 188, 208, 218
Interpersonal Skills Training, 101
Interpersonal understanding, 191. See also Social
understanding
Intersubjective reasoning, 78
Intersubjectivity, 33, 209
Involuntary vicarious response, 104
Isolation, 177, 179
“Jigsaw classroom,” 87
Judging what others know, necessity of, 43–44
Kafka, Franz, 51
Knowing, sense/feeling of, 44–45, 154, 156
Knowledge
necessity of judging others’, 43–44
over- vs. underestimating others’, 50–51
Knowledge projection. See Projection
Language comprehension, perspective
adjustment model of, 47
Lateral orbital frontal cortex, 141
Lateral septum, 179
Learning to Care Curriculum, 91
Letting go, 117
Limbic system, 157
Listening, 174
empathic, 115
Magnetoencephalography (MEG), 140
Maritally abusive men, empathic inaccuracy of,
61–62
Matching neural representations, 10
Maternal behavior, 175
Medial cingulate cortex (MCC), 201
Medial frontal cortex, 144
Medial prefrontal cortex (mPFC), 128, 141, 146,
186, 219, 227
Meditative therapy, 107
Medulla, 171
Mental flexibility, 73, 115, 119
Mentalizing, 57, 185, 186, 221–225
Mental-state attributions, 161, 216
Merging, 131
“Metaphorphosis” (Kafka), 51
Microsynchrony, 21
Mimicked neural representations, 5
Mimicking another’s posture, 10
Mimicry, 5, 20, 25, 26, 129, 184. See also Imitation automatic, 200
behavioral effects, 35
unconscious, 184, 200
unobtrusive, 33, 34, 37
Mind, theory of. See Theory of mind
Mindblindness, 60
Mind reading, 19, 220
everyday, 57, 67
Mirroring, 160
Mirror neurons, 24–25, 32, 73, 92, 126–129, 133, 155, 189, 200
Mirror neuron system (MNS), 32, 183, 187, 191–192
auditory, 131
emotional understanding and, 187–188
empathy and, 188–189
affective, 227
interpersonal competence and, 190–191
Mirror system, 25
Mobilization, 171
Modeling, 90. See also Imitation; Mimicry
Monitoring-and-adjustment hypothesis, 52
Monkeys. See Primates
Moral behavior, 86
Moral development, 139
“Moral intuition,” 144
Morality, 148
neuroimaging studies, 144
vs. social convention, 142–146
Moral reasoning, 148, 203, 217
cognitive empathy and, 146–147
and emotional empathic responses to victims, 143–145
Moral socialization, 144
Moral vs. conventional transgressions, 142, 143, 145
Mothers’ empathic accuracy, and children’s self-esteem, 63
Motor imitation, 32–34
Motor mimicry, 4, 5, 20
Music education training, 90
Mutual empathic resonance, 115–116
Mutually shared knowledge, 64
Neural correlates. See also Neuroendocrine correlates
of being imitated, 38
of empathy, 185–187
Neural model of empathy, 226
Neural network for cognitive and affective response, 224–227
Neural response matching, 5
Neuroanatomical basis of empathy, 216–217
Neuroception, 173
Neurodegenerative illness, prefrontal cortex, and empathy, 223–225
Neuroendocrine correlates. See also Neural correlates
of sociality, 175–176
See also specific topics
Nonverbal behavior, 120
Nonverbal clues, 26
Nonverbal expressions of pain, 158
Nucleus accumbens, 207
Occipitotemporoparietal junction, 128
Orbitofrontal cortex (OFC), 77, 78, 146, 207, 217–219, 224, 227, 228
lateral, 141
Other-oriented affective responses, 154, 156
Other-oriented feelings, 8, 10, 11, 203
Other-perspectives, 186, 204, 206.
See also Perspective taking
Overprojection, 48–51
Oxytocin, 175–179
Pain
catastrophizing about one’s, 160
complexities, 154
congenital insensitivity to, 159–160
defined, 154
definition and nature of, 72, 188, 199
emotional contagion and, 78, 155
emotion regulation and, 206–207
vs. empathic concern, viii, 131, 200, 206
Pain assessment, accuracy in, 155, 159
Pain expression/displays
automatic/reflexive vs. deliberate/intentional, 157
genuine vs. dissembled, 159
individual differences in, 159
verbal and nonverbal, 158
Pain processing, 204
sensory-discriminative and affective-motivational aspects of, 201–202
Pain-related empathy, 77, 127, 131, 153, 154, 161–162, 186, 189, 207
emotional regulation and, 207
empathic responses oriented to self vs. other, 153–154
model of adult capacity for, 156–158
contextual/relational factors, 160–161
factors related to observer, 159–160
factors related to person in pain, 158–159
neurobiology, 199–200
Palsy, progressive supranuclear, 223
Parietal cortex (PC), 218
right inferior, 72, 127
Parietal lobe, inferior, 127, 186
Parietal lobule, inferior, 187
Parietal operculum, 226
Pars opercularis, 188, 189, 191
Pars triangularis, 189, 191
Peer relations, empathic accuracy in, 63
Perceived empathy, 33, 125. See also specific topics
Perceived social support, 175
Perception-action coupling mechanism, 200
Perception-action model of empathy, 33
Perceptual emulator model, 129
Personal distress, 7, 71, 73, 203
affect sharing and, 189
definition and nature of, 72, 188, 199
emotion regulation and, 206–207
vs. empathic concern, viii, 131, 200, 206
guilt and, 72
as measured by IRI, 188, 189
mirror neurons and, 131
perspective taking and, 199
self- vs. other-centered responding and, 207–208
social and cognitive factors modulating, 206–209
vs. sympathy, 72
Person-centered approach, 102. See also Client-centered therapy
Perspective adjustment model of language comprehension, 47
Perspective taking, 72, 77, 185, 215
“imagine him” perspective, 7
and levels of empathy, 71
measures of, 67 (see also Interpersonal Reactivity Index)
nature of, 7, 132, 188
neurobiology, 189, 191, 204–206, 219
during perception of pain in others, 204
training in, 90
Perspective-taking instructions, 199, 204, 205
Phylogenetic states of polyvagal theory, 170, 171
Physiological arousal, 76
Physiological synchrony, 65–66
Pity, 8
Polyvagal theory, phylogenetic states of, 170, 171
Posterior cingulate cortex, 226
Postural feedback, 24
Postural mimicry, 21–22
Prairie voles, 177–178
Prefrontal cortex (PFC), 217–221, 223–226.
See also Medial prefrontal cortex; Ventrolateral prefrontal cortex
Prejudice, social, 87, 92
Premotor cortex, 201
Primates. See also Evolution
emotional contagion and empathy in, 25, 169
Projection, 6, 7, 34, 43–44, 52–53
as basic mode of knowing other persons, 44
can fail, 48–51
evidence of, 45–46
limits of, 51–52
a statistical case for, 46–47
Projective empathy, 7
Prosocial behavior(s), 72, 86, 183, 192, 200, 206
highly social mammals and analysis of, 176–179
Prosocial effects of being imitated, 34–36
Prosody, 174
Psychiatric illness, prefrontal cortex, and empathy, 223–225
Psychoanalysis, empathy in, 101
Psychological contact, 115–116
Psychological empathy, 7
Psychopathy, 143–144, 154
emotion dysfunction associated with, 144
Psychotherapy
conditions for change in, 102–104, 115–116
empathic accuracy in, 59–60
ways to improve, 60
empathic attunement in, 116–120
empathy cycle and embodied empathy, 113–114
empathy in, 101, 113, 120, 199 (see also Rogerian empathy)
aspects of therapist’s experience of, 117–118
mimicry and perceived, 33
neuroscience and, 126–128
phenomenology of therapist empathy, 116–118
and treatment outcome, 119–120
ways of enhancing therapists’ capacity for, 128–131
experiential therapists, 130, 132–134
intervention-based, 120
Rogerian model of client-centered, 85, 88
(see also Client-centered therapy; Rogerian empathy)
Racism. See Prejudice
Rapport, 33
Reactive flexibility, 133
Reactivity to stressors, 176
Reading, 87
Reasoning through what others feel, 185
Reflection in therapists, 128
Reflection (projection in reverse), 44–45
Reflection (psychotherapy), 101, 116
Relational victimization, 63
Relationship between empathizer and target of empathy, 132, 160–161. See also Client-centered therapy, therapeutic relationship
Relationships, close
empathic accuracy in, 65
Representational competition, 141
Resonating, bodily, 117. See also Embodied empathy; Somatic resonance
Restitution behaviors, 148. See also Appeasement displays
Risk detection, 174
Rogerian empathy, 101, 103, 109, 110, 131. See also Client-centered therapy
clinical scenarios, 105–109
and organismic experiencing of client and therapist, 104–105
vs. other forms of empathy, 103
Role playing, 90
Role taking, 7, 87, 90, 203
Rule transgression, moral vs. conventional, 142
Sadistic reactions, 154
Safety-threat detection system, 173
Schizophrenia, 223–224
School achievement, 87–88
Second Step, 91
Selective social behaviors, 179
Selective social interactions, 174
Selective sociality, neuropeptides and, 176–178
Self-acceptance, 118
Self-actualizing tendency, 103
Self-agency, 119
Self and other, shared neural circuits between, 200–203
Self-awareness, 74, 115, 119, 128, 133, 206
Self-expression, 119
Self-focused distress, 183
Self-oriented affective responses, 154, 156, 203.
See also Other-oriented feelings
Self-other awareness, 72
Self-other distinction, 185, 186, 206
Self-other overlap, 199, 200, 208
Self-other separation, 73
Self-perspectives, 186, 204–206. See also Perspective taking
Self-recognition, 185
Self-reflection, 128, 133
Self-regulation, 72, 73, 75, 76, 79. See also Emotion regulation
Self-regulatory processes, effortful, 74–75
Self-understanding, 119
Self used as a model, 186
Sensitive parenting, 79
Settle Conflicts Right Now, 90
Sex differences. See Gender differences
Sexually dimorphic neural pathways, 179.
See also Gender differences
Shame, 147, 148
Shared affect, 85, 184, 191
Shared feeling, 43
Shared mental representations, 72, 74, 79
Shared physiology, 6
Shared-representational theory of social cognition, 200
Similarity. See Common ground
Simulation, 7, 126, 227. See also Affective empathy; Emotional empathy
Simulation perspective, 3, 9, 216
Simulation processing, 216, 223–226, 228
Social bond formation, 176
Social cognition, 188, 191, 200, 216, 217
Social communication, 171, 172
Social engagement system, 170, 171
Social intelligence, 88
Sociality
sex differences in, 178–179
species-typical patterns of, 170
Social nervous system. See Evolving autonomic and social nervous system
Social neuroscience, viii, ix, 12
Social phobia, generalized, 207. See also Anxiety
Social psychology and empathic accuracy, 64–65
Social rule breaking, 142
Social skills, 183, 184, 192. See also Interpersonal competence
Social support, perceived, 175
Social understanding, 86. See also Interpersonal understanding
Somatic resonance, 77. See also Embodied empathy; Resonating, bodily
Somatic sensorimotor mirroring, 78
Somatosensory cortex, 127, 201, 204, 226
“Sorting through” metaphor, 118
Spontaneous flexibility, 133
Standard interview paradigm, 59, 66
Standard stimulus paradigm, 58–59, 66
Stanislavski, Konstantin, 24
Stimulus-specific fear, 178
Student empathy, 85, 88
fostering, 89
approaches to, 89–90
effects of, 91
Superior temporal sulcus (STS), 174, 201, 219, 226, 227
Sympathetic distress, 8
Sympathetic nervous system, 174
Sympathetic resonance, 78
Sympathy, 4, 6, 8, 31, 33, 71–72, 117, 153, 156, 188, 199
defined, 71–72
vs. personal distress, 71–72, 75, 76
(see also Personal distress)
Teacher empathy, 85, 88–89
ways to enhance, 89
Temperament in children, Rothbart’s model of, 74
Temporal cortex, anterior, 128
Temporal poles (TP), 141, 146, 186, 219, 226, 227
Temporal sulcus. See Superior temporal sulcus
Temporoparietal junction (TPJ), 38, 141, 146, 186, 206, 220, 226. See also Occipitotemporoparietal junction
Thalamus, 127, 128
Theory of mind (ToM), 57, 60, 146, 147, 185, 216. See also Cognitive empathy
cognitive empathy and, 146, 147, 215, 219–228
“hot” and “cold” aspects of, 221
Theory theories of mind, 6, 9
Training, 90, 101
for empathy, 86, 88, 92–93
in teachers, 88–89
feedback, 60
in perspective taking, 90
Transference (psychotherapy), 115
Trust, 177, 179
Tutoring, cross-age, 90

Unconditional positive regard, 101–105, 109, 132
Unconscious empathic responding, 206
Unconscious mimicry, 184, 200
Unitary actualizing tendency, 103
Unstructured dyadic interaction paradigm, 58–59, 66

Vasopressin, 175–180
Ventral prefrontal cortex (PFC), 217
Ventral premotor cortex, 32, 187, 188
Ventral striatum, 227
Ventrolateral prefrontal cortex, 141, 145, 146, 148
Ventromedial prefrontal cortex (VM), 217–221, 223–226
Verbal empathic understanding responses, 109, 110
Verbal information and empathic accuracy, 62
Vicarious emotion, regulation of, 73
Vicarious emotional arousal, 73
Vicarious experience of pain, 158
Vicarious feeling, 43
Vicariously induced emotion, 74

Vicarious personal distress, 9
Vicarious traumatization, 156
Vigilance, 178
Violent husbands, empathic deficit in, 61–62
Visual information, 62
Visualization techniques, 128
Vocal feedback, 23–24
Vocal feedback hypothesis, 23
Vocal mimicry, 21

“Women’s intuition,” stereotype about, 64–65
Yoked-subjects design, 59

Zygomaticus major (cheek) muscle region, 21