Compare and contrast the maturational and cultural perspectives of the development of infants' gross motor skills, using empirical studies to support your argument.

Gross motor skills are the basic movements infants acquired (birth-24months). These include reflexes, balancing, crawling, standing and walking. Motor study is important in understanding infant development for three reasons. Firstly, infants devote around half of their waking hours, around 5/6 hours, towards motor behaviour (Adolph & Joh, 2007), necessitating the implications of motor acquisition for other behaviours (Clearfield, 2011). Secondly, infants have limited capability to elaborate on their developmental experience with language; therefore movements are the most reliable measure of development. Lastly, and most importantly, “movement is behaviour” (Adolph & Berger, 2005; p.223); behaviour derives from action; therefore (depending on the area(s) of study) observation of movements should be the primary observation for psychologists. Two perspectives investigate infant movements: maturational theory (MT) explains motor development as milestone acquisitions in relation to body growth, whereas cultural view (CV) explains it in cultural-contextual terms. Despite inherent differences, they can be used interactively in applied practice by paediatricians to assess the health of different infants’ motor development contextually.

MT is biologically and developmentally driven; infants develop motor skills sequentially and predictively in response to growth in the skeleton, muscles, nervous system and the brain. Growth occurs in cephaelocaudal and proximodistal directions (Gesell, 1925; Gesell and Ames, 1940; Johnson, & Blasco, 1997). Growth is driven by genetics – for example, up to 80% of eccentric arm flexor strength can be attributed to genes (Montgomery & Safari, 2007). MT explains the role of reflexes, predicts generalised outlines of gross motor development according to biological criteria, and applies these principles to motor disorders in terms of ‘deficits’ (Knoblock & Pasmanick, 1974; Rochat & Hespos, 1997; Gesell, 1925; Adolph & Berger, 2006; Muscle Dystrophy Campaign, (MDC), 2011; Clinical Practice Guideline, (CPG), 2006).

CV is a product of the observed variety in motor skill acquisition between cultures (Wong, 2009; Vierhaus, 2011; Diamond, 2007; Adolph & Berger, 2005). Sub-cultural factors also contribute, such as parenting styles, nutrition, medication, environmental stimulation and play-positioning (Tamis-LeMonda & Adolph, 2005; Wong, 2009; Vierhaus, 2011; Shafir et al., 2006; CPG, 2006; Clearfield et al., 2011; Tudella et al., 2011; Davis et al., 1998; Dewey et al., 1998). These are mediated by societal values and consequent practice. Consider parenting style; care-givers can provide scaffolding to infants learning to stand (Tamis-LeMonda & Adolph, 2005). CV does not explain causes of motor disorders, however, it explains them in terms of ‘difference’ between infants as opposed to ‘deficits’; cultural practices vary, subsequently producing different infants.

Motor study is physiological in nature; however, it is strongly linked with psychology. Gross motor skill acquisitions are imperative because they facilitate independence, cultivate fine motor skills, and change perceptions of the environment (Clearfield, 2011). Gross motor acquisition also has massive implications for psychological development in areas like cognition, socialisation, intelligence and emotion (Tervo, 2003; Clearfield, Osborne, & Mullen, 2008). In contemporary research, perception and movement are seen by some as interdependent processes, relying on one-another for new information to be interpreted (Adolph & Berger, 2006). This derives from the definitive works of Gibson (1950) emphasising the role of movement with perception (see Rookes & Willson, 2000).

According to MT, new-born movements are basic and reactive, defined mostly by their innate reflexes. Three examples are 'rooting', 'asymmetrical tonic-neck' and 'stepping'. Rooting enables new-borns to latch onto the mother's breast, aiding survival (Rochat & Hespos, 1997). Asymmetric tonic-neck occurs when the baby is on their back; their arms raise and eye-gaze meets their hands. This may be coordinating vision and arm movement, which could later assist with fine motor skills (Knoblock & Pasmanick, 1974). Stepping occurs when an infant is held upright, which arouses muscle activity (Adolph & Bergers, 2006). This reflex could be preparatory for walking. Newborn reflexes are instinctual, universal, and extremely specific (Kodiak, 2006). However, with time, these reflexes are masked by outlying factors, such as leg size in the case of stepping (Thelen et al., 1984); they found that thinner-legged infants and bigger-legged infants placed in water are more likely to step than bigger-legged infants. This is a cultural phenomenon; western infants are heavier due to protein-rich milk, consequently they have bigger legs (Centre's-for-Disease-Control-and-Prevention; see Miller, 2011). MT accounts for the innate occurrence of reflexes; however, the masking of the stepping reflex clearly shows the environment's mediating role.

MT provides a general framework of milestones, defining typical and atypical motor development (Adolph & Berger, 2006). This framework offers a generalisation of motor development for infants, however it is massively variable (Adolph and Berger, 2006; CPG, 2006). Biological maturity enables motor skill acquisition, and this is achieved with variant amounts of time. Tudella et al. (2011) found that Down's syndrome infants developed motor skills significantly slower than typical infants; nevertheless all acquired the same skills – they just developed *differently*. However, prone positioning aided earlier motor development in Down's syndrome infants. Similarly, Montgomery & Safari (2007) attributed *up to* 80% of arm eccentric flexor strength to genetics. The other 20% is most likely an environmental factor (training). Thus, play-positioning and training reiterate the mediating role of the environment (McGraw, 1935; see Pick, 2002; Montgomery & Safari, 2007; Davis et al., 1998; Dewey et al., 1998).

As infants develop, maturation becomes growingly influenced by the environment. For example, care-giver influence is apparent in Jamaica and Mali, where infants avoid crawling. They are prompted to sit upright by being placed in ground holes (Adolph & Berger, 2005). Similarly, other cultures jump their infants to promote earlier onset of walking (Keller, 2003; see Adolph & Berger, 2006). Naturally, the implications of care-giver decisions will become more apparent as the infant grows. Missing out crawling will have implications for the immune system, (Wong, 2009) either by avoiding harmful pathogens, or conversely, by limiting exposure to 'healthy' bacteria; earlier onsets of walking will naturally lead to earlier changes in perception (Clearfield, 2011), with consequences in family-life following short-after.

Gross motor skill acquisition and physiological changes are interrelated. New-borns are extremely top-heavy with large heads and torsos and weak legs, hence they struggle to balance their heads; however, changes in muscle mass help toddlers maintain head balance. Adolph & Avolio (2000) phrase the change as follows: "…as infants grow, body fat and muscle mass are redistributed… toddlers… have more muscle relative to fat" (p.1148). Milestones observed from movement can be compared to physiological changes (CPG, 2006; Berk, 2009; Adolph, Weise & Marin, 2003). Head-balance and strength to roll from side-to-side is achieved by around 4months (CPG, 2006; Bayley, 1969, 1993, 2005; see Berk, 2009). By 8months, newborn reflexes have faded (CPG, 2006). Between 7-12 months, infants can begin to crawl, pull themselves up to stand and walk (CPG, 2006; Bayley, 1969; 1993, 2005). This period is massively variable across infants (Adolph & Berger, 2006). Indeed, 'two steps forward, one step back' occurrences are common during this transitional period (Adolph & Berger, 2006). Sometimes, infants learning to walk will revert to crawling if the situation is too hazardous (Adolph & Berger, 2006). Adaptation of movement in difficult situations also indicates infants' perceptual abilities.

Newborns prefer biological motion over random motion (Simion et al., 2008). 'Motion' is achieved by patterning lights into life-like shapes; dot-to-dot perception completes the image along Gestalt lines. Preference to biological motion suggests that human movement and perception are understood innately. Thus, motor and perceptual ability is present from birth and only requires time to emerge. However, pure maturation is unlikely; research has shown that less time in the prone position can slow crawling and other gross motor behaviors for a short time (Tudella et al., 2011; Davis et al., 1998; Dewey et al., 1998). Although this effect has been found to be transient, disappearing by 18months (Dewey el al., 1998). The short-term effect means that positioning can aid or slow motor development; efficient biological maturation needs the right environmental conditions.

Are MT milestones universal across cultures? Research suggests distinctive cultural differences (Wong, 2009; Adolph, 2008; Vierhaus, 2011; Diamond, 2007; Adolph & Berger, 2006). Wong (2009) cited an observational-anthropological study reporting evidence that crawling is a western social construct. Tracer investigated the Au tribes of Papua New-Guinea, and found they do not promote crawling in their infants (Wong, 2009). Mexico, Japan, India, Paraguay, Jamaica, Mali and Indonesia also practice this rule (Greenfield, 1992; Seymour, 1999; Adolph & Berger, 2005; Wong, 2009). Wong (2009) asserts that it can make evolutionary sense to *avoid* crawling; carrying infants limits their exposure to pathogens, and primates do not crawl before walking either. Tracer suggests that improvements in living conditions over the past few centuries in the west have made crawling more feasible to promote (Wong, 2009). However, Vierhaus (2011) found that although there were reported differences between German and Cameroonian infants in motor skills and language, basic similarities were still present. Other research has also found general gross motor milestones are met across different cultures (World Health Organisation, (WHO), 2006). WHO studied five diverse cultures, looking at 2–24 month olds. 90% of infants achieved 5/6 gross motor milestones, suggesting strong maturational presence even in different cultures. Maturation occurs within a cultural context, and despite the wide variation of environmental factors influencing motor development, most healthy infants acquire what they need for successful locomotion by 24months. The issue at hand is *how* infants acquire these motor skills.

Cultural influences affect specific milestones; where newborn reflexes are universal (Kodiak, 2006) crawling can be missed (Wong, 2009). Therefore, some motor skills are essential, whereas others are ‘optional’. In evolutionary terms, some are necessary for survival, whereas others may be adaptive to miss; for example, not having rooting-reflex would be detrimental (Rochat & Hespos, 1997), whereas not crawling in some situations may be adaptive (Wong, 2009).

Motor disorders most commonly occur in 6-18 month olds (Tervo, 2003). The massive progression during this period contains many inherent factors that can inhibit it. Problems acquiring motor skill can be due to biological deficits (e.g. cerebral palsy), or delay, mostly due to environmental constraints (nutrition; e.g. Shafir et al., 2006). Deficits are most common (Tervo, 2003). If MT can predict the general sequential progression of gross motor development, it must be equipped to predict the regression or inhibition caused by motor disorders. Muscular Dystrophy is a disease that affects the musculoskeletal system and hampers locomotion (MDC, 2011). Depending on the severity and type, MD impairs walking ability; progression is steady and once abilities are lost, they are rarely regained; patterns of deterioration are fairly predictable (MDC, 2011). MD cannot be cured; however regular exercise can delay progression to an extent (MDC, 2011). Eventually, a wheelchair is required as locomotion disappears. MD highlights several key points: firstly, deterioration is predictable, which supports MT; secondly, motor development heavily relies on the health of the musculoskeletal system, supporting MT; lastly, although environmental factors can delay regression, this effect is transient.

Hypotonia is another motor disorder example (Tervo, 2003). It has biological causes, either in the central nervous system or neuromuscular system. It is typically present in ‘floppy’ infants who struggle to maintain upright position, due to muscle weakness (Tervo, 2003, CPG, 2006). Unlike MD, this condition can be significantly reduced with physical and occupational intervention (CPG, 2006), reaffirming CV’s importance when applying therapy. The use of the terms ‘delay’ and ‘different’ over ‘deficit’ here are important: for parents, knowing their infant is delayed can promote intervention; and viewing their infant as ‘different’ rather than ‘lacking’ sustains a sense of individualism. MT’s deterministic outlook can downplay the role of interventions if the condition is too severe, whereas CV promotes self-help and motivates change, as it is possible (even if only temporarily) in MD. Using both MT’s predictions and CV’s empowerment simultaneously alleviates the problem of determinism.

Research studying general milestone acquisition and developmental disorders can be applied in practice. General outlines can be applied by pediatricians to guide parents (CPG, 2006; Tervo, 2003; Adolph & Berger, 2006). Cultural research provides important insights on the general milestone view. Research finding differences in cultural practices (Wong, 2009; Vierhaus, 2011; Adolph 2008, Diamond, 2007) demonstrate how important it is to place predictions on motor development cautiously to prevent cultural-bias. Applying western norms to other cultures may result in some milestones being ‘missed’ (Wong, 2009). Differences are common even between culturally-similar infants (Adolph & Berger, 2006), due to environmental differences in nutrition, play-positioning and stimulation (Shafir et al., 2006; CPG, 2006; Clearfield et al., 2011; Tudella et al., 2011; Davis et al., 1998; Dewey et al., 1998). One effective application of developmental acquisition assessment used by pediatricians is the Gesell Developmental Observation-Revised [GDO-R] (2010). It is an observational-qualitative assessment, investigating various areas of development, including gross motor acquisition. Intervention compares the infant to set-criteria (GDO-R, 2010).

Motor development is dynamic. Motor skills are acquired differentially, perhaps a reflection of the choppy rate of physical growth itself (Adolph & Berger, 2006). Despite (sub)cultural variances, restrictions of generalised practice should not be exaggerated; many milestones are met across different cultures (WHO, 2006; Vierhaus, 2011). Many movements, such as reflexes and walking, are universal and are performed by the vast majority of people (Kodiak, 2006). Moreover, defining deficits implies determinism underplays intervention – where appropriate, applying 'delayed' or 'different' approaches should be used, as in Downs's syndrome (Tudella et al., 2011). Ultimately, motor development derives from genetics, which are influenced by the environment. Newborns possess universal reflexes; however, infants grow according to their unique developmental path. Some movements are missed, mostly due to environmental conditions. For most, walking is mastered by 24months; here, the implications of psychological development emerge (Clearfield, 2011).

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