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# The Late Effects of Polio in Taiwan

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# THE LATE EFFECTS OF POLIO IN TAIWAN

## DISCUSSION OF A SURVEY TAKEN OF 260 POLIO SURVIVORS

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Many people around the world who suffered polio years ago have been experiencing new levels of weakness, discomfort and fatigue. The causes are varied and uncertain, but in many cases it is probably just the inevitable result of the long years of extra strains put on muscles and joints due to muscle inbalances and substitution. A survey was made of 260 Chinese polio survivors in Taiwan (male 46%, female 54% with mean age 25.28±4.48 and average number of years from onset of 23.14 also ± 4.48). 90% of them reported some degree of disability in lower limbs, 29% in upper limbs. 83% some deformity in foot, back, knee or hip and 82% claimed for themselves one or more of the items on a list of ten possible changes in physical status. The Third Rehabilitation Gazette International Post-Polio and Independent Living Conference at St. Louis in May 1985 polio survivors were urged to have thorough check-ups regularly by polio rehab experts and to have up-to-date records of their physical status in order to monitor any changes that may occur. Regular exercise without exertion is essential. Changes that are noticed should not be ignored, neither should they be unduly feared: with proper moderation and management one can still lead a full, active life. Given the fact that so many older polio survivors are experiencing physical changes, Taiwan's polio rehabilitation centers should open their doors to all post-polios regardless of age.

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Polio survivors--people who sometime in the past suffered an attack of poliomyelitis and are now "recovered" except for residual functional weakness, paralysis or deformity--have a reputation of being over-achievers. They tend to push their remaining powers to the limit as if having to prove to the world and to themselves that they are still as good as or even better than others. Busy trying to do all they can they have little time left for brooding over what they cannot do or envying what others can do. But this customary optimism is being threatened by revelations that many people around the world are beginning to experience various degrees of new muscular weakness, articular pain, respiratory distress, fatique, etc. Some who had been able to put aside braces, crutches or wheelchairs are having to start using them again. Others who formerly required respiratory assistance are needing it again. Many who have for years toiled effortlessly the whole day and into the night now find themselves tiring early.

Already three International Conferences have been held on this subject (G.I.N.I., 1984, 1985). (1-2) The Handbook on the Late Effects of Poliomyelitis for Physicians and Survivors (3) cites 165 medical references. (Laurie et al, 1984). The Cumulative Index Medicus for 1984 lists references to this problem from the United States, France, Germany and Mainland China. The following is a summary of opinions voiced by doctors at the Third Rehabilitation Gazette International Polio and Independent Living Conference in St. Louis, Missouri in May, 1985 which was attended by the first author of this paper. There does not seem to be any evidence that people are suffering a recurrance of polio, but some of the functional changes observed may be the result of further degeneration in anterior horn cells originally weakened by polio. Some doctors talk of a new disease process they call "progressive post-polio muscular atrophy", but only a small part of the cases may fall under this, namely, those with progressive weakness and confirmed electrodiagnostic findings. Some of the symptoms appearing in post-polio patients may have nothing to do with polio at all and doctors should be careful to rule out other diseases, since polio survivors are no more immune than anyone else to all the various degenerative processes found in the rest of the population. It seemed to be a general concensus that many of the new physical complaints are just signs of the wearing out of muscles and the breakdown of joints due to the prolonged strains of muscle inbalances and muscle substitution. The years of over-achievement are beginning to take their toll. Some physicians call this phenomenon the "post-polio syndrome", but others prefer not to use this term because the various combinations of symptoms and their cause are too diverse. The "late effects of polio" seems as good a name as any, but the effects need to be spelled out in each case.

In Taiwan, on July 7, 1985 over 50 Chinese polio survivors attended Taiwan's first public meeting on the late effects of polio, which was sponsored by Operation De-Handicap and the Catholic Sanipax Social-Medical Service and Education Foundation. O.D.H. subsequently conducted a questionaire survey to which 260 responded. One of the purposes of this paper to report the results of this inquiry.

## METHOD

The Survey sample. The respondents were 260 Chinese polio survivors living for the most part in the Taipei area. Though no systematic attempt was made to obtain a representative sample of all polio survivors

in Taiwan, the distributions by sex, age, and education level do show that they are fairly representative of the whole. (Table One) Untapped by the survey are only those so lightly affected by polio they cannot be classified as disabled and those so severely restricted by the consequences of polio they are out of contact with others.

## RESULTS

120 (46%) of the sample were male, 140(54%) female. Average age was 25.28±4.48 with a range of 15 to 44. Groupwise, 77(29.6%) were 15 to 22 years old, 102(39.2%) 23 to 27 and 78(30%) 28 to 44 years old. 100 had either grammar school (12.7%) or junior middle education (25.8%) and 62 had gone to technical school (9.6%) or college (15.2%). Only 30(11.5%) were married and only 38(14.6%) were out of work. Only 19(7.3%) called themselves poor and 60(23.6%) classified themselves as living at the level or low-income laborers, while the majority(68.1%) considered themselves as rather financially sound. Only 5% of them got polio after the age of three. The mean number of years that elapsed since onset of polio was 23.1±4.48. (Table I).

Physical effects of polio. Table II summarizes the present physical status of the 260 respondents. Their most commonly shared disability was in the legs. Only 27(10.4%) had no lower limb disability, 47.7% were affected in one leg only, 41.9% in both legs. In contrast, the upper limbs of 186(71.5%) were not affected, 20.4% had one arm disability and only 8.1% both arms. Two-fifths (40.8%) used crutches and only one-seventh (13.8%) wheelchairs. 83.1% reported one or more physical deformities in foot, knee, hip or back. Exactly one-half of them reported having undergone one or more corrective operations.

For the most part, there were no significant group differences in these statistics except for the following details:

A. More females than males used crutches (49.3% to 30.8% respectively, $p<.05$).
B. Those 23 to 27 years old had more hip defomities than the others (39.2% to 25.2%).
C. Those whose polio onset was over twenty years ago had more instances of spinal deviation than the others (33.7% to 20.8%).

Recent physical changes. Altogether 214 of the 260 respondents (82.3%) reported one or more of the ten recent kinds of change listed in Tables Three and Four. 33.8% were getting more spinal deviation, 39.2% were experiencing increased muscular weakness and 20% articular pain. 39.2% are walking less than they formerly did and 36.9% find they tire more easily.

The following statistically significant differences between groups were noted (Table III and IV):

a. More females than males reported articular pain (25.0% to 14.2% respectively, $p<.05$) and breating heavier in exertion (20.7% to 11.7%).
b. More articular pain was felt by those 28 years old or older than by those younger (28.2% to 16.6% respectively, $p<.05$), while those under 23 years old noted changes in leg length more than others did (32.5% to 21.1%).
c. More of those with polio over 25 years were working less compared to those with polio a shorter time (47.4% to 33.7% respectively, $P<.05$).
d. Those with both lower limbs disabled reported recent spinal deviation more often than the others (48.6% to 23.3% respectively, $p<.05$) and more articular pain (28.4% to 12.9%).
e. Those with a single leg disabled reported increased muscular weakness more than others did (37.1% to 19.8%).
f. Those using crutches complained more of spinal deviation (45.3% to 26.0%).
g. Wheelchair users were putting on more weight than the others (22.2% to 10.7%).
h. Finally, changes in spinal alignment were mentioned least by those who did not use special equipment (7.7%) and most by those who used equipment regularly (41.3%).

## DISCUSSION

It seems rather clear from the data presented in Tables Three and Four that many polio survivors in Taiwan are experiencing various kinds and degrees of changes in their physical status. These changes appear for the most part independent of sex, age, duration of the disease, site of the disability, previous surgical history or the presence of deformities. This is somewhat at odds with the data presented in the Third International Conference in St. Louis, where the general impression was that these symptoms are appearing more in those with a history of 20 years or more of polio and who are approaching middle age. It is probably the type and the source of our study that accounts for the differences. We polled a wide range of polio survivors while the medical reports were based on only those personally examined by doctors. Though the subjective results of our survey have not yet been confirmed through physical examination by medical personnel, medical examination, while likely to modily some of the statistics, will not alter the fact that large numbers of polio survivors in Taiwan are facing real changes in function and comfort.

Based on our experience and the evidence presented by such forums as the international conferences, we make the following observations:

1. The possibility that polio survivors will begin to experience new weakness, pain, fatique at some time in the future if they have not already is very real.
2. It is imperative that polio survivors avoid putting too much stress or strain on weakened muscles.
3. At the first signs of change, polio survivors would consider modifying activities to preserve energy for those activities they consider most important.
4. Each polio survivor should have a thorough physical and functional examination soon to establish baselines against which to measure any future changes that may occur.
5. A thorough physical examination and functional evaluation should be undergone whenever changes occur.
6. There is no evidence that the late effects of polio will necessarily shorten life or require early retirement from work.
7. Temporary depression may be expected when changes occur, but determination to go on doing all one can is the key to overcoming it.
8. Polio survivors can and must continue to keep busy and active at all times and maintain a program of proper exercise, even if adjustments in life style may be necessary from time to time.

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TABLE I. Sex, age, education level, marital status, employment status, financial status, age of onset of polio and the number of years since onset for 260 Chinese polio survivors on Taiwan.

Sample. 260 Chinese disabled by polio

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Age. Mean | : | 23.28 years | | Sex. | | N | % |
| Range | : | 15-44 | | Male | : | 120 | 46.2 |
| Stan. dev. | : | 4.48 | | Female | : | 140 | 53.8 |
| Age groups. | | N | % | Education level. | | | |
| 15 to 22 | : | 77 | 29.6 | Grammar | : | 33 | 13.2 |
| 23 to 27 | : | 102 | 39.2 | Jun. middle | : | 67 | 26.8 |
| 28 to 44 | : | 78 | 30.0 | Sen. middle | : | 86 | 34.4 |
| no response | : | 2 | 0.8 | Technical | : | 24 | 9.6 |
| | | | | College | : | 38 | 15.2 |
| Marital status. | | | | no response | : | 2 | 0.8 |
| Single | : | 229 | 88.1 | | | | |
| Married | : | 30 | 11.3 | Age of polio onset. | | | |
| no response | : | 1 | 0.4 | 1 year old | : | 122 | 46.9 |
| | | | | 2 years old | : | 41 | 15.8 |
| Employment status. | : | | | 3 years old | : | 71 | 27.3 |
| For employer | : | 123 | 47.3 | 4-23 yrs old | : | 13 | 5.0 |
| Self-employed | : | 32 | 12.3 | no response | : | 13 | 5.0 |
| Home industry | : | 19 | 7.3 | | | | |
| Not working | : | 38 | 14.6 | Duration (years since onset). | | | |
| no response | : | 3 | 1.2 | Mean | : | 23.14 | |
| | | | | Range | : | 3-40 | |
| Financial status. | | | | Stan. dev. | : | 4.48 | |
| Ordinary | : | 177 | 68.1 | | | | |
| Low income | : | 60 | 23.1 | Duration groups. | | | |
| Poor | : | 19 | 7.3 | 3 to 20 | : | 72 | 27.7 |
| Rich | : | 2 | 0.3 | 21 to 25 | : | 97 | 37.3 |
| no response | : | 18 | 6.9 | 26 to 40 | : | 76 | 29.2 |
| | | | | no response | : | 15 | 5.8 |

TABLE II. Percentages of 260 Chinese polio survivors who have upper limb disability, lower limb disability, limb deformity, have undergone corrective surgery or use special equipment.

Sample. 260 Chinese disabled by polio.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Have upper limb disability. | | | | Use special equipment. | | | |
| | | N | % | | | N | % |
| Right arm only | : | 27 | 10.4 | Don't need any | : | 38 | 14.6 |
| Left arm only | : | 26 | 10.0 | Use daily | : | 123 | 47.3 |
| Both arms | : | 21 | 8.1 | Use often | : | 36 | 13.8 |
| Neither arm | : | 186 | 71.5 | Not very often | : | 25 | 9.6 |
| | | | | Almost never | : | 25 | 9.6 |
| Have lower limb disability. | | | | no response | : | 13 | 5.0 |
| Right leg only | : | 71 | 27.3 | | | | |
| Left leg only | : | 53 | 20.4 | Equipment used. | | | |
| Both legs | : | 109 | 41.9 | One longleg brace | : | 81 | 31.2 |
| Neither leg | : | 27 | 10.4 | Two longleg braces | : | 58 | 22.3 |
| | | | | One shortleg brace | : | 14 | 5.8 |
| Site of surgery. | | | | Two shortleg braces | : | 6 | 2.3 |
| | Once | | Two or more times | Back brace | : | 18 | 6.9 |
| Foot: | 88 | 33.8 | 51 19.6 | Crutches | : | 106 | 40.8 |
| Knee: | 54 | 20.8 | 18 6.9 | Wheelchair | : | 36 | 13.8 |
| Hip : | 17 | 6.5 | 6 2.3 | | | | |
| Back: | 13 | 5.0 | 8 3.1 | Have deformity. | | | |
| | | | | Foot | : | 148 | 56.9 |
| Number of times underwent surgery. | | | | Back | : | 79 | 30.4 |
| | | | | Knee | : | 77 | 29.6 |
| One or more times | : | 130 | 50.0 | Hip | : | 21 | 8.1 |
| No time | : | 130 | 50.0 | None | : | 44 | 16.9 |

TABLE III. Percentages of 260 polio survivors reporting changes in physical status compared by sex, age and duration of the disease.

| | Total T=260 | | Sex Male (N=120) | Sex Fem. (N=140) | Age (yr) <22 (N=77) | Age (yr) 23-27 (N=102) | Age (yr) <28 (N=78) | Duration of polio(yr) <20 (N=72) | Duration of polio(yr) 21-25 (N=97) | Duration of polio(yr) <26 (N=76) |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | % | % | % | % | % | % | % | % |
| Spine deviation | 88 | 33.8 | 30.8 | 36.4 | 31.2 | 35.3 | 33.3 | 27.8 | 37.1 | 36.8 |
| Muscle weakness | 73 | 28.1 | 29.2 | 27.1 | 23.4 | 31.4 | 26.9 | 27.8 | 25.8 | 30.3 |
| Joint pain | 52 | 20.0 | 14.2 | 25.0+ | 14.3 | 18.6 | 28.2+ | 18.1 | 16.5 | 25.0 |
| Low back pain | 37 | 14,2 | 10.8 | 17.1 | 10.4 | 12.8 | 20.5 | 11.1 | 12.4 | 19.7 |
| Walk less | 102 | 39.2 | 35.8 | 42.1 | 38.9 | 36.3 | 41.0 | 34.7 | 32.9 | 47.4+ |
| Tire more | 96 | 36.9 | 32.5 | 40.7 | 37.7 | 37.3 | 35.9 | 34.7 | 40.2 | 36.8 |
| One leg longer | 64 | 24.6 | 22.5 | 26.4 | 32.5+ | 21.6 | 20.5 | 29.2 | 27.8 | 17.1 |
| Breathe heavier | 43 | 16.2 | 11.7 | 20.7+ | 15.6 | 18.6 | 15.4 | 16.7 | 16.5 | 18.4 |
| More weight | 32 | 12.3 | 10.0 | 14.3 | 70.4 | 9.8 | 16.7 | 11.1 | 9.3 | 15.8 |
| Use wh'ch. more | 17 | 6.5 | 7.5 | 5.7 | 9.1 | 3.9 | 7.7 | 8.3 | 6.2 | 5.3 |
| None of above | 46 | 17.7 | 21.7 | 14.3 | 18.2 | 16.7 | 19.2 | 18.1 | 18.6 | 15.8 |

P<.05 using chi-square with 2 x 2 design.

TABLE IV. Percentages of 260 polio survivors reporting changes in physical status compared by site of disability, presence of deformity, history of corrective surgery, and the use of crutches, wheelchairs or equipment in general.

| | Upper limbs Both O.K. 186 | one dis. 53 | Both dis. 21 | Lower limbs Both O.K. 27 | One dis. 124 | Both dis. 109 | Have deformity No | Yes 216 | Underwent surgery No 130 | Yes 130 | Use crutches No 154 | Yes 106 | Use wheelch. No 224 | Yes 36 | Use of equipment No need 39 | used 167 | Not used 54 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spine deviation | 32.3 | 35.8 | 42.9 | 25.9 | 22.6 | 48.6+ | 18.2 | 37.0+ | 34.6 | 33.1 | 26.0 | 45.3+ | 31.7 | 47.2 | 7.7+ | 41.2+ | 29.0+ |
| Muscle weakness | 28.5 | 30.2 | 19.1 | 11.1+ | 37.1+ | 22.0 | 22.7 | 29.2 | 23.1 | 33.1 | 30.5 | 24.5 | 29.5 | 19.4 | 33.3 | 24.0 | 37.0 |
| Joint pain | 17.7 | 22.6 | 33.3 | 18.5 | 12.9 | 28.4+ | 11.4 | 21.8 | 23.1 | 16.9 | 18.2 | 22.6 | 19.6 | 22.2 | 28.2 | 17.4 | 22.2 |
| Low back pain | 14.5 | 9.4 | 23.8 | 7.4 | 13.7 | 16.5 | 13.1 | 15.4 | 13.1 | 15.4 | 12.3 | 16.9 | 14.3 | 13.9 | 15.4 | 12.6 | 18.5 |
| Walk less | 40.9 | 34.0 | 38.1 | 22.2 | 38.7 | 44.0 | 31.8 | 40.7 | 37.7 | 40.8 | 35.1 | 45.3 | 42.0 | 22.2+ | 33.3 | 37.7 | 48.2 |
| Tire more | 35.5 | 39.6 | 42.9 | 29.6 | 34.7 | 41.3 | 34.1 | 37.5 | 36.9 | 36.9 | 36.4 | 37.7 | 37.0 | 36.1 | 43.6 | 34.7 | 38.9 |
| One leg shorter | 24.7 | 24.5 | 23.8 | 11.1 | 27.4 | 24.8 | 13.6 | 26.9 | 24.6 | 24.6 | 26.0 | 22.6 | 25.9 | 16.7 | 20.5 | 23.4 | 31.5 |
| Breathe heavier | 15.6 | 13.2 | 33.3 | 18.5 | 12.1 | 21.1 | 11.4 | 17.6 | 16.2 | 16.9 | 15.6 | 17.9 | 16.9 | 13.9 | 18.0 | 17.4 | 13.0 |
| More weight | 12.9 | 7.6 | 19.1 | 11.1 | 8.1 | 17.4 | 13.6 | 12.0 | 11.5 | 13.1 | 13.0 | 11.3 | 10.7 | 22.2+ | 10.3 | 14.4 | 7.4 |
| Use wh'ch. more | 5.4 | 13.2 | 0.0 | 14.8 | 3.2 | 8.3 | 2.3 | 7.4+ | 10.0 | 3.1+ | 9.7 | 1.9+ | 2.2 | 33.3+ | 0.0 | 8.4 | 5.6 |
| None of above | 18.3 | 18.9 | 9.5 | 22.2 | 21.8 | 11.9 | 29.5 | 15.3+ | 20.8 | 14.6 | 20.1 | 14.2 | 18.3 | 13.9 | 20.5 | 20.1 | 18.5 |

P<.05 using chi-square with z x z design.

# 台灣小兒麻痺後遺症之統計與分析

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## 摘　要

曾經染患小兒麻痺之生還者，除了四肢或身體某部份機能喪失或麻痺外，都經由適當的復健，已「穩定」。可重新振作其殘存之力量，向世人及自己證明，他們和別人一樣，甚至比別人好。

近年來，歐、美等國根據小兒麻痺長期使用患肢及輔助用具，其身體四肢長時間承受擠壓、過度或不使用，而可能造成關節痠痛或攣縮、肌肉軟弱、走路耐力減退，甚而（再）須使用拐杖、支架或以輪椅代步。

爲使他們「早期發現、早期預防」，更生復健服務中心特別對全省各地大約二、三十年前小兒麻痺之生還者抽樣地發出問卷，主要是想調查其㈠生理狀況—小兒麻痺受影響之部位、使用輔助用具情形及曾接受過的手術、變形部位和目前所有的症狀。㈡心理、社會適應問題等。

在這二百六十位調查回卷中，46% 是男性，女性佔54%，年齡最大是四十四歲，最小者十五歲，平均年齡是二十五點三歲；大部份是在一、二歲時不幸染患小兒麻痺，僅 5 %是在三歲後得到的；有 74.4 % 的人僅受過中、小學教育，其中有些家庭是低收入者，可喜的是 11.5 %已結婚。一般而言，他們的心理和社會適應都蠻好的，但受教育較高者對環境、社會或別人的要求也愈高，滿意程度也愈差。現在就來以小兒麻痺對其生理影響看其最近生理上的改變情形：

一小兒麻痺對身體之影響—大部份的人是下肢受到影響，僅二十七人，10.4 %下肢沒有受到侵襲，相反地，僅有28.5%的人手部受到迫害，而已有七分之一的人須靠輪椅代步。

二最近身體之改變—在二百六十人中，已有二百一十四人有變壞的感覺，如39.2%的人有肌肉較弱無力的經驗，36.9 %覺得容易疲勞，33.8 %有脊椎側彎和 20 %的人有關節痠痛的經驗等。

綜合這些調查統計，雖然大多數小兒麻痺之生還者尚且太年輕，但二十八歲以上的患者比較年青者有後遺症之現象，諸如單腳的患者易造成肌肉無力，坐輪椅的人較易發胖等等，所以要注意避免新的衰弱、病痛和疲勞所造成的傷害，以免發生老化或失去活動能力了。

雖然沒有任何跡象顯示—小兒麻痺生還者會較快老化，須提早退休或甚而減少壽命，但是有些功能上的改變，是患者須特別注意的！千萬不要過度或都不使用肢體或輔助用具，都可能會造成後遺症，希望患者能做些適當地運動並保持活力。社會大衆關心此一問題及有一專責機構——如振興復健醫學中心爲年齡較大的患者提供治療、測量和功能的維護，使復健醫學能繼續治癒此後遺症，好同享有美滿幸福之生活。