# The Centrality of O&M in Rehabilitation Programs Designed to Enhance Quality of Life: A Structural Equation Modelling Analysis

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*This study employs structural equation modelling to explain the manner and extent to which ability to get around; satisfaction with functional capacity, satisfaction with life essentials, satisfaction with personal relationships, and a number of concomitant health conditions affect QOL among older persons who have difficulty seeing (N = 356). Findings revealed that ability to get around was indirectly associated with QOL through a pathway that included satisfaction with functional capacity, life essentials, and personal relationships. The number of health conditions was directly related to ability to get around and satisfaction with functional capacity. These findings support the notion that O&M, which seeks to improve ability to get around, is central to vision rehabilitation programs designed to enhance QOL in older persons.*

Traditionally, the goal of vision rehabilitation has been to restore independence in function to the levels enjoyed before the onset of significant vision impairment (La Grow, 1992). Thus, the argument that Orientation and Mobility (O&M) is central to the rehabilitation of those who are blind or had low vision is compelling (Orr, 1992). Yet, as age-related vision impairment has become increasingly common, the value of increased independence may seem to be a less relevant outcome for vision rehabilitation than that of enhanced quality of life (QOL) especially among the older population (Crews & Long, 1997). While it is abundantly clear what role O&M plays to restore independence, its contribution to enhance QOL is less obvious. As a result, the argument for the centrality of O&M instruction for the rehabilitation of older people who are vision impaired has become somewhat less compelling.

In an earlier study, we found that three variables (satisfaction with life, ability to get around and number of concomitant health conditions) made a unique contribution to explaining approximately two thirds of the variance in perceived QOL among older persons with self-reported vision disability (La Grow, Alpass, Stephens, & Towers,

2011). The finding that ability to get around (i.e., response to the question 'How well are you able to get around?') was a significant independent predictor of perceived QOL offers considerable insight into the principal role O&M (designed to promote the ability to get around) may actually play in enhancing QOL. However, the method of analysis used in our previous study (i.e., linear multiple regression) lacked sufficient sophistication to indicate how these three variables might combine or interact with one another to enhance QOL. Also the single-item measure of satisfaction with life used in that study may be too imprecise to shed much light on the ways various aspects of satisfaction with life (e.g., satisfaction with sleep, sex life, health, access to transport, living conditions, capacity to work) might impact on one's global QOL. The use of a more complex conceptualisation of satisfaction with life, that catalogues the multiple facets underpinning a more global single-item measure, will better illustrate the specific impact that different facets of life satisfaction have on an individual's QOL. The purpose of this study is to revisit and reassess the original dataset using a twofold enhancement of our analysis. First, we intend to use a more sophisticated analytical process (i.e., structural equation modelling) that has the ability to identify multidirectional interactions between predictor variables. This allows us to illustrate both their individual and combined contribution to QOL. Second, we aim at replacing the single-item measure of life satisfaction with an expanded construct based on multiple items from an internationally validated QOL measure. This enhanced analysis will enable us to propose, assess and ultimately develop a comprehensive model to explain the manner and extent to which (1) ability to get around, (2) satisfaction with life, and (3) number of health conditions (i.e., total number of health conditions identified from a list of 25 named conditions identified in response to the request to 'tick the box "yes" to indicate if a doctor, nurse or health care worker has told you that you have') (henceforth *total health conditions*) affect the QOL of older persons who have difficulty seeing. In doing so, we hope to be able to more clearly identify the role that O&M may have in a rehabilitative process which seeks to enhance the QOL of its recipients.

## Methodology

This study constitutes a secondary analysis of the data reported in La Grow et al. (2011). These data stem from the second data collection wave of Massey University's Health, Work and Retirement (HWR) study that was carried out in accordance with the treaty of Helsinki and approved by the Massey University Human Ethics Committee (MUHEC 05/90). In the present analysis, participants included only those identified as having difficulty reading ordinary news print even when wearing glasses or contact lenses (N = 356[1]). They ranged in age from 56-72 years. Fifty-one percent were female. Participant responses to questions concerning QOL, ability to get around, various aspects of satisfaction with life and diagnosed health conditions were the primary variables of concern for this study. The specific questions included in this

1. Total N is greater than in the original study (N=265). This is due to a greatly reduced number of variables in the current study in comparison to the original, so the current study contains a greater proportion of participants who answered all the relevant questions and were eligible for analysis.

analysis (with response options illustrated in parentheses) were:

1. How would you rate your quality of life? (1 = very poor; 2 = poor; 3 = neither poor nor good; 4 = good; 5 = very good).
2. How well are you able to get around? (1 = very poorly; 2 = poorly; 3 = neither poorly nor well; 4 = well; 5 = very well).
3. How satisfied are you with your (1) ability to perform activities of daily living, (2) capacity to work, (3) health, (4) yourself, (5) sleep, (6) transport, (7) access to health services, (8) conditions of your living space, (9) personal relationships, (10) sex life, and (11) support you get from friends? (1 = very dissatisfied; 2 = dissatisfied; 3 = neither satisfied nor dissatisfied; 4 = satisfied; 5 = very satisfied). These items were selectively chosen for inclusion in the HWR second data collection wave and stem from the brief version of the World Health Organization's *Quality of Life* assessment instrument (WHOQoL-BREF; see Skevington, Lotfy, & O'Connell, 2004).
4. A list of 28 specified and one unspecified (i.e., 'other') chronic health conditions were presented to the participants. The number of those ticked as 'yes' were reported as a summed score labelled 'total health conditions'.

### Data Analysis

The current analysis consists of exploratory factor analysis conducted using IBM SPSS (version 19), in addition to confirmatory factor analyses and structural equation modelling conducted using IBM AMOS (version 18).

## Results

### Exploratory Factor Analysis for Satisfaction with Life

The first stage of the present analysis was to identify the various constructs that constitute satisfaction with life from the 11 WHOQoL questions used in this data collection wave. All 11 items were entered into an exploratory factor analysis (EFA) with a promax rotation in order to identify whether or not they combined to form latent satisfaction with life factors. Prior to conducting the EFA, the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1974) measure of sampling adequacy and Bartlett's test of sphericity (Bartlett, 1954) were examined to determine whether or not the sample was appropriate for such analysis. The KMO measure of sampling adequacy index was found to be 0.88, and Bartlett's test of sphericity was significant, ($\chi^2 = 1340.68$, $n = 356$, df = 55, $p < 0.0001$), indicating that the sample was indeed appropriate for such an analysis. An EFA with promax rotation was performed and the number of appropriate factors to retain based on a combination of methods (e.g., eigenvalue > 1, scree plots), as well as conceptual clarity. As can be seen in Table 1, the 11 satisfaction with life items clustered around three distinct components which in turn explained 66.0% of variance in interrelationships among these items.

We termed the first component 'satisfaction with functional capacity', as it included five items regarding performance of daily living activities, capacity to work, health, yourself, and sleep. The second factor we termed 'satisfaction with life essentials', as it reflected three items regarding transport, access to health services, and the conditions of one's living space. The third

**Table 1.** Rotated factor loadings for the three-factor solution for life satisfaction scale ($n$ = 356).

| Item | Content | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|---|
| 1 | How satisfied are you with your ability to perform your daily living activities? | **0.86** | 0.39 | 0.33 |
| 2 | How satisfied are you with your capacity to work? | **0.83** | 0.40 | 0.40 |
| 3 | How satisfied are you with your health? | **0.82** | 0.38 | 0.37 |
| 4 | How satisfied are you with yourself? | **0.68** | 0.43 | 0.53 |
| 5 | How satisfied are you with your sleep? | **0.57** | 0.22 | 0.40 |
| 6 | How satisfied are you with your transport? | 0.42 | **0.77** | 0.15 |
| 7 | How satisfied are you with your access to health services? | 0.32 | **0.76** | 0.27 |
| 8 | How satisfied are you with the conditions of your living space? | 0.41 | **0.73** | 0.41 |
| 9 | How satisfied are you with your personal relationships? | 0.42 | 0.38 | **0.82** |
| 10 | How satisfied are you with your sex life? | 0.47 | 0.20 | **0.74** |
| 11 | How satisfied are you with the support you get from friends? | 0.33 | 0.57 | **0.58** |

**Bolded** text indicates factor loading.

factor we termed 'satisfaction with personal relationship', as it reflected three items regarding personal relationships, sex life, and support received from friends. These three factors showed good to very good internal consistency with Cronbach's alpha coefficients (Cronbach, 1951) of .86, .73, and .70 respectively.

### Confirmatory Factor Analysis for Satisfaction with Life

Following the EFA we conducted a confirmatory factor analysis (CFA) to determine whether or not the 3-factor solution proposed by the EFA had good construct validity, and to ensure that this 3-factor solution was superior to a 1-factor solution reflecting the simple summation of all 11 items.

Table 2 displays the CFA fit indices for the 1 and 3 factor models, with a variety of fit indexes used to test the adequacy of these models: the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), the Goodness of Fit Index and Adjusted Goodness of Fit Index (GFI & AGFI; Joreskog & Sorbom, 1989), and the Comparative Fit Index (CFI; Bentler, 1990). A good fitting model is indicated by GFI, AGFI, and CFI values at or above 0.90 and RMSEA values of 0.05 or less (Thompson, 2000). The results of the 1-factor solution did not demonstrate goodness-of-fit, but the initial 3-factor structure suggested good

**Table 2.** Fit indices for the confirmatory factor analysis for the life satisfaction scale.

| Model | $\chi^2$/ df | RMSEA | GFI | AGFI | CFI |
|---|---|---|---|---|---|
| 1 factor | 320.10/44 | 0.13 | 0.83 | 0.75 | 0.82 |
| 3 factor | 122.96/41 | 0.08 | 0.94 | 0.90 | 0.95 |
| 3 factor w/covaried error* | 82.23/37 | 0.05 | 0.96 | 0.93 | 0.97 |

* Model included specified covariance between error terms for the following pairs of items in Table 1: 4 & 8; 4 & 9; 4 & 11, 8 & 11.

concordance among indices although the model fitting was only adequate (GFI, AGFI, and CFI) and just short of adequate (df/$\chi^2$, RMSEA). Modification indices produced by the statistical package suggested that significant model improvement would be achieved by specifying the presence of a covariance for the error terms of four specific items. These items did not load on the same factor in the CFA (e.g., one item loaded on the 'satisfaction with functional capacity' factor while the second loaded on the 'satisfaction with personal relationships' factor), but each pair of items contained related content and thus possessed some form of association which needed to be statistically addressed. Covariance error terms were thus specified for the following four pairs of items as identified by AMOS; (a) 4 and 8, (b) 4 and 9, (c) 4 and 11, and (d) 8 and 11. The indicators of model fit in Table 2 shows that this adjusted 3-factor model with covaried error terms had an adequate to good fit with the data. The adjusted three-factor model (satisfaction with functional capacity, satisfaction with life essentials, satisfaction with personal relationships) was thus retained for further analysis.

## Structural Equation Modelling Analysis

Structural equation modelling (SEM) analysis was employed to explore the relationships existing between the variables of ability to get around, total health conditions, the three satisfaction with life variables and QOL. Extensive non-normal distribution is a potential problem in any dataset and may lead to the over-estimation of chi-square values (in which chi-square values become too large), the underestimation of certain fit indexes (such as CFI), and the underestimation of the existing standard errors of parameter estimates (West, Finch, & Curran, 1995). In order to control for these concerns, the current SEM analysis deployed a bootstrapping method (Bollen & Stine, 1993).

The initial model used in this study parallels the linear results from La Grow

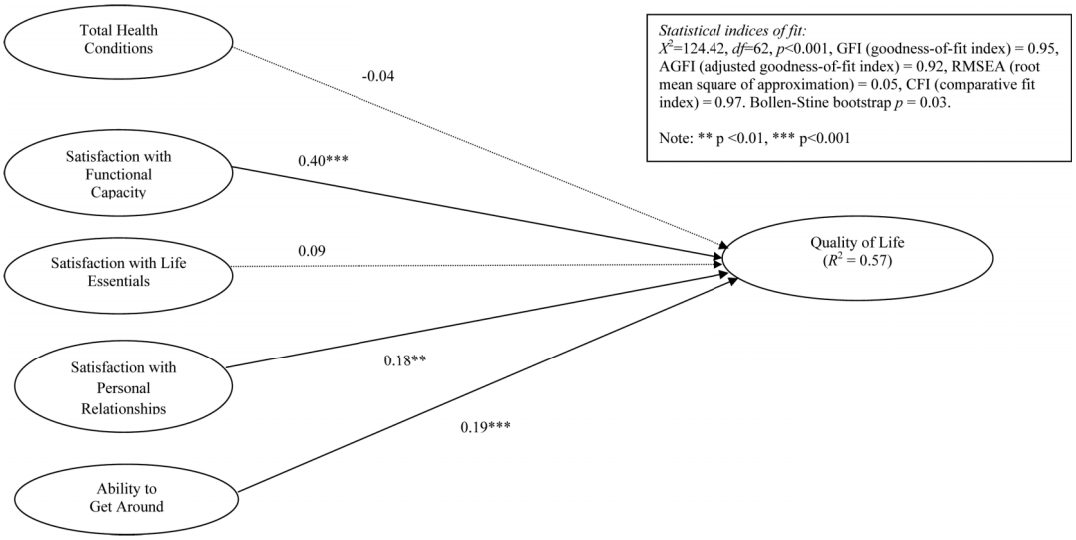


**Figure 1.** The initial model of structural relations between total health conditions, the three life satisfaction scores, ability to get around, and quality of life.

et al.'s (2011) regression analysis but with the three constructs of satisfaction with life identified above rather than the single measure of satisfaction with life used earlier. Figure 1 shows the initial model, which demonstrates the direct linear contribution of all five predictor variables (the three constructs of satisfaction with life, total health conditions, and ability to get around) on QOL.

An alternative model to that in Figure 1 was then proposed for comparison with this initial model. This alternative model was based on research showing those who have difficulty seeing are worse off financially, have poorer physical and mental health and experience more social isolation or loneliness than the population in general (Branch, Horowitz, & Carr, 1989; Crews, 1994; Horowitz, Brennan, & Reinhardt, 2005; Jin & Wong, 2008; LaForge, Spector, & Sternberg, 1992; La Grow, Alpass, & Stephens, 2009). We hypothesised that restrictions in the ability to get around and the resulting (or often concomitant) increase in health conditions associated with the onset of vision impairment may influence QOL directly but that their primary mode of influence was *indirect*, based on their principal role in generating satisfaction or dissatisfaction with life at present. Specifically, we proposed a positive relationship between ability to get around and the three life satisfaction variables and a negative relationship between the life satisfaction variables and total health conditions. This was based on the notion that increased mobility should reflect positively on our personal estimation of satisfaction with functional capacity, our potential ability to access life essentials, and our capacity to engage in personal relationships. On the contrary, ill health (i.e., an increase in total health conditions) may significantly limit our personal perceptions of functional capacity, our ability to access life essentials, and capacity to engage with others. The alternative model is shown in Figure 2.

Table 3 illustrates the statistical fit of both models for explaining the current data. The fit indices for the initial and alternative models suggested both fit the data well, but the indices suggested a stronger overall fit

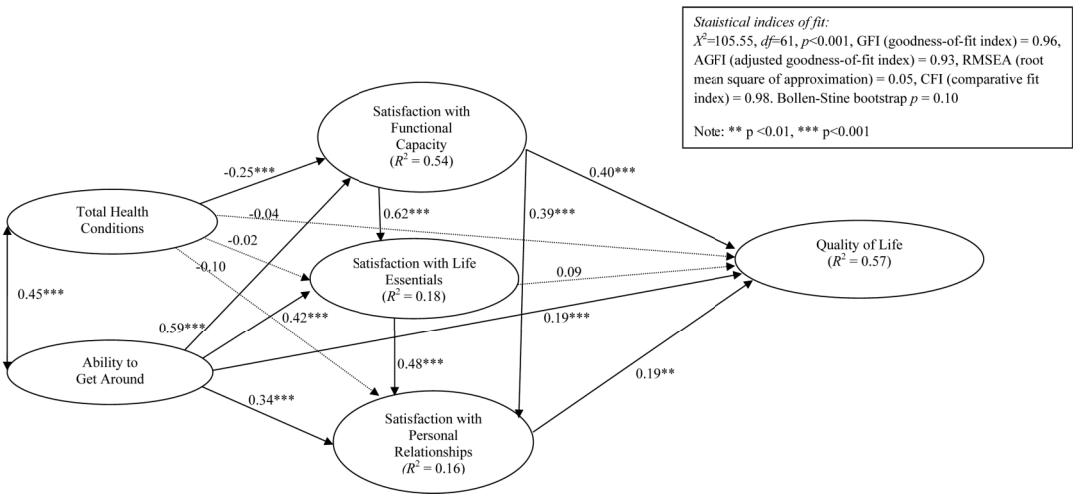


**Figure 2.** The alternative and final model of structural relations between total number of diagnosed health conditions, three-construct of life satisfaction scale, ability to get around, and quality of life.

**Table 3.** Fit index of the initial model and the alternative model.

| Fit Index | Initial Model | Alternative Model |
|---|---|---|
| $\chi^2$/ df | 124.42/62 | 105.55/61 |
| RMSEA | 0.05 | 0.05 |
| GFI | 0.95 | 0.96 |
| AGFI | 0.92 | 0.93 |
| CFI | 0.97 | 0.98 |
| Bollen-Stine *p* value | 0.03 | 0.10 |

for the alternative rather than the initial model.

Figure 2 shows the alternative model and, using maximum likelihood parameter estimates, illustrates the direct influence of ability to get around and total health conditions on the three life satisfaction variables, and the direct impact of all five predictor variables on QOL. The bootstrap procedure was used to compute the Bollen-Stine bootstrap *p* values and confidence intervals of all path coefficients between latent variables on this model to account for the presence of multivariate non-normally distributed data. The present test was based on 2,000 bootstrap samples. The method yielded a non-significant Bollen-Stine bootstrap *p* value of 0.10 indicating that this model did not have to be rejected. As the alternative model (see Figure 2) yielded a very good fit ($X^2$ = 105.55, *df* = 62, $p$<0.001, GFI = 0.96, AGFI = 0.93, RMSEA = 0.05, CFI = 0.98), it was, therefore, accepted as the final model for explaining the phenomenon in question.

The final model indicates that total health conditions had no direct impact on QOL and its only significant association was with satisfaction with functional capacity. However, ability to get around influenced QOL directly ($\beta$ = 0.19, p <.001), and had strong direct impacts on all three satisfaction constructs, particularly satisfaction with functional capacity. The squared multiple correlations between all five predictor variables in the final model explained 57% of the variance in QOL. Table 4 presents factor loadings, construct reliability, total pathway effects, variance explained and goodness of fit indexes for the final model.

In order to distinguish the nature of each predictor's influences on QOL, Table 5 shows the SEM regression estimates which highlight the direct, indirect, and total impact of each of the five independent variables on QOL. This shows that although two of the three satisfaction with life variables (i.e., functional capacity and personal relationships) directly impact on QOL, they also play an important mediating role on the relationships between ability to get around, total health conditions, and QOL. Also, although ability to get around had a small-to-medium direct impact on QOL, its greatest contribution to influencing QOL was through its relationship with life satisfaction, primarily its strong association with functional capacity. When taken in total, both ability to get around and functional capacity are the primary predictors of QOL. Whilst total health conditions is not directly related to QOL, it is indirectly related to QOL (mediated by satisfaction of functional capacity and personal relationships, total $\beta$ = -0.16, indirect $\beta$ = -0.12).

**Table 4.** Factor loadings, construct reliability, total pathway effects, variance explained and goodness of fit indexes for the final model.

| *Factor loadings* | Final Model |
|---|---|
| Satisfaction with Functional Capacity (α = 0.78) | |
| Daily living activities | 0.71*** |
| Capacity to work | 0.66*** |
| Health | 0.62*** |
| Yourself | 0.58*** |
| Sleep | 0.24*** |
| Satisfaction with Life Essentials (α = 0.54) | |
| Transport | 0.44*** |
| Health services | 0.40*** |
| Conditions of living space | 0.54*** |
| Satisfaction with Personal Relationships (α = 0.50) | |
| Personal relationships | 0.64*** |
| Sex life | 0.39*** |
| Support you get from friends | 0.27*** |
| *Variance explained $R^2$* | |
| Overall quality of life | 0.57 |
| Satisfaction with Functional Capacity | 0.54 |
| Satisfaction with Life Essentials | 0.18 |
| Satisfaction with Personal Relationships | 0.16 |

***$p<0.001$

**Table 5.** Direct, indirect and total effects (Beta coefficients) illustrating the effect size for each predictor variable on quality of life.

| *Scale* | Ability to get around | Total Health Conditions | Satisfaction with Functional Capacity | Satisfaction with Life Essentials | Satisfaction with Personal Relationships |
|---|---|---|---|---|---|
| Overall Quality of Life | | | | | |
| Direct Effect | 0.19 | -0.04 | 0.40 | 0.09 | 0.19 |
| Indirect Effect | 0.34 | -0.12 | 0.12 | 0.09 | — |
| Total Effect | 0.53 | -0.16 | 0.52 | 0.18 | 0.19 |

Absolute Beta values less than 0.10 indicate a 'small' effect, value about 0.30 a 'medium' effect; and those greater than 0.50 indicate a 'large' effect (Kline, 1998).

## Summary and conclusion

The initial model proposed and tested in this study was an elaboration of the earlier linear model reported in La Grow et al. (2011) but with a more sophisticated construction of satisfaction with life. This initial model proposed that satisfaction with functional capacity had the greatest contribution to the variance in QOL than

any other variable in the study; while neither total health conditions nor satisfaction with life essentials were directly related to QOL. While this model provided further insight into the factors that affect QOL than that found in our earlier study, it still did not account for interactions between and among variables. The alternative model did, and in doing so, it became clear that ability to get around not only had a direct and significant effect on QOL but also on satisfaction with functional capacity, satisfaction with life essentials and satisfaction with personal relationships. Total health conditions was found to have a reciprocal relationship with ability to get around and a direct affect on satisfaction with functional capacity, but no strong association with QOL. Satisfaction with functional capacity was found to have a direct and significant impact on QOL, satisfaction with life essentials, and satisfaction with personal relationships. While all of these variables and constructs were found to be inter-related, it is apparent that ability to get around has a very large impact on satisfaction with functional capacity and that, in combination; these two variables have the greatest effect on the QOL of older adults with some level of vision impairment. It is clear from the findings of this study that ability to get around and therefore, by extension, O&M is indeed central to one's perception of QOL. Thus, O&M, as an intervention that ultimately seeks to increase ability to get around, remains as central to a rehabilitation process aimed at enhancing QOL as it is to one seeking to increase independence.

Our findings have implications for conceptualising and examining ability to get around in relationship with QOL in those who have difficulty seeing and possibility other populations. The association between ability to get around and QOL is likely indirect rather than direct, based on the position that ability to get around influences proximal or intermediate variables, and in turn, those intermediate variables influence the distal outcome of QOL. The present study further supported an indirect relationship between ability to get around and QOL based on an expanded number of mediating variables including satisfaction with functional capacity, satisfaction with life essentials and satisfaction with personal relationships. Future studies should be encouraged to examine a broad array of psychological, social and/or physical variables as mediators of the relationships between ability to get around and QOL in other diverse populations.

To our knowledge, this study is the first study to use the complex conjunction of factor analyses and structural equation modelling techniques to examine whether or not ability to get around and total health conditions are indirectly related to QOL. Despite the strengths of the study, the cross-sectional nature of the data precludes conclusions and inferences about the causal and directional relationships among variables. The study acknowledges there could be other models for explaining the associations among ability to get around, total health conditions and QOL. Accordingly, future research should consider other mediating variables and longitudinal and experimental research design when examining the relationship between ability to get around, total health conditions and QOL in persons who have difficulty seeing.

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