# 行政院國家科學委員會專題研究計畫 成果報告

## 四級棒球選手視覺能力差異性之研究
## 研究成果報告(精簡版)

計 畫 類 別 ： 個別型
計 畫 編 號 ： NSC 95-2413-H-216-001-
執 行 期 間 ： 95 年 08 月 01 日至 96 年 07 月 31 日
執 行 單 位 ： 中華大學通識教育中心

計 畫 主 持 人 ： 劉雅甄
共 同 主 持 人 ： 龔榮堂
計畫參與人員： 碩士班研究生-兼任助理：陳靜怡、林國華
講師級-兼任助理：簡永杰

報 告 附 件 ： 出席國際會議研究心得報告及發表論文

處 理 方 式 ： 本計畫可公開查詢

中 華 民 國 96 年 10 月 29 日

**行政院國家科學委員會補助專題研究計畫** **□ 成 果 報 告**
**□期中進度報告**

# 四級棒球選手視覺能力差異性之研究

計畫類別：■ 個別型計畫　　□ 整合型計畫
計畫編號：NSC 95－2413－H－216－001－
執行期間：　95 年 08 月 01 日至 96 年 07 月 31 日


計畫主持人：劉雅甄 助理教授 中華大學通識中心體育組
共同主持人：龔榮堂 副教授 國立體育學院球類學系
計畫參與人員：簡永杰 講師 高苑科技大學企業管理系
　　陳靜怡 研究生 國立台灣體育學院休閒運動管理研究所
　　林國華 研究生 國立台北教育大學體育研究所


成果報告類型(依經費核定清單規定繳交)：■精簡報告　□完整報告

本成果報告包括以下應繳交之附件：
□赴國外出差或研習心得報告一份
□赴大陸地區出差或研習心得報告一份
■出席國際學術會議心得報告及發表之論文各一份
□國際合作研究計畫國外研究報告書一份

處理方式：除產學合作研究計畫、提升產業技術及人才培育研究計畫、列管計畫及下列情形者外，得立即公開查詢
□涉及專利或其他智慧財產權，□一年□二年後可公開查詢

執行單位：中華大學 體育組

中　華　民　國　九十六　年　十　月　二十五　日

# 四級棒球選手視覺能力差異性之研究
## Comparison to Visual Ability Among Four-Stages Baseball Players


**摘　要**

本研究目的在於探討棒球選手視覺能力之發展情形，並比較成棒、青棒、青少棒、少棒等四級選手，以及比較優秀選手、一般選手、非運動員等不同棒球水準選手，動體視力、眼球運動、周邊視野以及瞬間視力等視覺能力之差異。研究對象為 222 名不同級別(成棒、青棒、青少棒、少棒)和不同棒球水準(國際級選手、國內級選手、非運動員)等男性棒球選手，利用 ATHLEVISION 運動視覺測試軟體分別進行動體視力(向左、向下、向右、向上)、眼球運動、周邊視野以及瞬間視力等測試；並以 Kruskal-Wallis 單因子等級變異數分析和 Dunn 多重比較進行統計分析。研究發現(1)10-15 歲是運動視覺快速發展階段，15-24 歲則開始下降；(2)對於國內級選手和非運動員而言，少棒階段有顯著較低的運動視覺能力(p<.05)，但國際級選手則在成棒階段有顯著較佳的運動視覺能力(p<.05)；(3)國際級選手的運動視覺能力顯著優於國內級選手(p<.05)，而國內級選手又顯著優於非運動員(p<.05)。本研究證實視覺能力會隨年齡變化，且不同階段與不同棒球技能水準之間具顯著差異，特別是在成棒階段以及優秀選手；因此，本研究結果可做為遴選具潛力選手、設計視覺訓練課表以及改善棒球技能之參考依據。



**關鍵詞：運動視覺、發展、動體視力、壘球**



**ABSTRACT**

The purposes of this study were to investigate the development of dynamic visual acuity (DVA), eye movement (EM), peripheral vision (PV), and momentary vision (MV), as well as to exam differences among different educational stages and baseball skill levels. Two hundred and twenty two male subjects with different educational backgrounds (university, senior high, junior high, elementary school) and baseball skill levels (international players, national players, non-athletes) participated voluntarily in this study. All subjects first had to qualify through a screening process that consisted of visual fatigue and static visual acuity, before measuring sports vision (SV) by ATHEVISION software. Kruskal-Wallis one-way analysis of variance by ranks and Dunn's multiple comparison procedure were used to process all data. Results indicated that (1) 10-15 years of age had a rapid increase period for sports vision, but 15-24 years old had a decline period. (2) There was a slight change after the junior-high stage in SV for national players and non-athletes, but SV at the elementary stage was significantly lower (p<.05). The university stage had the best SV for international players (p<.05). (3) International players SV was significantly better compared to the other groups (p<.05), and the national players SV was significantly greater compared to non-athletes (p<.05). The results suggest that visual abilities varied according to age, and critical parameters between different educational stages and level players, particularly at the university stage and elite players. The findings, therefore, would apply to selecting potential players, to design a visual training program, and to improve baseball skills.



**Keywords: sports vision, development, DVA, softball**

## INTRODUCTION

Visual ability plays an important role on performance in fast-ball sports such as baseball or fast-pitch softball. Baseball or softball batters actually need to watch the ball for the whole of its trajectory in order to hit it (Flyger et al, 2006). There are several visual abilities such as static visual acuity, kinetic or dynamic visual acuity, eye movement, depth perception, eye-hand coordination, peripheral awareness, visual reaction time, visualization, focus or convergence flexibility, contrast sensitivity, light sensitivity and visual concentration (Loran & MacEwen, 1997). Some of previous studies have shown the significant correlation between visual abilities with performance in baseball players (Adams, 1965; Falkowitz & Mendel, 1977; Sherman, 1983; Hoffman et al, 1984; Portal & Romano, 1988; Classe et al, 1996; Classe et al, 1997), the significant difference among baseball player and non-athletes(Sanderson, 1981; Horner, 1982; Rouse et al, 1988; Solomon, 1988; Berg & Kilian, 1995; Laby et al, 1996; Maeda & Tsuruhara, 1998a, 1998b), sports vision could improves by proper visual training or baseball training (Long and Rourke, 1989; Long and Riggs, 1991; Maeda and Tsuruhara, 1998a, 1998b). Sports vision should be have the best training effect, when baseball player trains their visual ability or baseball skill at peak in developmental curve of sports vision. However, there is no study to analyze the development curve of sports vision by age under skill levels so far. In order to demonstrating hypothesis, the purposes of this study were to investigate the development of dynamic visual acuity, eye movement, peripheral vision, and momentary vision, as well as to exam difference among different educational stages and baseball skill level.

## METHOD AND MATERIAL

**Subjects:**

222 male subjects (age range from 10 to 26 years old) with different educational stages (university, senior, junior, elementary) and baseball skill levels (international players, national players, non-athletes) participated voluntarily this study. Background of subjects was shown in Table-1.

Table-1: Age, sport experience, VF and SVA of four groups.

| Stages | n | Age (yr) | Experience (yr) | VF (Hz) | SVA (L-eye) | SVA (R-eye) |
|---|---|---|---|---|---|---|
| University | 66 | 20.80±1.91 | 10.98±1.78 | 32.47±5.31 | 1.29±0.30 | 1.31±0.38 |
| Senior-high | 60 | 16.77±1.02 | 7.32±1.60 | 29.51±4.02 | 1.35±0.46 | 1.34±0.42 |
| Junior-high | 59 | 14.66±1.29 | 3.83±2.62 | 29.04±4.87 | 1.17±0.26 | 1.16±0.49 |
| Elementary | 37 | 11.16±0.98 | 1.18±0.98 | 28.76±5.22 | 1.15±0.28 | 1.17±0.31 |

**Measure procedural:**

All subjects tested visual fatigue (VF), static visual acuity (SVA), and sports vision at indoor in one day, respectively. All tests were conducted before regular baseball practice session. Subject allowed to practice in each test until they totally understand measure procedural. Subjects allowed wear a glasses or contact lens at all of tests. In order to screen qualify subjects, visual fatigue device and Landolt C table were used in this study. In VF test, Red dot shows at different frequency in the center of monitor. Subject requested to identify when red dot flash at certain frequency. Frequency reflects VF level. Standard SVA measure procedural was conducted by using Landolt C table. After statistical analysis of one-way ANOVA with repeated measurement, it showed that there is not significant difference among groups in VF and SVA of both eyes ($p>.05$). The result was shown in table-1. It indicated that subjects have similar visual condition before DVA test.

ATHEVISION commercial software (Windows version vol.1, Asics Corp. Japan) was used to measure dynamic visual acuity (DVA), eye movement (EM), peripheral vision (PV), and momentary vision (MV). DVA was defined the ability to discriminate the fine part of a moving object, subjects required read numbers that move at high speed. DVA measured to read one-digit numbers that move rapidly. The moving number changes twice during a test, so subject should be recognize three numbers and enter the three numbers in order of appearance. The numbers move in four directions, right, left, down, and up, which showed by DVA-right, DVA-left, DAV-down, DVA-up. DVA measurement showed as figure-1.

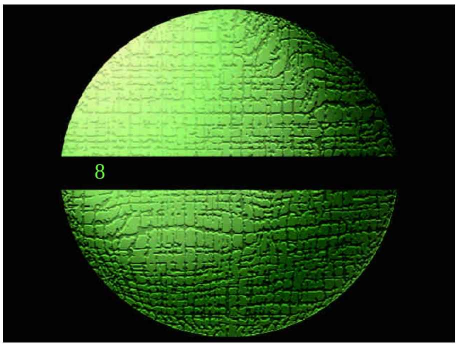



Figure-1 DVA measurement

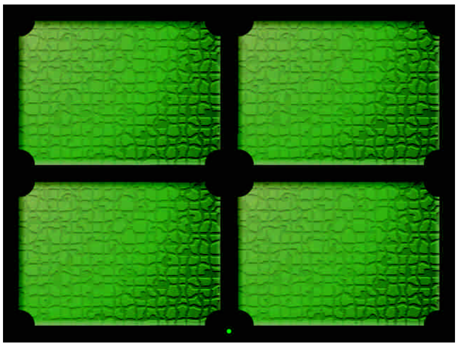


Figure-2 EM measurement

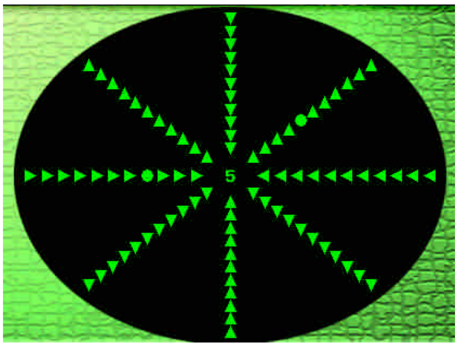



Figure-3 PV measurement

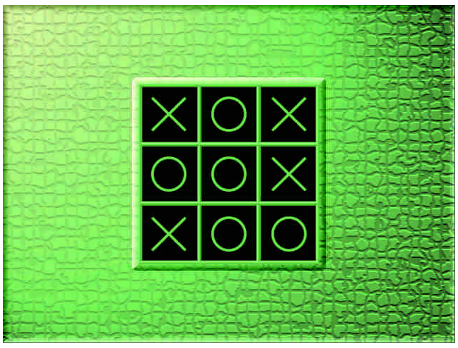


Figure-4 MV measurement

EM was defined the ability to switch the visual line quickly, subject required identify two types of symbols that flash randomly at various places on the screen. Subject need to answer the position where the symbol ■ changes to ●. EM measurement showed as figure-2. PV was defined the ability to ensure a broad visual field, subject required identify two types of symbols that appear around a number at center of the screen. Subject need to answer the center number firstly, and then the two directions that including the symbol ●. PV measurement showed as figure-3. MV was defined the ability to assess a situation in a moment's time, subject required repeat a symbol pattern displayed momentarily. The two types of symbols are displayed in the 3×3 table. Subject need to answer symbols that are assigned to cells. MV measurement showed as figure-4.

Testing score by ranks was gave depend on subject's ability from 1 to 10. The DVA was calculated by DVA-right, DVA-left, DAV-down and DVA-up. Then sports vision was sum up DVA, EM, PV and MV. The calculated formulas showed as below.

*DVA = DVA-right + DVA-left + DVA-down + DVA-up*
*Sports Vision = DVA+EM+PV+MV*

**Statistics:**

Kruskal-Wallis one-way analysis of variance by ranks and Dunn's multiple comparison procedure were used to process all data. The accepted level of significance was set at 5%. The data are presented as means ± SD. All statistics were analyzed by SPSS 12.0 version.

## RESULTS

**Development of sports vision in baseball players by age:**

Baseball players (n=149) were analyzed for the developmental curve of sports vision by age. The results were showed that (1) 10-16 years old was rapidly developmental period for DVA, 16-24 years old was decline period. Showed as Figure-5. (2) EM increases during the period of 10-14 years old, but decreases after 15 years old. Showed as Figure-6. (3) There was slight change in developmental curve of PV. It slightly decreases after 14 years old. Showed as Figure-7. (4) 10-14 years old was rapidly developmental period for MV, 14-24 years old was decline period. Showed as Figure-8. (5) 10-15 years old was rapidly increase period for sports vision, but 15-24 years old was decline period. Showed as Figure-9.

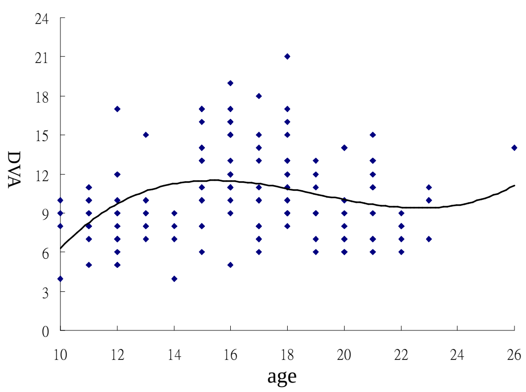



Figure-5 DVA developmental curve

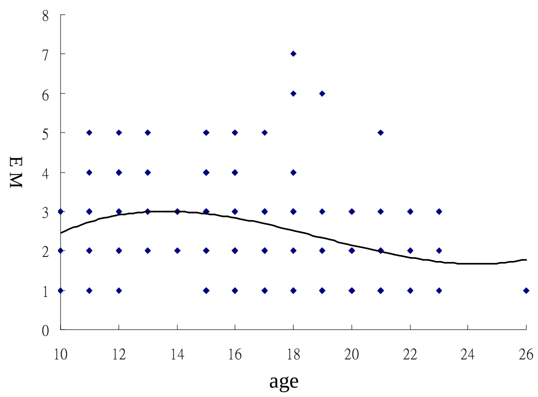



Figure-6 EM developmental curve

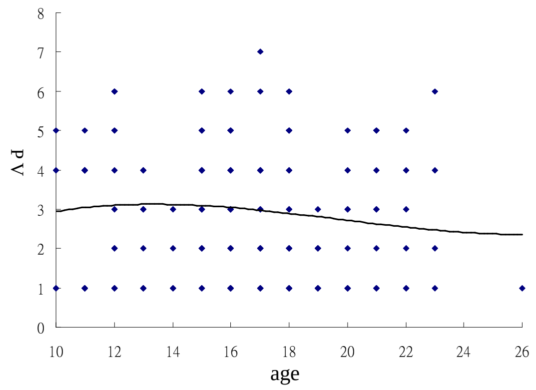



Figure-7 PV developmental curve

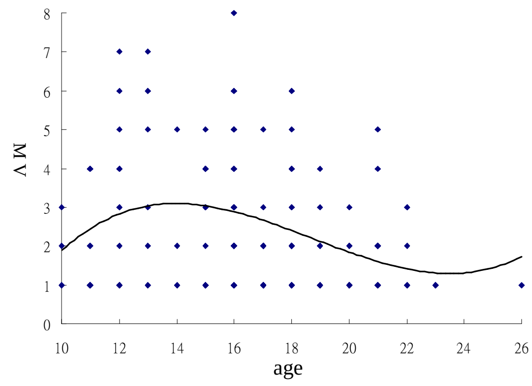



Figure-8 MV developmental curve

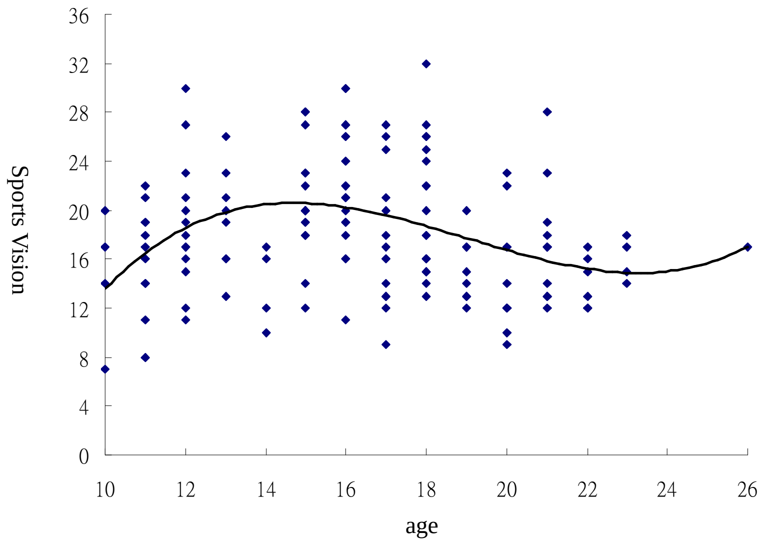



Figure-9 Developmental curve of Sports vision by age

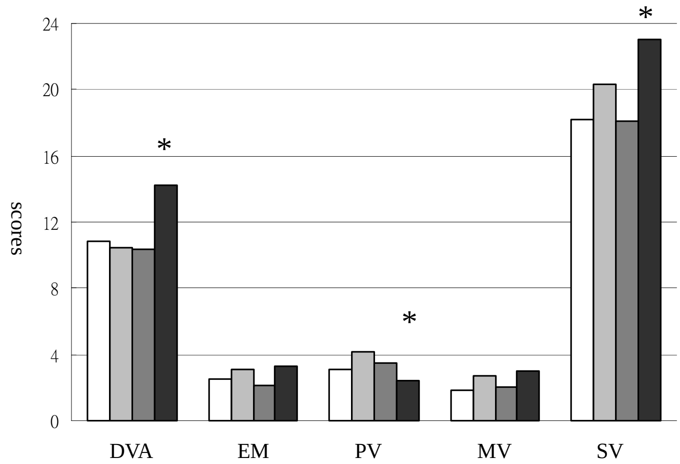



Figure-10 Difference of visual ability in international players (*p<.05)
(White is elementary, gray is junior, deep gray is senior, black is university)

**Difference among educational stages:**

After analyzing data of all subjects (n=222) by Kruskal-Wallis one-way analysis of variance by ranks and Dunn's multiple comparison, the results reveal that (1) International players at university stage have significant better DVA and SV than at other educational stages (p<.05), but PV at junior-high stage significant better than that at university (p<.05). Showed as Figure-10. (2) For national players, DVA, PV, MV, and SV at elementary stage were significant worst than those at other stages (p<.05). Showed as Figure-11. (3) For non-athletes, EM, MV, and SV at elementary stage were significant worst that those at other stages (p<.05). Showed as Figure-12.

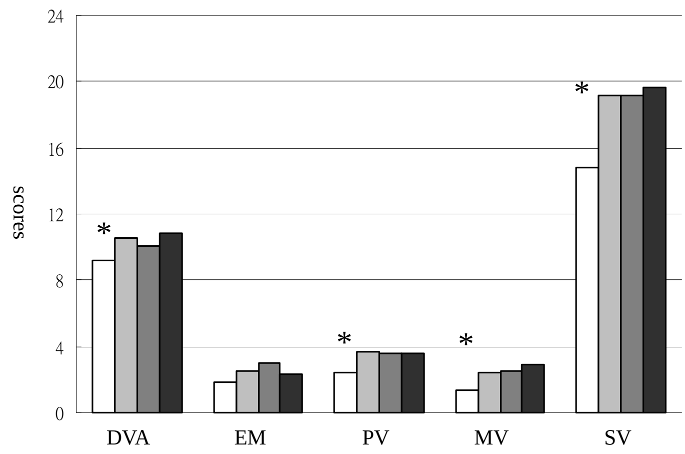



Figure-11 Difference of visual ability in national players (*p<.05)
(White is elementary, gray is junior, deep gray is senior, black is university)

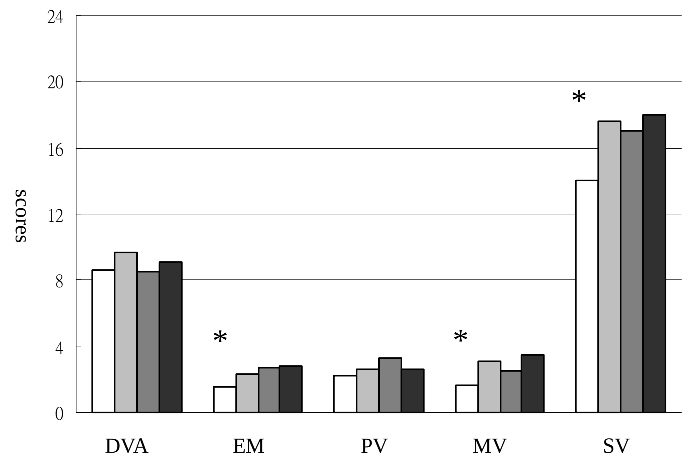



Figure-12 Difference of visual ability in non-athletes (*p<.05)
(White is elementary, gray is junior, deep gray is senior, black is university)

**Difference among baseball skill level:**

After analyzing data of all subjects (n=222) by Kruskal-Wallis one-way analysis of variance by ranks and Dunn's multiple comparison, the results indicated that (1) international players at university and at elementary has significant the best DVA (p<.05). Baseball players at senior-high, including international level and national level, has significant better DVA than non-athletes (p<.05). Showed as Figure-13. (2) international players has significant the best EM, except that at senior-high (p<.05). Showed as Figure-14. (3) international players at elementary and at junior-high has significant the best PV (p<.05), but national players at university has significant the best PV (p<.05). Showed as Figure-15. (4) non-athletes at junior-high and at university has significant the best MV (p<.05). Showed as Figure-16. (5) international players at elementary, at junior-high, and at university has significant the best SV (p<.05). Showed as Figure-17.

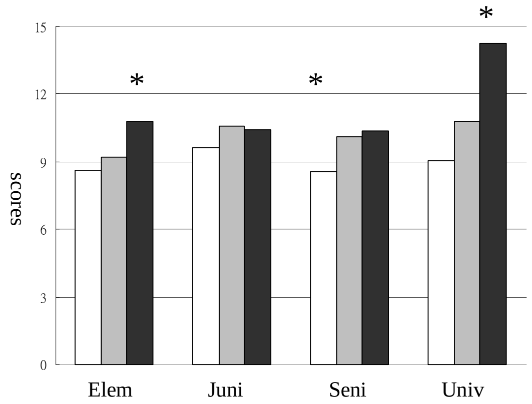



Figure-13 Difference DVA among levels

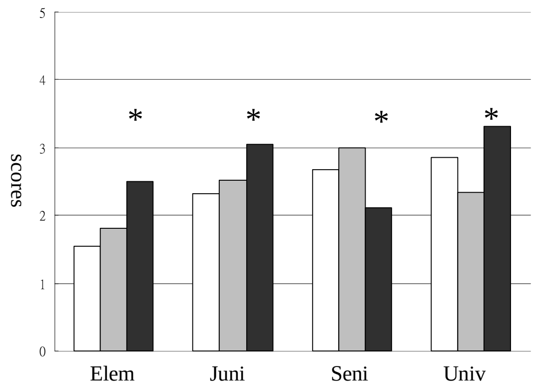



Figure-14 Difference EM among levels

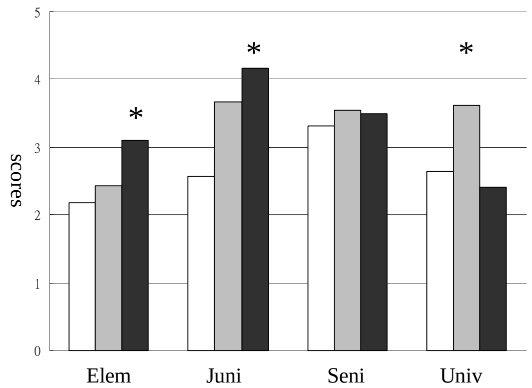



Figure-15 Difference PV among levels

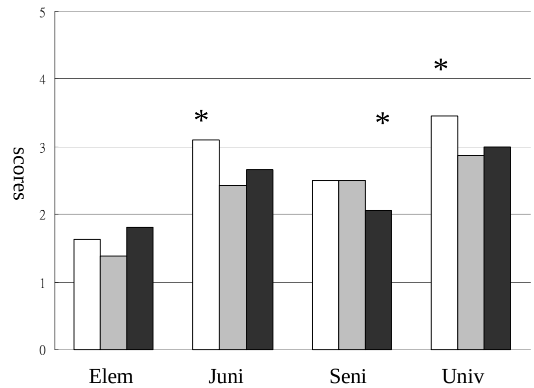



Figure-16 Difference MV among levels

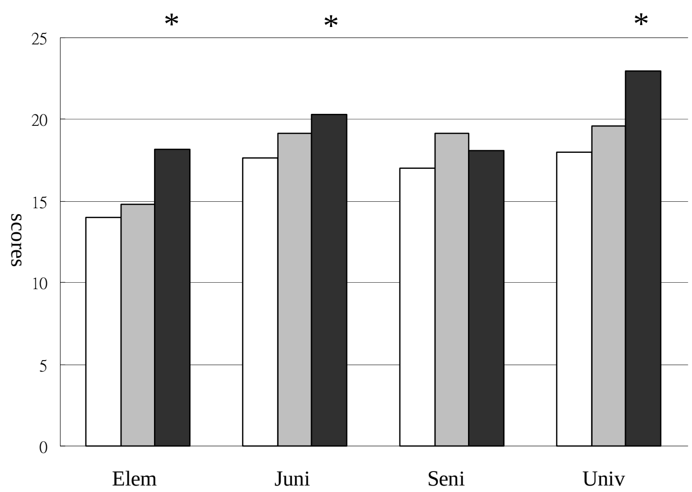



Figure-17 Difference SV among levels

(White is non-athletes, gray is players, black is elite players)

# DISCUSSION

The purposes of this study were to investigate the development of dynamic visual acuity, eye movement, peripheral vision, and momentary vision, as well as to exam difference among different educational stages and baseball skill level. The results indicated that (1) 10-15 years old was rapidly increase period for sports vision, but 15-24 years old was decline period. (2) There was slight change after junior-high stage in SV for national player and non-athletes, but SV at elementary significant the lowest ($p<.05$). University stage has the best SV for international players ($p<.05$). (3) International players has significant the best SV than others ($p<.05$), and national players has significant SV than non-athletes ($p<.05$). The findings suggested that visual abilities were vary by aging, and were critical parameters between different educational stages and level players, particular at university stage or in elite players.

Sports vision is based on several abilities, including DVA, to make eyes follow moving things, EM, to switch eyes in a moment, PV, to secure a wide range of vision, and MV to make sure of the situation momentarily. Each ability is plays an important role in baseball. For instance, DVA and EM are important in baseball, which require an ability to capture a ball that moves at a high velocity. DVA is considered one of the most important visual ability for baseball. DVA was defined as the ability to resolve detail when there is relative movement between the observer and the target object (Hoffman et al, 1981). In other words, DVA is the ability to discriminate the fine part of a moving object. Burg (1966) carried out a study on change in DVA with age. After measuring static and dynamic visual acuity of 17,500 male and female, found that both static and DVA declined with age. The decline in DVA was greater than that of static visual acuity. The decline in DVA accelerated as age increased.

Moreover, Long and Crambert (1990) compared the DVA of a group of young adults with that of a group of older adults at two levels of luminance and found that the DVA of the young adults was superior to that of the older adults under all conditions. They speculated that the decline in DVA with age resulted from the changes in the optical system rather than from post-retinal changes. These studies suggested that DVA declines with age. The static visual acuity of infants is considered to develop rapidly after birth until age 5 when it reaches a level close to an adult's static visual acuity (Mayer and Dobson, 1982). According to results of Ishigaki & Miyao (1994), DVA developed between the ages of 5 and 15 years, and after reaching a peak at 15. It declined at a constant rate without show a plateau. That study also speculated that DVA components are susceptible to the aging process, as DVA begins to decline immediately after maturity whereas static visual acuity stays at a constant level until around age 40. Comparing DVA of men and monkeys, Barmack (1970) identified foveal activity, oculomotor control, and parafoveal acuity as possible components. Hoffman et al (1981) compiled literature on dynamic visual acuity and stated that power of the retina, peripheral awareness, oculomotor abilities, and psychological characteristics were related to DVA.

Hoffman et al (1984) reported an increased ability to detect small differences in luminance between an object and its background (contrast sensitivity) in baseball players compared with general population. Solomon et al (1988) described better dynamic depth perception (stereoacuity) in major league batters than in pitchers. Furthermore, Laby et al (1996) found that visual acuity, contrast sensitivity, and distance stereoacuity of professional baseball players are superior to those of the general population and also show differences between major and minor league players. Those studies have similar result with this study. These findings suggested that visual abilities are important to baseball players who with better skill. Bahill and LaRitz (1984) studied the ability of a batter to watch a pitch com toward the home plate, and found that batters were able to follow a pitch only to within 5 feet of the home plate. Because the angular velocity of a pitch was about 500 degrees per second as it crossed the home plate, whereas the fastest eye movement was about 150 degrees per second. In general, a batter has approximately 400 msec from the time a pitcher released the ball until it cross the home plate. 200 msec. was needed from the time a swing was initiated until the bat crossed the home plate. Thus a batter would have to decide within the first 200 msec. whether or not swing after visual process of a pitch. Expert baseball players fixated during wind-up on the anticipated release point of pitcher and then, after a latency of about 150msec. following pitch release moved their eyes to the oncoming ball. Novice batters tended to move their eyes before release point, such as the pitcher’s head (Shank & Haywood, 1987). Performance differences in hitting may be partially attributable to these differences in visual abilities. Therefore, the better visual abilities baseball players have, the much time to recognize the pitch detail such as speed, trajectory, and location.

To sum up, the results suggested that the period of 10-15 years old was rapidly increase period, but 15-24 years old was decline period for sports vision. It reflected that the age of 14 or 15 might split the tendency of the sports vision. Visual abilities were vary by aging, and were critical parameters between different educational stages and level players, particular at university stage or in elite players. The findings, therefore, would apply to select potential player, to design visual training program, and to improve baseball skill.

## REFERENCE


Adams, G. L., (1965). Effect of eye dominance on baseball hitting. *Research Quarterly, 36*(1), 3-9.

Bahill, A. T. & LaRitz, T. (1984). Why can’t batters keep their eye on the ball? *American Science, 72*, 249-253.

Barmack, N. H. (1970). Dynamic visual acuity as an index of eye movement control. *Vision Research*, 10, 1377-1391.

Berg, W. & Kilian, S. M. (1995). Size of the visual field in collegiate fast-pitch softball players and nonathletes. *Perceptual and Motor Skills, 81*, 1307-1312.

Burg, A. (1966). Visual acuity as measured by dynamic and static tests. *Journal of Applied Psychology*, *50,* 460-466.

Classe, J, G., Daum, K., Semes, L., Wisniewski, J., Rutstein, R., Alexander, L., Beisel, A., Mann, K., Nowakowski, R., Smith, M., & Bartolucci, A., (1996). Association between eye and hand dominance and hitting, fielding, and pitching among players of the Southern Baseball League. *Journal of the American Optometric Association*, *67*(2), 81-86.

Classe, J, G., Semes, L, P., Daum, K, M., Nowakowski, R., Alexander, L, J., Wisniewski, J., Beisel, J, A., Mann, K., Rutstein, R., Smith, M., & Bartolucci, A., (1997). Association between visual reaction time and batting, fielding, and earned run averages among players of the Southern Baseball League. *Journal of the American Optometric Association*, *68*(1), 43-49.

Falkowitz, C., & Mendel, H., (1977). The role of visual skills in batting averages. *Optometric Weekly*, *68*(20), 577-580.

Flyger, N., Button, C. & Rishiraj, N. (2006). The science of softball: implications for performance and injury prevention. *Sports Med*. *36*(9), 797-816.

Hoffman, L, G., Polan, G., Powell, J., (1984). The relationship of contrast sensitivity function to sports vision. *Journal of the American Optometric Association*, *55*, 747-752.

Hoffman, L. G., Rouse, M. & Ryan, J. B. (1981). Dynamic visual acuity: a review. *Journal of the American Optometric Association*, *52,* 883-887.

Hornor, D, G., (1982). Can vision predict baseball players hitting ability? Poster presented at the American Academy of Optometry Annual Meeting, Abstract available in *American Journal Optometry Physiology Optometric, 59*, 69.

Ishigaki, H. & Miyao, M. (1994). Implications for dynamic visual acuity with changes in age and sex. *Perceptual and Motor Skills, 78*, 363-369.

Laby D. M., Rosenbaum, A. L, Kirschen, D. G., Davidson, J. L. Rosenbaum, L. J., Strasser, C., & Mellman, M. F. (1996). The visual function of professional baseball players. *American Journal of Ophthalmology, 122*, 476-485.

Long, G. M., & Crambert, R. F. (1990). The nature and basis of age-related changes in dynamic visual acuity. *Psychology and Aging, 5,* 138-143.

Long, G. M., & Riggs, C. A. (1991). Training effects on dynamic visual acuity with free-head viewing. *Perception, 20,* 363-371.

Long, G. M.., & Rourke, D. A. (1989). Training effects on the resolution of moving targets-dynamic visual acuity. *Human Factor, 31*(4), 443-451.

Loran, D. F. C. & MacEwen, C. J. (1997). *Sports Vision*. Boston: Butterworth- Heinemann.

Maeda, A.., & Tsuruhara, T. (1998a). Effect of batting practice by using high speed pitched balls on kinetic visual acuity of baseball players. *Training Science*, *10*(1), 35-40.

Maeda, A.., & Tsuruhara, T. (1998b). Batting training by using super high speed ball to increase batting performance visual kineticacuity. *Baseball Clinic*, *8*, 22-25.

Mayer, D. L. & Dobson, V. (1982). Visual acuity development in infants and young children as assessed by operant preferential looking. *Vision Research*, *22*, 1141-1151.

Portal, J. M., & Romano, P. E., (1988). Patterns of eye-hand dominance in baseball players(letter). *National English Journal of Medicine*, *319*(10), 655-656.

Rouse, M, W., DeLand, P., Christian, R. & Hawley, J., (1988). A comparison study of dynamic visual acuity between athletes and nonathletes. *Journal of the American Optometric Association*, *59*(12), 946-950.

Sanderson, F, H., (1981). Vision acuity and sports performance. In: Cockerill IM, Mac-Gillivary WW, eds. *Vision and sports*. Cheltenham, England: Stanley Thornes, 74.

Shank, M, D. & Haywood, K. M. (1987). Eye movements while viewing a baseball pitch. *Perceptual and Motor Skills*, *64*, 1191-1197.

Sherman, A., (1983). A method of evaluating eye-hand coordination and visual reaction time in athletes. *Journal of the American Optometric Association*, *54*(9), 801-802.

Solomon, H., Zinn, W, J., & Vacroux, A., (1988). Dynamic stereoacuity: a test for hitting a baseball? *Journal of the American Optometric Association*, *59*(*7*), 522-526.

# 行政院國家科學委員會補助國內專家學者出席國際學術會議報告

96 年 7 月 25 日

| | | | |
|---|---|---|---|
| 報告人姓名 | 劉雅甄 | 服務機構及職稱 | 中華大學<br>通識教育中心<br>助理教授 |
| 時間<br>會議<br>地點 | 96 年 07 月 10 日－14 日<br><br>芬蘭，Jyvaskyla | 本會核定<br>補助文號 | NSC 95-2413-H-216-001 |
| 會議<br>名稱 | (中文) 第 12 屆歐洲大專運動科學研討會<br>(英文)12th Annual Congress of the European College of Sport Science | | |
| 發表<br>論文<br>題目 | (中文)棒球選手運動視覺之發展特徵<br>(英文) Developmental characteristics of sports vision baseball players | | |

表 Y04

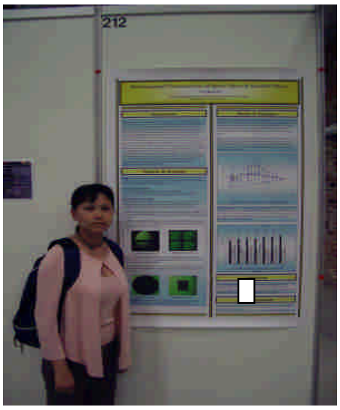
報告內容應包括下列各項：

一、參加會議經過

本次參加第 12 屆歐洲大專運動科學研討會，其會議時間為 7 月 10 日至 14 日，為期五天，舉辦地點為芬蘭中部的 Jyvaskyla 大學。此會議於 10 日上午開始報告；下午則是會議開幕儀式及迎賓會晚宴，此次參與人次高達一千五百人次，內容主要有四議題、34 場次 111 人受邀演講、68 場次 405 人口頭發表、及 725 篇海報發表，其發表領域包括（Adapted Physical Activity、Aging、Biochemistry and Endocrinology、Biomechanics、Coaching and Performance、Genetics and Molecular、Nutrition and Exercise、Physical Education and Pedagogics、Physical Activity,Health and Fitness、Physiology、Psychology、Sport Sociology、Sports Medicine、Ergometry and Testing、Growth and Development、Kinanthropometry、Motor Control and Learning、Physical Education）。由於發表場次及人數眾多，因此同一時段中有許多不同領域的研究可供選擇聆聽與觀看，在如此大型的研討會能得到更多新的資訊及觀念，使國際間的學術交流更多元化；另外於會場中心有多家廠商擺設最新儀器產品參與展示，提供與會學者最新的儀器資訊。

二、與會心得

本人此次文章被安排在「心理學」主題的海報發表：發表篇目為：棒球選手運動視覺之發展特徵(Developmental characteristics of sports vision baseball players)，發表時間為 7 月 13 下午 14:30~15:30，其中每個主題各有一位主詞人帶領相關同好參觀海報，各發表者有兩分鐘的口頭介紹主要研究動機、方法、與結果。


海報發表


與外國學者討論


台灣參與研討會的老師


與澳洲學者討論


主持人討論議題


有趣的海報

此行最大的收獲當然還是將自己所做的論文成果與參加會議的各國學者專家分享，其中有澳洲學者因為自己的小孩從事棒球運動而對本研究產生興趣，也有來自南非的教授給予本人相當多的指教，並互相交換意見增進學術交流，讓來自其他國家的學者了解臺灣的心理學學術及應用的現況與發展。

表 Y04

三、考察參觀活動(無是項活動者省略)

無

四、建議

綜觀本次研討會上的各國發表論文，可以歸納目前國際運動科學的研究趨勢，有紮根的基礎研究，更有實務的理論應用，甚至全人健康相關主題。

然而，針對本人所研究的領域應朝向廣泛的高科技應用、各學術領域間之整合與合作、政府和學術機構的大力支持，因此建議國內體育運動的相關單位應多對運動訓練與心理學領域多加重視，並可多鼓勵年輕學者多參與國際性的學術會議，以繼續提升我國運動科學相關研究的學術水準，有助國內體育大事業的蓬勃發展

五、攜回資料名稱及內容

攜回研討會手手冊、摘要與光碟一片。

六、其他

最後，由衷感謝行政院國家科學委員會能提供機會，讓年輕學者能有機會參與國際性研討會，瞭解目前最新的運動科學研究方向，真是受益匪淺。

# Developmental Characteristics of Sports Vision in Baseball Players

Ya-Chen Liu

Office of Physical Education, Chu-Hwa University, Hsin-Chu City, Taiwan.

**Abstract**

Visual ability plays an important role on performance in fast-ball sports such as baseball or fast-pitch softball. The purpose of this study was to investigate sports visions of development and difference among baseball players. 240 male subjects with different educational stages (university, senior, junior, elementary) and baseball skill levels (international players, national players, non-athletes) participated voluntarily this study. All subjects tested visual fatigue and static visual acuity for screening qualify subjects, before measuring dynamic visual acuity (DVA), eye movement (EM), peripheral vision (PV), and momentary vision (MV) by ATHEVISION software. DVA was defined the ability to discriminate the fine part of a moving object, subjects required read numbers that move at high speed. EM was defined the ability to switch the visual line quickly, subjects required identify two types of symbols that flash randomly at various places on the screen. PV was defined the ability to ensure a broad visual field, subjects required identify two types of symbols that appear around a number at center of the screen. MV was defined the ability to assess a situation in a moment's time, subjects required repeat a symbol pattern displayed momentarily. Kruskal-Wallis one-way analysis of variance by ranks and Dunn's multiple comparison procedure were used to process all data. The results indicated that (1) EM and MV are dramatically development after junior high school in national players and non-athletes ($p<.05$). International players at university stage have better DVA and EM than international players at other educational stages ($p<.05$). Elite players have different sports vision of developmental pattern. It might caused by high intensity practice for a long period. (2) Baseball players not only have better PV than non-athletes at junior stage, but also have better DVA than non-athletes at senior stage ($p<.05$). At university stage, international players have better DVA and EM. It reflected that sports vision is a significant factor for selecting into national team and competing in international championship. The results suggested that DVA and EM are vary by aging and are critical parameters between different level players, particular in elite players or at university stage. The findings, therefore, would apply to select potential player, to design visual training program, and to improve baseball skill. (The research, *NSC 95-2413-H-216-001*, was financially supported by National Science Council, Taiwan, ROC)

**Keywords: visual ability, DVA, eye movement, vision field, softball**