Review Article

Introduction to the Work Ability Index – A Guide for Rehabilitation Practitioners

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The purpose of this report is to introduce the *Work Ability Index* to a rehabilitation audience and to provide some background on its scope and features. As an indication of its popularity, (a) it is available in 26 languages; (b) it has been applied for more than twenty years and (c) from 1991 there are 388 records including "Work Ability Index" in PubMed. A summary of the data from 29 previous studies of 31,472 participants is provided and it indicated an overall mean of 38.94. Overall this mean would be categorised as a "good" work ability index. As expected, studies of rehabilitation or illness samples indicate "poor" work ability. Each of the 10 questions in the assessment is introduced. The conceptual nature of work ability is reviewed and some issues are raised about the validity of the scoring of the assessment. A conceptual framework for the work ability process is outlined.

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Introduction to the Work Ability Index – A Guide for Rehabilitation Practitioners[1]

Background

The *Work Ability Index* was developed by the Finnish Institute of Occupational Health (Tuomi, Ilmarinen, Jahkola, Katajarinne, & Tulkki, 1998) as an employee's perception of his/her own level of work ability. It has been described as the "most commonly used tool for measuring work ability" (El Fassi *et al*., 2013, p. 2), both for clinical as well as research purposes. As an indication of its popularity, (a) it is available in 26 languages; (b) it has been applied for more than twenty years (van den Berg *et al*., 2009); and (c) from 1991 there are 388 records including "Work Ability Index" in PubMed. The purpose of this report is to introduce the *Work Ability Index* to a rehabilitation audience and to provide some details on its scope, its

features, its validity and reliability. Guidelines on its use and some normative data from a personal injury context are provided by way of background for users.

Description of the Work Ability Index

The *Work Ability Index* comprises 10 questions grouped into seven fields that cover: (a) one's current work ability compared with the lifetime best; (b) work ability in relation to the physical and mental aspects of a job (2 items); (c) the number of diseases that have been diagnosed by a doctor; (c) estimated impairment or limitations on working; (d) the amount of sick leave during the past year; (e) an estimate of work ability two years from now; and (f) personal and mental resources to remain active and alert or hopeful about the future (3 items).

The items are rated and adjusted for whether one's work was physical or psychological or both. The range of scores is from 6.5^{2} to 49 with <27 being poor work ability, 28-36 being moderate work ability, 37-43 good work ability and 44-49 excellent work ability. The cut-off points were derived (Tuomi et al., 1998) so that poor was represented by the lowest 15th percentile of the work ability index distribution and excellent was represented by the 85^{th} percentile. The moderate and good categories were centred above and below the median respectively.

The *Work Ability Index* was developed through a follow-up study of ageing municipal workers, and it was found to predict the incidence of work disability for a group of 50-year-olds (see Ilmarinen, 2007). It was intended that the *Work Ability Index* evaluate How good is the worker at present, in the near future, and how able is he or she to do his or her work with respect to work demands, health, and mental resources?" (Tuomi et al., 1991). In terms of the relevance for rehabilitation, Bethge *et al*. (2012) studied white collar workers and the relation of the *Work Ability Index* (WAI) with the need for rehabilitation. They reported:

> ...we identified the optimal cut-off to predict the need for rehabilitation as a WAI score ≤ 37. This range is nearly identical to that of the WAI ranges for poor (7–27 points) and moderate work ability (28–36 points), for which the WAI developers recommend measures to restore and improve work ability (2012, p. 984)

Additionally, in a 28-year follow-up of 5,971 occupationally active people aged 44-58 years, it was concluded: "Perceived poor work ability in midlife was associated with accelerated deterioration in health and functioning and remains evident after 28 years of follow-up" (Von Bonsdorff, 2011, p. E235).

In an Australian context, an analysis of work ability for persons (N=58) with a compensable personal injury has been undertaken (Athanasou 2023a). A rating of poor working ability (7-27) was obtained by 49 out of the 58 persons, six would be categorised as moderate working ability (28-36) and only three as being of good working ability (37-43). The median physical capacity was self-rated as rather poor and median self-rated mental capacity was moderate. The highest correlation (.796) was between the rating of capacity to work and the estimate of disability or work impairment. The *Work Ability Index* discriminated those who returned to work following injury from those who were not working.

With reference to the reliability of results, De Zwart *et al.* (2002) examined the test-retest reliability of the WAI using 97 construction workers aged 40 years and over, who were tested then retested after a four-week interval. They reported (p. 177): (a) the same WAI score in 25% of participants; (b) 95% of the differences were less than 6.86 points (two standard deviations); (c) no significant difference in the mean WAI score at a group level (40.4 versus 39.9); (d) there was 66% agreement in the classification of the four WAI categories (poor, moderate, good, excellent). The unweighted coefficients alpha from an analysis of 36 coefficients alpha in 25 studies of the *Work Ability Index* have been analysed (Athanasou, 2023b). The coefficient alphas ranged from.573 to.9 with a median of.724 and a mean of.736 (95% CI=.027). Further aspects of the validity and reliability of Work Ability Index are discussed by Ilmarinen and Tuomi (2004); Lavasani, Wahat & Ortega (2015) as well as Radkiewicz and Widerszal-Bazyl (2005).

Normative data

Table 1 now provides a summary of the data from 29 previous *Work Ability Index* studies of 31,472 participants. The overall mean is 38.94 (SD= 7.13). Overall this mean would be categorised as a “good” *Work Ability Index*. The results are also displayed in Figure 1. No claim is made that this listing of studies is complete.

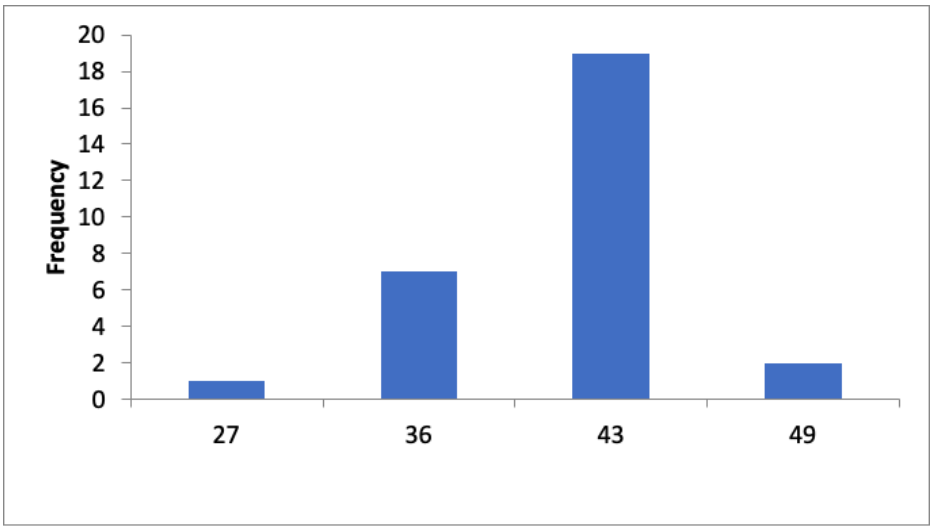

Figure 1. Distribution of mean values from N=29 studies

(Note: <27=poor; 28-36 moderate; 37-43 good; 44-49 excellent work ability).

It is reasonable to ask whether particular groups scored lowly on the *Work Ability Index*. The group with the lowest mean score on the *Work Ability Index* were women from Sweden in human service organisations who were on long-term sick leave (M=24), followed by rehabilitation patients in Germany (M=28.2) then nurses in Jordan (M=29.3), followed by patients with mental fatigue (M=30.3). All these groups were at least one standard deviation below the overall mean of 38.94 (SD=7.13) across all the 29 studies. In the case of the case of the Australia personal injury sample, the overall mean was 17.8 (N=97, 95%CI=1.59) with some 86.5% in the poor work ability category. The highest correlation between an item and the overall work ability index was.89 for item 1 (current work ability compared to the highest work ability ever). The lowest and only negative correlation was =-.20 for the number of current diseases.

Author	Year	Country	Sample N	Population	Mean	SD
Adel	2018	Iran	645	Employees	38.1	5.5
Ahlstrom	2010	Sweden	290	Women, human service organisations, long-term sick leave	24	9
Alavinia	2009	The Netherlands	850	Construction workers	38.7	5.7
Amirmahani	2022	Iran	91	Midwives	39.0	5.2
Bascour-Sandoval	2020	Spain	360	Workers	34.1	3.0
Bethge	2012	Germany	1036	White collar workers	40.2	6.2
Bethge	2015	Germany	336	Rehabilitation patients chronic musculoskeletal disorders	28.2	7.7
De Zwart	2002	The Netherlands	97	Construction workers aged 40 years and over	40.4	6.1
El Fassi	2013	Luxembourg	12389	Workers 40-65	41.0	6.2
Garosi	2018	Iran	101	Nurses	40.0	4.0
Habibi	2014	Iran	171	Workers	37.1	3.8
Hasad	2020	Bosnia	299	Employees	40.8	5.8
Heyam	2018	Jordan	349	Nurses	29.3	6.8
Jaaskelainen	2016	Finland	5251	Municipal employees 44-58 years	35.9	7.6
Johansson	2022	Sweden	154	Patients with mental fatigue	30.3	10.6
Juszczyk	2019	Poland	530	Employees	37.5	7.7
Kaewboonchoo	2011	Thailand	2008	Workers	40.2	4.6
Kaewdok	2022	Thailand	360	Workers (convenience sample)	31.4	4.1
Kalte	2016	Iran	117	Workers – male, dairy industry	44.9	5.5
Lavasani	2016	Malaysia	275	Employees with physical disability	32.0	8.5
Martus	2010	Germany	371	Employees	40.1	5.5

Author	Year	Country	Sample N	Population	Mean	SD
Mateo Rodriguez	2022	Spain	1062	Health centre workers	37.7	7.3
Mokarami	2017	Iran	1579	Workers	39.9	6.1
Mokarami	2022	Iran	407	Employees	40.5	5.4
Rahmani	2021	Iran	101	Firefighters	44.3	3.5
Reeuwijk	2015	The Netherlands	1331	Office workers	42.1	4.8
Rothmore	2019	Australia	155	Outdoor workers	42	4.8
Thanapop	2021	Thailand	324	Formal and informal workers	38.1	5.0
Zmauc	2019	Slovenia	433	Nurses aged over 50 years	36.9	6.4

Table 1. Mean and Standard Deviation of Work Ability Index values from N=29 studies[1].

[1]*Note: No claim is made that this listing of WAI studies is complete*

Description and explanation of the items of the Work Ability Index

This section describes each question on the *Work Ability Index*. By way of background the results from an unpublished study (see Athanasou, 2023a) on the distribution of responses to each item from 97 compensable personal injury patients (e.g., motor vehicle, work injury cases) are also depicted.

Question 1. Compare your work ability now to your highest ever work ability:

Work ability is rated from 0 (cannot work at all) to 10 (work ability at its best). As expected, personal injury patients tend to rate mainly 0-5. This first question has also been used in some research as an overall *Work Ability Score* and there is some research to support the validity of this overall self-assessment (Schouten et al., 2015). The distribution of responses on this question was skewed and dominated by a rating of 0-2 (see Figure 2).

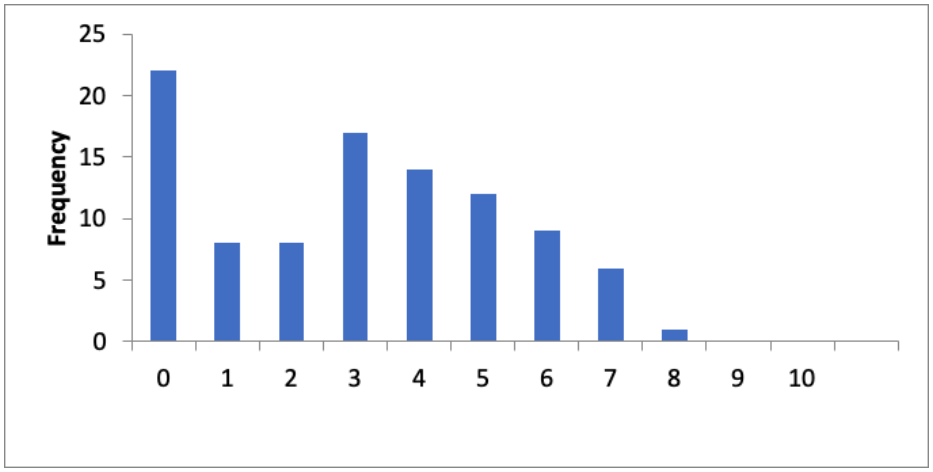

Figure 2. Rating of work ability from 0 to 10 (N=97)

Question 2. How is your work ability for the physical parts of your work?

The second question focuses on the physical aspects of work. This is rated on a five-point scale – very poor, rather poor, moderate, rather good, very good.

The scoring details vary according to whether a person's occupation is physically or psychologically demanding. (Scoring details: (a) for persons whose work is physically demanding the physical demands of the job are multiplied by 1.5 for ratings from 3 to 5; (b) for persons whose work is psychologically demanding the physical demands of the job are multiplied by 0.5 for ratings from 1 to 2). Physical work ability was positively skewed and rated mostly as very poor for a personal injury group (see Figure 3).

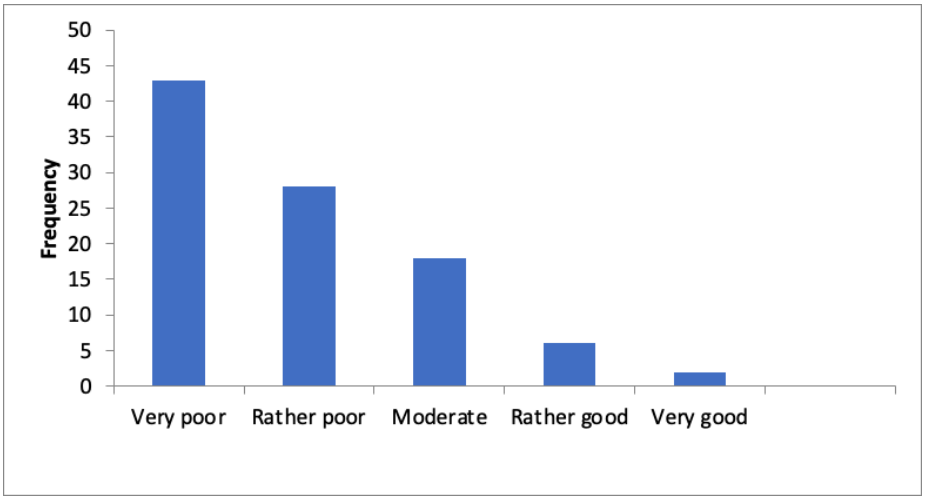

Figure 3. Rating of work ability for the physical parts of work (N=97)

Question 3. How is your work ability for the mental parts of your work?

The third question deals with the thinking aspects of work and is also rated on the same five-point scale from very poor to very good. Once again, the scoring details vary according to whether a person's occupation is physically or psychologically demanding. (Scoring details: (a) for persons whose work is physically demanding the mental demands of the job are multiplied by 0.5 for ratings from 1 to 2; (b) for persons whose work is psychologically demanding the mental demands of the job are multiplied by 1.5 for ratings from 3 to 5). In the case of the mental demands of work the distribution was again skewed but more even and with a larger proportion in the moderate category (see Figure 4).

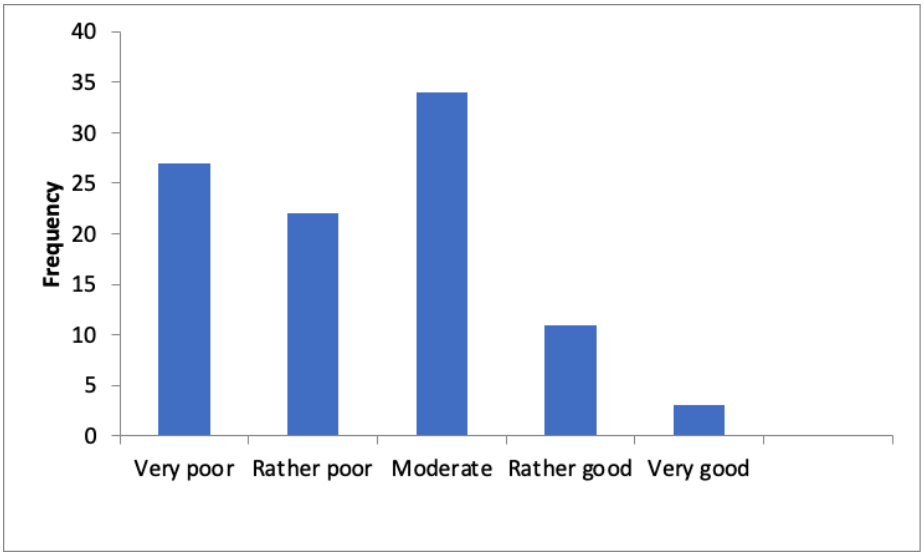

Figure 4. Rating of work ability for the mental parts of work (N=97)

Question 4. Current diseases diagnosed by a doctor

In this question, the respondent indicates which of the following conditions have been diagnosed by a doctor:

- Injury due to an accident
- Musculoskeletal disease in back, limbs or other part of the body (repeated pain in joint muscle, sciatica, rheumatism, arthritis)
- Cardiovascular disease (hypertension, coronary heart disease)
- Respiratory disease (repeated infections of the respiratory tract, emphysema)
- Mental disorder (depression, “burn-out”, anxiety or insomnia)
- Neurological or sensory disease (hearing or visual disease, migraine, epilepsy)
- Digestive disease / condition (gastritis, gall stones, liver or pancreatic disease, repeated constipation)
- Genitourinary disease (infection in urinary tract, gynaecological disease or prostate)
- Skin disease (allergic or other rash, varicose veins)
- Tumour or cancer
- Endocrine or metabolic disease (diabetes, severe obesity or gout)
- Blood diseases (anaemia, other blood disorder or defect)
- Birth defects

- Other disorder or disease
- Estimated work disability

The scoring for this question is based on the number of conditions diagnosed by a physician (Scoring details: 5 or more diseases = 1 point; 4 diseases = 2 points; 3 diseases = 3 points; 2 diseases = 4 points; 1 disease = 5 points; no diseases – 7 points). The number of different conditions diagnosed by a doctor varied from 1 to 7 with a mode of 3. It was fairly evenly distributed (see Figure 5).

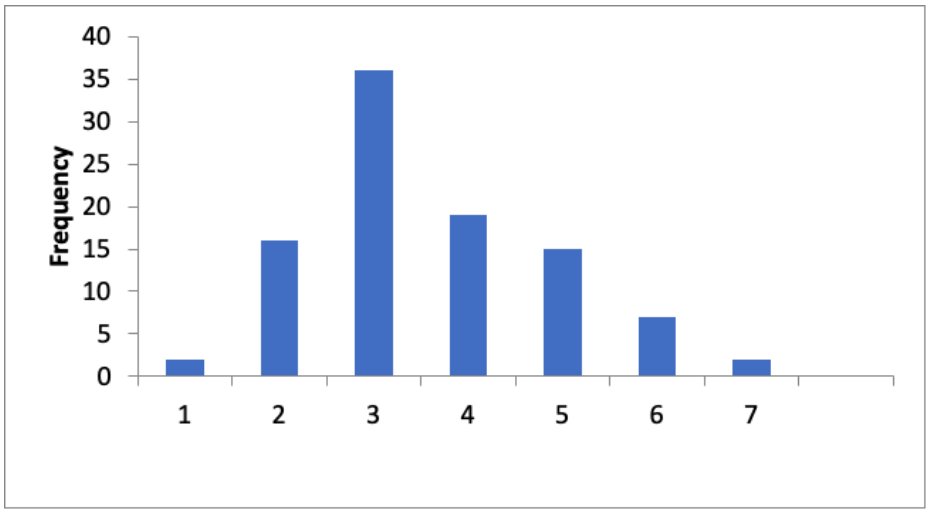

Figure 5. Number of current diseases diagnosed by a doctor (N=97)

Question 5. Is your illness or injury a hindrance to work?

A particularly relevant question relates to the impact of an injury or condition on one's capacity to work. This question sets out this impact across the following six dimensions:

- There is no hindrance / I have no diseases.
- I am able to do my job, but it causes some symptoms.
- I must sometimes slow down my work pace or change my work methods.
- I must often slow down my work pace or change my work methods.
- Because of my condition, I feel I am able to do only part time work.
- In my opinion I am entirely unable to work.

The response to this question is ranked from (1) In my opinion I am entirely unable to work through to (5) There is no hindrance/I have no disease. As expected, the responses to this question were dominated by

an inability to work (see Figure 6).

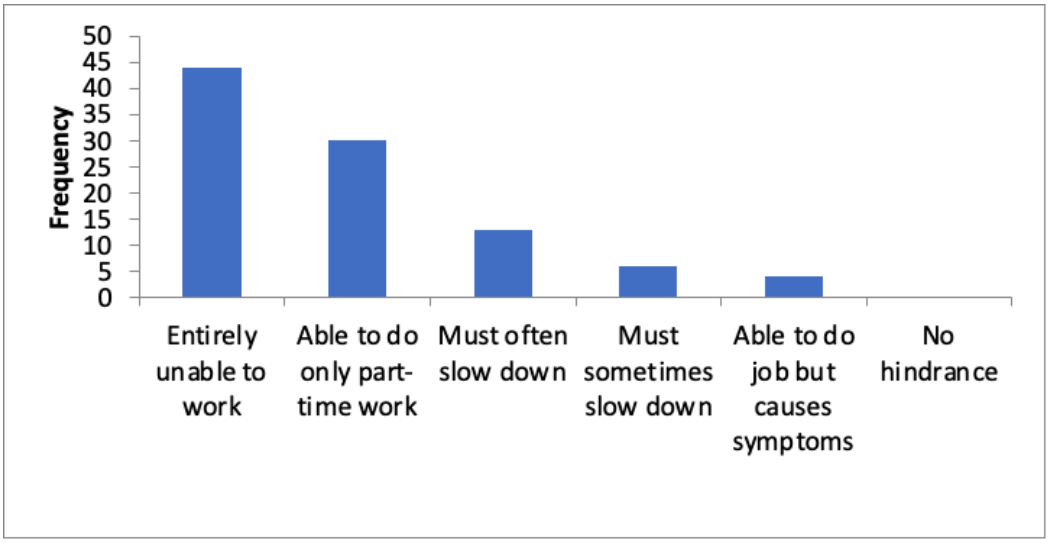

Figure 6. Estimated work impairment due to disease (N=97)

Question 6. In the last 12 months: How many days have you been off work because of illness?

The number of days off work in the last 12 months is rated from one of five categories: None, Maximum 9 days, 10-24 days, 25-99 days, 100-354 days. A typical response in personal injury cases is 100-354 days. Occasionally other categories are chosen where there has been some return to work. The response to this question is rated from (1) 100-354 days off work because of illness down to (5) None days off work because of illness. Figure 7 indicates that the number of days off work because of illness in a personal injury group was greater than 100 days in the last 12 months.

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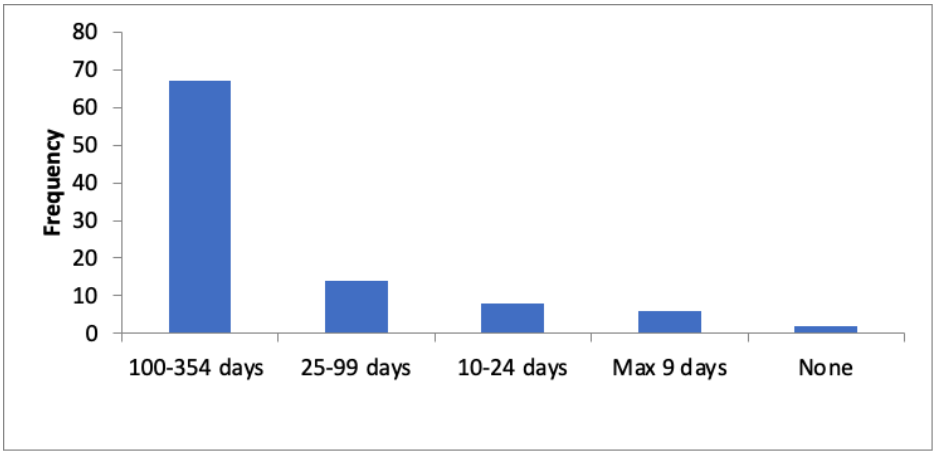

Figure 7. Days off work because of illness (N=97)

Question 7. Do you believe, based on your health that you will be able to work two years from now?

A particularly relevant question in a rehabilitation context is the view about whether someone feels they can return to work. The responses are rated from (1) Unlikely through (4) Not certain to (7) Relatively Certain. A distribution of responses for a compensable personal injury group is shown in Figure 8.

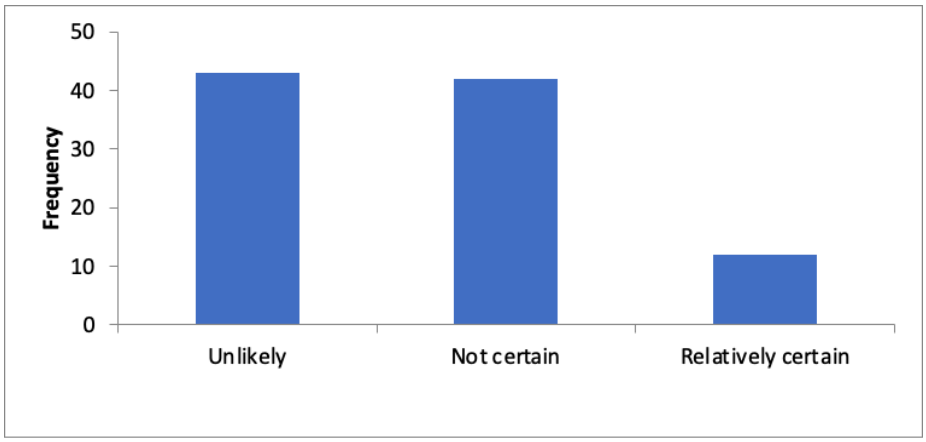

Figure 8. Able to work two years from now (N=97)

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Question 8. In the last three months, have you been able to enjoy your regular daily activities?

The last three questions deal with personal capacity. They share the same five-point rating scale: Often, Rather often, Sometimes, Rather seldom, Never. Questions 8-10 are each rated from (0) Never through to (4) Often. The three questions are added together and the overall sum receives a modified score (sum 0-3 = 1, sum 4-6 = 2, sum 7-9 = 3, sum 10-12 = 4). The distribution of responses for this group is shown in Figure 9.

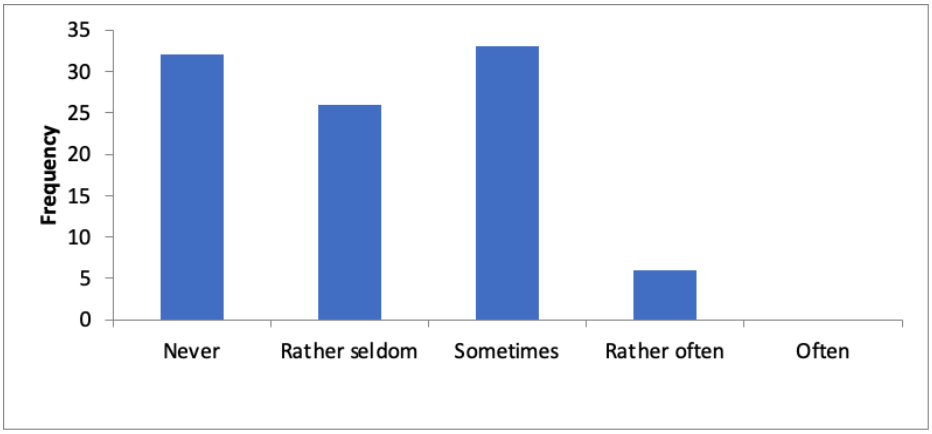

Figure 9. Able to enjoy regular daily activities (N=97)

Question 9. In the last three months, have you been active and alert?

This question also uses the same five-point rating scale. The distribution of responses for this group is shown in Figure 10.

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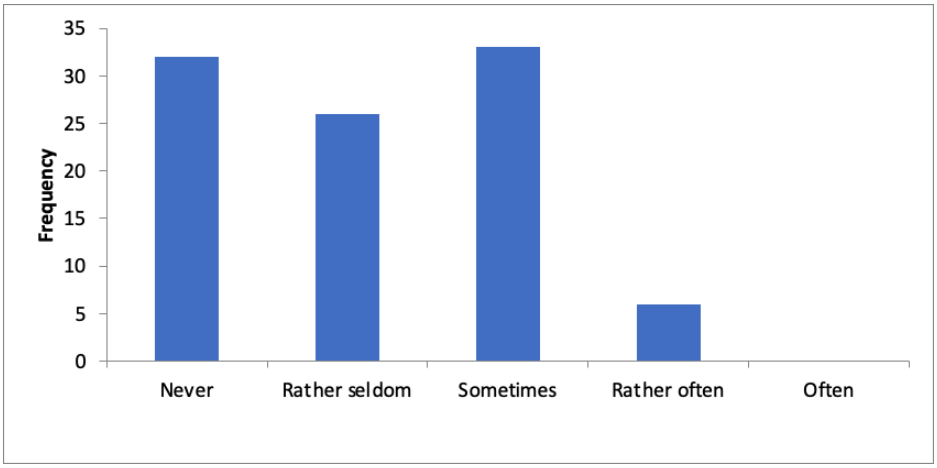

Figure 10. Active and alert in the last three months (N=97)

Question 10. In the last three months, have you felt full of hope about the future?

The final question deals with hope about the future and in the case of this particular group of compensation claimants it was clearly skewed. The distribution of responses for this group is shown in Figure 11.

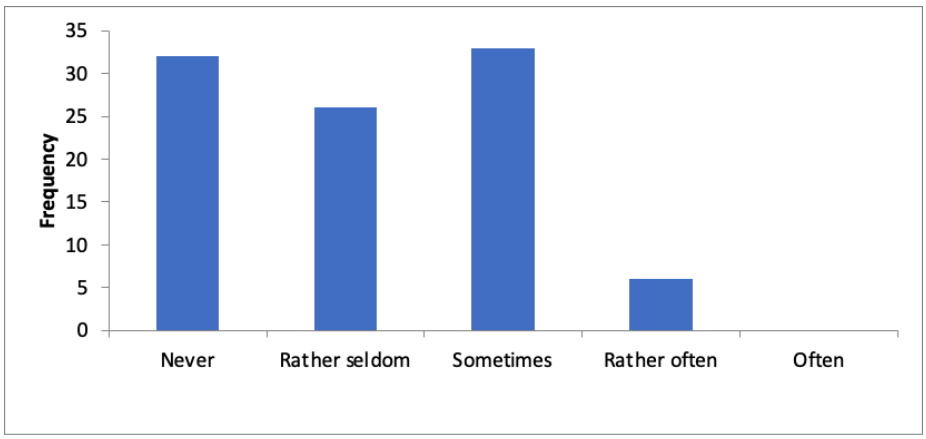

Figure 11. Hope about the future (N=97)

As has been noted the results from the 10 questions are grouped into fields and the sum of the scores is tabulated. From the preceding answers (Figures 1-10), the overall work ability index for the 97 personal injury cases was categorised as poor and shown in Figure 12. The mean work ability index was only 17.8 (SD=7.9, CI(95%), 1.59)).

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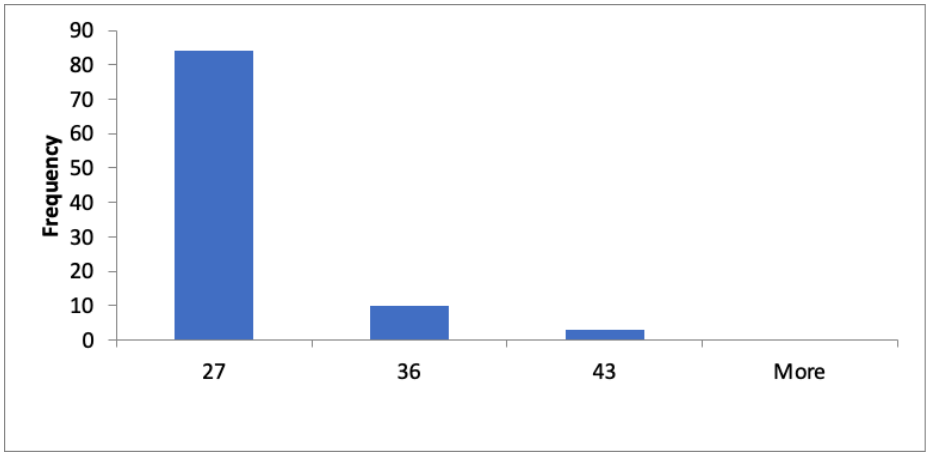

Figure 12. Distribution of work ability index (N=97)(Note: <27=poor; 28-36 moderate; 37-43 good; 44-49 excellent work ability).

Conclusion

This paper has outlined the scope of the *Work Ability Index* and described the items as well as the scoring. Furthermore, for the purposes of comparison the normative results from 29 studies were reported. These showed an overall *Work Ability Index* of around 39, which is categorised by the authors as a "good" work ability. As well, results from an unpublished study of personal injury cases were included. They had by far the lowest overall group results for a work ability index.

The components of the Work Ability Index

By definition, the seven fields of the *Work Ability Index* that contribute to the final result constitute the concept of "work ability". On further analysis, these seven fields comprise a holistic evaluation but not a homogeneous view of work ability. For instance, the contribution of each question could vary depending on the overall level of work ability. As an extreme example, current work ability (item 1) varies substantially for a person with the lowest (6.5) to the maximum amount of work ability (49). Question 1 contributes 0% to the total score for someone with minimal work ability but 8% for someone at maximum work ability. The contribution of each field at a minimum and maximum score level is shown in Table 2.

Work ability field	Minimum	Maximum	Minimum %	Maximum %
Current work ability	0	10	0%	20%
Work ability in relation to demands	1.5	10	23%	20%
Current diseases	1	7	15%	14%
Estimated work impairment due to disease	1	6	15%	12%
Illness within las year	1	5	15%	10%
Estimation of work ability in 2 years	1	7	15%	14%
Mental capacities	1	4	15%	8%
Total	6.5	49		

Table 2. Components of the *Work Ability Index* and their contribution to the extreme (maximum or minimum) score

As a further example of the incongruity. Four individuals were selected who had a poor work ability index from 17.5 to 20. The contribution of each question to their total raw score is indicated in Table 3. It is obvious that not only do items have different weights for different scores but they have variable weights even for the same work ability category. In short, the same score can be arrived at by different item ratings and the same work ability index does not mean that people had the same total score or item ratings. The concept of work ability in this assessment is multifactorial since the influence of each of the seven components will vary across the range of scores.

Item	Person A	Person B	Person C	Person D
Current work ability	14%	11%	19%	21%
Work ability - physical demands	10%	17%	4%	7%
Work ability - mental demands	5%	6%	8%	7%
Current diseases	14%	11%	15%	18%
Estimated work impairment	10%	17%	8%	14%
Illness within las year	10%	6%	4%	11%
Estimation of work ability in 2 years	19%	22%	15%	7%
Mental capacity – Daily activities	10%	0%	4%	7%
Mental capacity – Active and alert	5%	6%	15%	4%
Mental capacity – Hope	5%	6%	8%	4%
Total score	21	18	26	28
Work Ability Index	17.5	18.5	19.5	20

Table 3. Contribution of items to the total score

It means there is a valid concern about the numerical weightings attached to each question and their applicability to an individual rehabilitation or compensation patient who is likely to score well below the maximum. It may point to a problem in the units that comprise each field. Furthermore there is doubt as to whether the items scores are truly additive in nature as the questions cover vastly different areas of work, life and capacity. The numbers from each question may be added arithmetically but they do not constitute units of work ability. Accordingly, it is suggested further investigation is required of the nature and validity of the overall score from the *Work Ability Index*.

Nonetheless, it is recommended that use of the *Work Ability Index* continues as it represents a standardised assessment of vocational potential. One of the advantages of the *Work Ability Index* is that it assesses seven relevant components. It is not clear, however, that these seven disparate elements now contribute in a unique way to the work ability index. There may be an argument for developing an

algorithm that specifies the four work ability levels (poor, moderate, good or excellent). Unfortunately there at least 9.5 million possible response patterns to the 10 questions and it would be a substantial task to reduce them to four meaningful categories.

Instead there is justification for reporting the answers to the questions in the *Work Ability Index* in descriptive terms, such as in the hypothetical example that follows and not relying on a quantitative index that may be only partly accurate, viz.:-

He said that his work ability for the physical parts of work is now rather poor to moderate and also rather poor to moderate for the mental parts of his work. He thought that he must often slow down his work pace or change his work methods and because of his condition feels he is able to do only part time work. He rated his work ability as 3 on a 10-point scale from 0 (cannot work at all) to 10 (work ability at its best). He was uncertain whether he would be able to work two years from now. His overall rating on the *Work Ability Index* is 27.5.

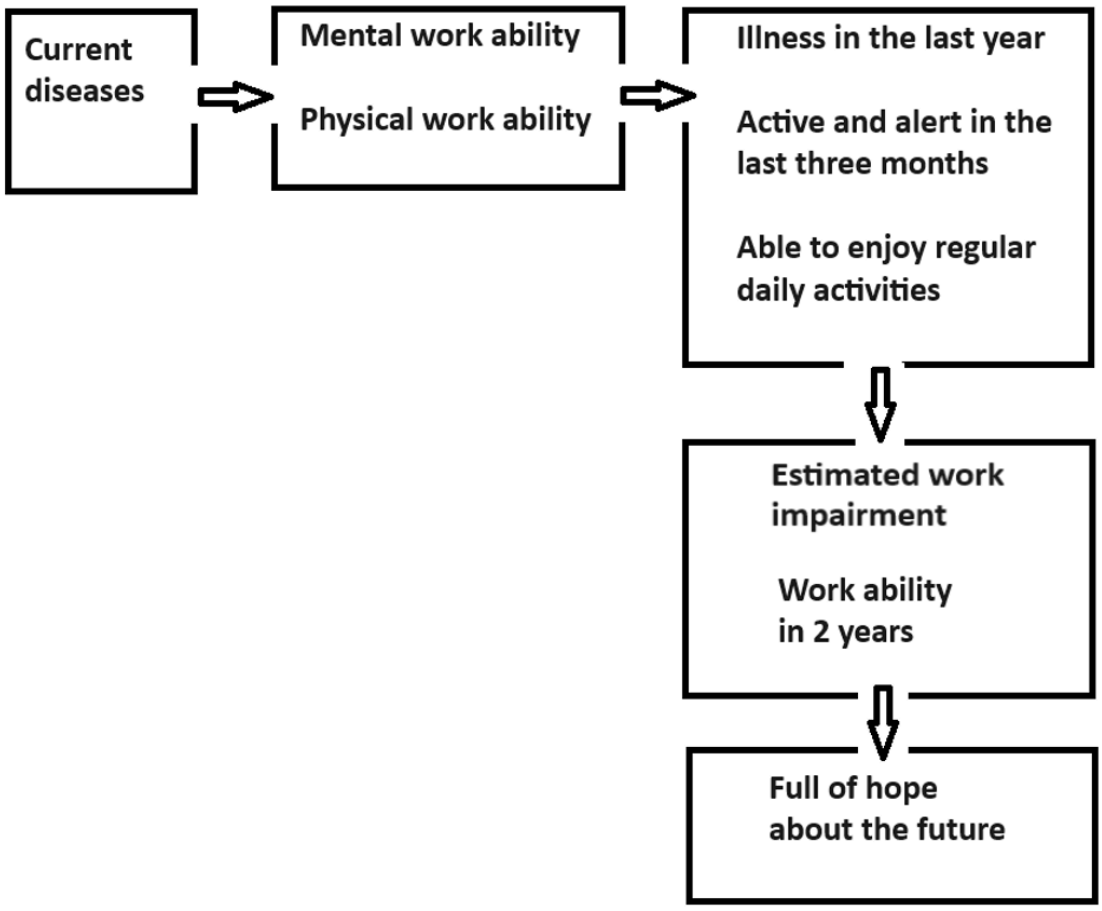

Figure 13. A tentative process for the estimate of current work ability

A work ability framework for personal injury cases

In closing, a tentative framework for the process of current work ability associated with personal injury is proposed in Figure 13. The process commences with current diseases or conditions that affect mental and physical work ability. These produce illness and reduce physical activity or mental alertness and indirectly the ability to enjoy one's daily activities. It is then a short step for someone to conclude that through the force of events that their propensity to work is impaired and that there may be a long-term impact (e.g., 2 years). The finals step is that hope for the future is impacted.

From this entire process the individual is able to make a judgement and to rate their current work ability compared to the highest ever work ability (in this case through Question 1 from 0 to 10). The *Work Ability Index* that totals 6.5 to 49 is merely a broad but useful categorisation as to whether this work ability is poor, moderate, good or excellent. Needless to say, whatever the process or the components of work

ability might be it is sad that work ability is reduced drastically through personal injury and even sadder when one encounters around one-third of persons in a rehabilitation or compensation context who say that they have no hope for their future.

Footnotes

[1] An earlier version of this paper was presented at the Annual Conference of the Australian Society of Rehabilitation Counsellors, 2024.

[2] Note that the scoring guide to the *Work Ability Index* defines the lowest score as 7 but it is possible to obtain a score of 6.5. It can occur in rare instances when using the scoring criteria for a person with very poor current work ability to meet the physical as well as the mental demands of work.

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