|  |  |
| --- | --- |
| **Evolutionary Trends** | **Primate 🡪 Early human ancestors 🡪 Human** |
| **Brain** |  |
| Size | Size of brain increases over time  Evidence: Measuring cranial capacity of fossilised skulls  (pour sand/beads in to skull 🡪 measure volume)  Average ape = 400-500cm3  Average human = 1350cm3 |
| Convolutions | Gradual increase in number of folds (convolutions) in the surface of the cerebrum  Increase in convolutions = increase in surface area = more neural connections  Evidence: Endocasts (plaster cast of impression left by brain on inside of fossilised skulls) |
| Cerebral cortex | Makes up increasingly larger portion of the brain  Site of higher order functions (vision, memory, reasoning) 🡪 Increase in surface area leads to changes in behaviour and development of special skills |
| **Digits** |  |
| Features | Pentadactyl = 5 digits on each limb  Digits move independently of each other |
| Opposability | 1st digit (thumb) is able to touch each digit  Primates have opposability in hands and feet 🡪 Arboreal life (in trees) 🡪 Grasping appendages  Humans have opposability in hands only 🡪 Bipedal life 🡪 Adaptations for weight bearing foot rather than grasping |
| Ends of digits:  Claws/Nails  Friction ridges | Primitive primates have claws  Higher primates (including humans) have nails on all digits  Friction ridges (fingerprints) on underside and sensory receptors 🡪 Help grip and manipulation of objects  Precision grip 🡪 Full manipulation of small and delicate objects using tips of fingers and thumb (pad to pad rather than tip to tip) |
| Prehensile | Capable of grasping and wrapping digits around branches 🡪 essential for climbing  Power grip 🡪 Allows underside of fingers and palm to tightly hold objects |
| **Dentition** |  |
| Jaw shape | Apes have a more U shaped jaw (parallel)  Humans have a more parabolic shaped jaw  Prognathism (protruding jaw) reduces over time – Apes have pronounced prognathism  Reduced prognathism allows skull to balance perfectly on foramen magnum |
| Teeth structure | Apes have larger, projecting canines  Gap between incisors and canines (diastasis) present in apes and early hominins  Molar shape has changed over time from 3 cusped to “Y” shaped 5 cusps as diet changed |
| **Skull shape** |  |
| Brow ridges | Become less pronounced over time  Apes have larger and stronger muscles for jaw movement (needed for grinding a mostly plant based, fibrous diet) 🡪 Brow ridges support weaker bones in face |
| Sagittal crest | Ridge of bone that runs along the midline of the top of the skull  Attachment point of large jaw muscles  Present in larger apes, greatly reduced in most hominins |

|  |  |  |
| --- | --- | --- |
| **Adaptations for bipedal locomotion** | **Apes** | **Humans** |
| **Foramen magnum**  (Hole in skull where spinal cord joins the brain) | Towards the back of the skull | Gradually moved forward over time 🡪 Now **located centrally** underneath skull  Skull now balanced on top of vertebral column 🡪 Large neck muscles no longer needed to hold head in position |
| **Jaw Bone** | Pronounced prognathism | **Prognathism reduced** over time 🡪 Smaller non-protruding jaw = flatter face  Weight evenly distributed in front and behind foramen magnum 🡪 Balanced with minimal muscular effort |
| **Vertebral column** | “C” shaped curvature with spinal cord entering back of skull  Forces them forward on all fours 🡪 quadrupedal “knuckle-walkers” | **“S” shaped** double curvature created by wedge shaped lumber vertebrae  Vertebral column directly under skull 🡪 Head balanced on top 🡪 Cervical curvature (top of “S”) directs centre of gravity under skull 🡪 Able to stand upright |
| **Pelvis** | Long and narrow 🡪 Doesn’t provide stability needed for walking bipedally | **Short, broad and bowl shaped**  Broad pelvis 🡪 Attachment of femurs wide apart = allow for carrying angle 🡪 Attachment points for large buttocks muscles to move legs and maintain upright position  Bowl shaped 🡪 Supports abdominal organs and developing foetus |
| **Femurs** | Smaller carrying angle 🡪 Line from hips to knees is almost straight 🡪 less stability when standing bipedally 🡪 Feet do not strike ground “one in front of the other” 🡪 Sway from side to side | **Femurs converge** towards knees to create a **carrying angle** 🡪 Weight distribution is close to central axis 🡪 Increases stability and enables a **striding gait** (hip and knee fully extended, one foot in front of the other) |
| **Knee joint** | Degree of movement is less 🡪 doesn’t fully straighten when standing upright | Large and strong outer hinge to take weight of body and **support upright stance**  Knee can be straightened but not bent backwards 🡪 ligaments provide natural resistance so **energy is not waisted** to support standing position |
| **Length of arms and legs** | Arms longer than legs 🡪 Higher centre of gravity when standing upright 🡪 Less stability | **Legs are longer than arms** 🡪 lower centre of gravity 🡪 Increased stability |
| **Foot** | Longitudinal arch only 🡪 Flat-footed 🡪 Can’t maintain bipedal locomotion for long periods of time | **Big toes** now aligned with other toes and **weight bearing** to support bipedal locomotion  **Longitudinal and transverse arches** 🡪 allows for perfect weight distribution 🡪 striding gait (hip and knee fully extended) |
| **Others** |  | **Muscle tone** 🡪 Partial muscle contraction to support posture  **Swinging arms** 🡪 Compensate for rotating trunk |