# 戴具上孕婦乘員與垂向振動環境下之生物動態響應研究


## 曾福廣、梁卓中

E-mail: 9314504@mail.dyu.edu.tw



**摘 要**

車輛受到隨機路面之作用，常造成車身劇烈振動，此振動環境可能會使孕婦產生不舒適的感覺或潛在的損傷，進而影響到胎兒之發育。本論文乃以載具上孕婦乘員於垂向振動環境下之生物動態響應為研究對象。本論文首先評估Muksian考慮內在力之人體集中質量模型、Muksian不考慮內在力之人體集中質量模型、Patil人體集中質量模型與Qassem人體集中質量模型等四個不同自由度之人體模型，並配合相關生物實驗數據相互比較後，選定較適合之Muksian不考慮內在力之人體集中質量模型為探討孕婦的人體集中質量模型之原型。其次再利用孕婦因懷孕所增加之質量，合理分配質量於Muksian不考慮內在力之人體集中質量模型中，建立孕婦坐姿集中質量模型，並應用此模型探討Jelen所提出孕婦於垂向振動環境下之危險頻率，兩者之解十分接近。本論文另將孕婦坐姿集中質量模型與Baumal車輛懸吊系統模型及Bouazara車輛懸吊系統模型相互結合，模擬車輛行駛於ISO所制訂之隨機路面上，並依據ISO 2631之人體損傷容忍極限及人體舒適度等相關規範，評估出於普通路面下，孕婦均可承受乘載於兩車輛懸吊系統時因路面起伏所造成之振動；而於惡劣路面下，孕婦可承受乘載於Baumal車輛懸吊系統模型時因路面起伏所造成之振動，而乘載於Bouazara車輛懸吊系統模型時，路面所造成之振動可能會對孕婦造成傷害。最後，本論文以Bouazara車輛座椅為基準，探討車輛座椅對孕婦生物動態響應之影響，研究結果顯示，當提高Bouazara車輛座椅之阻尼參數為1.5倍時，於普通路面與惡劣路面下，孕婦骨盆所受到之均方根加速度可減少約30%，可有效降低孕婦可能受到傷害，但提高座椅之阻尼時，仍須配合適當之勁度，才能達到有效之減振效果。本論文之研究結果希能提供孕婦於垂向振動之傷害預防與車輛業界對車輛懸吊系統及車輛座椅設計之參考。



關鍵詞 : 孕婦，生物動態響應，集中質量系統模型，車輛懸吊系統，隨機路面


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