The Learning and Development Survey: Further Evaluation of its Psychometric Properties

Megan Tones[1] & Hitendra Pillay
Queensland University of Technology

ABSTRACT

The current study reports upon further evaluation of the psychometric properties of the Learning and Development Survey. Originally tested on 113 local government employees, the Learning and Development Survey was found to have good reliability, however there was a large proportion of redundant items, with 62 indicators spanning six constructs. These six constructs were: Organisational Opportunities: Learning Climate, Organisational Constraints, Individual Goal Engagement, Individual Goal Selection, Organisational Opportunities: Work Tasks, and Individual Goal Disengagement. In the current study, factor analysis, internal consistency analysis and item reliability analysis were conducted to reduce the total number of items and retain the optimal indicators of the latent factors. The six factors were replicated in the analyses, however the number of items was reduced. Despite a reduction in the number of items, internal consistency remained high, and inter-factor correlations were reduced. A MANOVA was conducted with age and occupation type acting as independent variables, and the factors from the revised Learning and Development serving as the dependent variables. Findings from the MANOVA analysis determined that employees over 45 years of age reported fewer opportunities for learning and development at work than employees aged less than 45 years, especially in blue collar settings. Older workers were also found to be less engaged in learning and development goals than younger workers.

INTRODUCTION

A variety of organisational and social changes have lead to the erosion of the traditional linear career path, creating an impetus for self directness in learning and development to maintain employability (Theijssen, van der Heijden & Rocco, 2008). Recent theoretical and empirical literature supports continuous learning throughout work life via the incorporation of developmentally appropriate learning opportunities across the lifespan from early career to the approach of retirement (Ilmarinen, 2006; Robson & Hansson, 2007; Robson, Hansson, Abalos & Booth, 2006). Several authors in the organisational and developmental psychology fields have suggested the use of lifespan development psychology as a framework to explore various workforce issues (Baltes & Dickson, 2001; Kanfer & Ackerman, 2004).

[1] Contact

Ms Megan Tones
School of Learning & Professional Studies
Queensland University of Technology,
Victoria Park Road,
Kelvin Grove, Australia, 4059
Ph: +61-7-3864 5746
Fax: +61-7-3864 8265
Email: m.tones@qut.edu.au

Professor Hitendra Pillay
School of Learning and Professional Studies,
Queensland University of Technology,
Victoria Park Road,
Kelvin Grove, Australia, 4059
Ph: +61-7-3864 3030
Fax: +61-7-3864 8265
Email: h.pillay@qut.edu.au

This paper describes further validation of the Learning and Development Survey (LDS), which was designed to measure learning and development in the workforce based on the principles of lifespan development psychology (Tones & Pillay, 2007).

Lifespan development psychology is the study of human development from conception to death (Heckhausen & Schultz, 1999). Current literature in the field poses two underpinning concepts in the regulation of human development: plasticity and bio-cultural co-construction (Li & Freund, 2005). Plasticity refers to the scope of development possible within a given area of functioning, defined by opportunities and limitations (Staudinger, Marsiske & Baltes, 1993). Biocultural co-construction refers to the reciprocal interactions between individual biological processes, most notably brain development, individual behaviours and cognitions, and the external factor of culture, which broadly describes all external environmental factors (Baltes, Rosler & Reuter-Lorenz, 2006). The meta-theory of Selective Optimisation with Compensation (SOC) describes how adaptive development is regulated by the processes of selection, optimization and compensation (Riediger, Li, & Lindenberger 2006). Selection refers to the choice of life domains in which to invest personal resources, time and effort in the form of goals (Freund & Baltes, 2002). This process is further broken down into two modes: elective selection and loss based selection. Elective selection involves advancement in life domains, such as career development, aligned with psychological needs, personal resources and environmental opportunities. Selection in response to personal or environmental losses, such as changing jobs due to a sustained injury or being made redundant, fall into the category of loss based selection (Freund & Baltes). Optimisation refers to personal investment of time, energy and other resources towards goal achievement in the selected domains. Compensation describes efforts to regulate losses in developmental resources that have the potential to block goals. Although SOC has been applied to a broad scope of scenarios ranging from the cellular to societal level, the subsequent overview will be limited to individuals.

Studies of SOC using self report methods have revealed important demographic and contextual effects regarding the use of selection, optimization and compensation strategies. For instance, in a sample of 399 German citizens aged between 14 and 89 years, a negative correlation was observed between age and the use of SOC strategies (Freund & Baltes, 2002). An earlier large scale study of SOC meta-theory reported a decrease in selection and optimizing strategies with age amongst a sample of 1200 German citizens, while disengagement strategies typified by loss based selection were reputed to increase with age (Brandtstadter & Renner, 1990; Brandtstadter & Baltes-Gotz, 1990). In addition, Heckhausen (1997) noted that amongst a sample of 510 adults, goal focus changed with age. Specifically, the incidence of goals directed at accruing gains in one's career declined with age, while goals intended to avoid losses, such as health related goals, assumed higher importance in advancing age. Individual differences played an important role, with high occupational status linked to continued pursuit of growth related goals in old age. Other more recent studies have shown that occupational status is an important determinant of the use of SOC strategies, due to the increased autonomy and greater opportunity afforded by high status jobs (Bajor & Baltes, 2003; Wrosch, Heckhausen & Lachman, 2006). For instance, the use of SOC strategies has been shown to predict career success in younger workers (Weise, Freund & Baltes, 2002), and is associated with greater job autonomy in older workers (Abraham & Hansson, 1995). However, there have been no studies that have used a learning specific SOC measure to investigate continuous learning and development, or perceived opportunities and constraints for development at work. Early social and developmental psychology research and current lifespan developmental psychology theories both emphasise the reciprocity of the individual and environment (Kohn & Schooler, 1973; Kohn & Schooler, 1978; Baltes et al, 2006; Wrosch et al, 2006). Given the importance of learning in today's work environment for all employees, the absence of a learning specific measure is a shortcoming in the current lifespan development psychology literature. In order to address this issue, Tones and Pillay (2007) developed the Learning and Development Survey (LDS).

The LDS was based on the meta-theory of SOC, and subsequent models of adaptive development including the dual process model of developmental regulation (Brandtstadter & Rothermund, 2002), Optimisation via Primary and Secondary Control (Heckhausen, 2001), and Socioemotional Selectivity Theory (Carstensen, Isaacowitz & Charles, 1999). These models complement the meta-theory of SOC

via their contribution of the cognitive elements of goal engagement and goal disengagement, and a collective conceptualisation of SOC. Findings from a pilot study conducted on 113 local government workers revealed a sixty-two item questionnaire, which encompassed six domains: Individual Goal Selection, Individual Goal Engagement, Individual Goal Disengagement, Organisational Opportunities: Learning Climate, Organisational Opportunities: Work Tasks, and Organisational Constraints (Tones & Pillay, 2007). The first three domains were designed to measure employee's selection of and engagement in learning and development goals, as well as their thought processes in disengagement from learning goals. The latter three domains were intended to assess employee perceptions of opportunities for development at work based on learning climate and job tasks, and constraints for development. While initial psychometric properties of the LDS were acceptable, the scale was still very long and suffered from possible item redundancy issues, which are elaborated upon in the methodology section.

The purpose of this study was to further evaluate the psychometric properties of the LDS. There were two aims for the current study: (1) Removal of redundant items in the LDS via screening of LDS items for non-normality, repeat of exploratory factor analysis, and investigation of reliability via internal consistency and item reliability analyses; and (2) Evaluation of the criterion validity analysis of the revised LDS through examination of interfactor correlations, and a MANOVA study of the impact of demographic variables (age, occupation) on LDS outcomes.

METHOD

Participants

The participants were 113 local government workers from two regional local government member councils in Queensland. Fifty one percent of the sample was aged 45 years or younger, and 64% were white collar workers. One case was deleted due to non completion of the LDS. Participation was voluntary, and hard copies of the surveys were distributed during in house training and development sessions by the training and development manager. Surveys were collected by HR staff at each council, where they were returned to the university for data entry into SPSS.

Development of the Learning and Development Survey

The Learning and Development Survey was developed from an integration of questionnaires designed to measure selection, optimization and compensation, employee learning and development, and opportunities and constraints for learning at work. Responses were recorded on a five point scale ranging from (1) Strongly Agree to (5) Strongly Disagree. The original factor solution for the Learning and Development Survey is reproduced in Table 1. While the internal consistency ranged from acceptable (α =.752) to excellent (α =.957), Boyle (1991) notes that high internal consistency may be indicative of item redundancy via repetition of similar questions within subscales. In scale development, three to six items per construct is considered sufficient to adequately describe most underlying constructs (Hinkin, 1998; Tabachnick & Fidell, 2006). Inter-correlations above +/- r= 0.3 may also be suggestive of item redundancy, as stronger correlations indicate greater covariance between two factors.

Item redundancy is apparent in the current version of the LDS as the first four factors have more than six items, and six intercorrelations exceed +/- r= 0.3 (see Table 2). The most problematic subscale is Organisational Opportunities – Learning Climate (OO-LC), with 24 items and large intercorrelations with Organisational Opportunities – Work Tasks (OO-WT), Organisational Constraints (OC) and Individual Goal Selection (IGS). Some items from Individual Goal Engagement (IGE) and OC are also expected to be redundant as both scales contain 10 items. In addition, IGE also shares strong correlations with IGS and OO-WT. Finally, IGS also has too many items, and is strongly correlated with OO-WT. Only OO-WT and Individual Goal Disengagement (IGD) contain a sufficient number of items.

Table 1: Initial Factor Solution of the Learning and Development Survey

Factors	Abbreviation	Number of items	Cronbach's alpha	Eigenvalue	Proportion of variance explained
Organisational Opportunities – Learning Climate	OO-LC	24	α =.957	16.067	25.12%
Individual Goal Engagement	IGE	12	α =.867	6.402	10.00%
Organizational Constraints	OC	10	α =.833	4.743	7.41%
Individual Goal Selection	IGS	7	α =.852	3.213	5.02%
Organisational Opportunities – Work Tasks	OO-WT	6	α =.855	2.666	4.17%
Individual Goal Disengagement	IGD	3	α =.752	2.389	3.73%

Table 2: Interfactor Correlations of the Learning and Development Survey

	OO-LC	IGE	OC	IGS	OO-WT	IGD
OO-LC	1					
IGE	.275**	1				
OC	-.362**	-.023	1			
IGS	.355**	.324**	-.016	1		
OO-WT	.498**	.377**	-.115	.401**	1	
IGD	-.084	-.155	.274**	-.131	-.156	1

Procedure

There were five stages of data analysis in the current study: data screening, exploratory factor analysis, internal consistency analysis, item reliability analysis and criterion validity analysis.

First, items of the LDS were screened for non normality. According to Finney & DiStefano (2006), maximum likelihood estimation is robust to moderate violations of non normality, defining as skewness less than +/- 2, or kurtosis less than +/-7. Items that exceeded these limits were deleted.

Secondly, the remainder of the LDS items was subjected to exploratory factor analysis via the maximum likelihood function on SPSS. Unrotated, orthogonal and oblique solutions were obtained to determine the most conceptually meaningful solution. The number of factors was determined via the criteria of eigenvalues exceeding 1.0, leveling off of eigenvalues as determined by the scree plot, and theoretical justification (Fabrigar, Wegener, MacCallum & Strahan, 1999; Tabachnick & Fidell, 2006). Items were retained if they exhibited a loading of +/- 0.4 or greater, and did not share cross loadings of +/- 0.3 on additional factors.

Thirdly, internal consistency analysis was conducted to identify item redundancy, marked by an increase or lack of change in Chronbach's alpha values upon deletion of an item. The process was repeated until all redundant items identified via internal consistency analysis were removed.

Fourth, item reliability analysis was undertaken to identify redundant items. According to Green and Salkind (2006) items that share a large correlation with more than one factor may be indicators of multiple constructs, while Boyle suggests correlations above +/-0.3 are sufficient to question item reliability.

Lastly, a MANOVA was conducted with age, education level and occupation serving as the independent variables. The subscales of the revised LDS constituted the independent variables.

Data screening

One item of the LDS presented severe non normality and was deleted, "IGE7 - When I have difficulties learning something new, I ask somebody for help" ($Z_{kurtosis}$= 7.774).

RESULTS

Exploratory Factor Analysis

The remaining 84 items were factor analyzed using the maximum likelihood factor analysis function on SPSS. The Kaiser-Meyer-Olkin measure of sampling adequacy was .53 and the Bartlett's test of sphericity was significant, both of which were unchanged from the previous analysis (Tones & Pillay, 2007). There were 21 factors with an eigenvalue exceeding 1.0, however the scree plot and theoretical justification indicated six factors (Tones & Pillay). A promax oblique rotation was found to be the most conceptually meaningful. A total of 32 items were discarded because they failed to share a loading of 0.4 with any of the six retained factors. Three items were also deleted due to a cross loading of >.3 on the first and sixth factors, "OGS2 - My workplace has a mentoring system," "OGS8 - My workplace helps me to decide on my most important learning and development goals," and "OGS14 - If I find learning and development activity too difficult for me, my workplace can help me achieve it." All retained items are reproduced in Table 3, along with factor loadings. The total variance explained by the Learning and Development Survey was 55.44%, although the factor solution demonstrated a poor fit to the data χ^2(1647) =2333.725, p<0.01.

Table 3: Factor Analysis and Item Reliability Analysis of the Learning and Development Survey

Items **Organisational Opportunities – Learning Climate (18 items)**	**Factor Analysis**
Eigenvalue (percentage of variance explained)	17.201 (20.48%)
OGS3 - My workplace provides learning and development opportunities that meet my needs	.819
OGS6 - Learning and development are important goals at my workplace.	.992
OGS7 - My workplace helps me to decide which skills to improve.	1.024
OGS9 - My workplace supports study and education for older workers outside of work.	1.024
OGS10 - In my workplace, learning and development activities are designed to develop a range of skills.	.908
OGS11 - My workplace provides training in advanced skills.	.699
OGS12 - My workplace is willing to change learning and development activities to suit my needs.	.911
OGS13 - My workplace has special learning and development programs for workers with limited formal education.	.622
OGE14 - In my workplace, I have the opportunity to participate in training.	.761
OGE15 - I have access to learning and development advice within my workplace.	.588
OGE18 - In my workplace, my co-workers are supportive of learning and development.	.424
OGE19 - In my workplace, my supervisor is supportive of learning and development.	.606
OGE20 - In my workplace I am given useful feedback to improve my skills.	.846
OGE21 - In my workplace, there are rewards for taking part in learning and development activities.	.738
OGE12 - In my job, I have enough time to develop my skills.	.422
OGS1 - My workplace provides job opportunities that are appropriate for me.	.479
OGS4 - My workplace's rules and policies make it possible for me to take part in learning and development activities.	.699
OGE13 - In my workplace, I can get help when my job becomes difficult.	.566

Individual Goal Engagement (10 items)	
Eigenvalue (percentage of variance explained)	7.458 (8.88%)
IGE1 - I am willing to work hard at developing new work skills.	.793
IGE2 - I try to obtain challenging jobs in order to develop my skills.	.828
IGE3 - If training and development opportunities are available within my workplace, I will participate in them.	.695
IGE5 - I design better ways of doing my job when it becomes challenging.	.598
IGE6 - When aspects of my job become challenging, I try to find solutions by myself before I ask for help.	.508
IGE12 - When I have a learning and development goal, I think about how I will benefit when I succeed in that goal.	.606
IGE13 - I have the ability to achieve my learning and development goals.	.679
IGE14 - When I have a learning and development goal, I think about how good I will feel when I achieve it.	.609
IGE10 - When I feel that there are few learning and development opportunities at work, I spend my free time considering alternate jobs I could do.	.465
IGE4 - I spend as much time as I can to learn new things at work.	.442
Organizational Constraints (7 items)	
Eigenvalue (percentage of variance explained)	5.138 (6.12%)
OGD1 - In my workplace, older workers are encouraged to retire.	.850
OGD2 - Older workers are not offered training and development in my workplace.	.664
OGD3 - In my workplace, knowledge of the latest technologies is valued over direct industry experience.	.881
OGD5 - In my workplace, younger workers are considered to be more competent than older workers.	.707
OGD7 - In my workplace, I have been given fewer learning and development opportunities as I get older.	.637
OGD8 - In my workplace, younger workers are given more learning and development opportunities than older workers.	.455
OGD4 - In my workplace, up to date qualifications seem to be more important than work experience.	.552
Organisational Opportunities – Work Tasks (5 items)	
Eigenvalue (percentage of variance explained)	3.492 (4. 72%)
OGE1 - Learning new knowledge and skills is important for my job.	.642
OGE2 - In my job, I have to make difficult decisions.	.802
OGE3 - In my job, I have to make quick decisions.	.990
OGE8 - My work is challenging for me.	.646
OGE5 - In my job, I am able to try new ways of doing things	.402
Individual Goal Selection (6 items)	
Eigenvalue (percentage of variance explained)	3.124 (3.72%)
IGS1 - It is important for me to teach work skills to younger workers.	.915
IGS2 - It is important for me to influence the future of my workplace.	.724
IGS3 - It is the right time for me to improve my work skills.	.434
IGS5 - I decide what learning and development goals are important to me.	.473
IGS6 - I know exactly what skills I want to improve.	.772
IGS 7 - I am interested in developing my work skills.	.650
Individual Goal Disengagement (3 items)	
Eigenvalue (percentage of variance explained)	3.032 (3.61%)
IGD2 - Learning and development goals are not important to me.	.652
IGD4 - When my learning and development goals do not work, it's because I am unlucky.	.566
IGD6 - I do not need to participate in learning and development because I am competent in my job.	.835

Internal consistency analysis

A series of scale reliability analyses were conducted to determine the internal consistency of each subscale, and lead to the removal of three more items from the questionnaire. The item "OGE12 - In my job, I have enough time to develop my skills" shared a loading of .422 on OO-LC. However, item reliability analysis revealed that its inclusion reduced the internal consistency from $\alpha = .946$ to $\alpha = .942$, and therefore the item was redundant. It was also found that removal of the item "IGE10 - When I feel that there are few learning and development opportunities at work, I spend my free time considering alternate jobs I could do" increased the internal consistency of IGE from $\alpha = .856$ to $\alpha = .867$. Finally "OGD4 - In my workplace, up to date qualifications seem to be more important than work experience," which loaded onto the OC (.552) was also redundant as deletion had a minimal impact on internal consistency $\alpha = .851$ to $\alpha = .856$.

Item reliability analysis

Item reliability analysis was conducted to further improve the reliability of the Learning and Development Survey. Seven items showed evidence of cross loading, with correlations above $r=0.4$ on more than one factor, while a further 17 items shared correlations above $r=0.3$. Of the items with correlations exceeding +/- 0.4, three items correlated on OO-LC and OO-WT ("OGS1 - My workplace provides job opportunities that are appropriate for me", "OGS4 - My workplace's rules and policies make it possible for me to take part in learning and development activities", and "OGE5 - In my job, I am able to try new ways of doing things"), one on OO-LC and IGD ("OGE13 - In my workplace, I can get help when my job becomes difficult"), and three on IGS and IGE ("IGE4 - I spend as much time as I can to learn new things at work", "IGS6 - I know exactly what skills I want to improve" and "IGS 7 - I am interested in developing my work skills."). All seven items were deleted as internal consistency was unaffected by their omission, leaving 39 items.

However, OO-LC and IGE were still deemed to be too large with 14 and eight items respectively. Deletion of all 17 items with sharing correlations above +/- 0.3 would have resulted in the deletion of entire factors, so interfactor correlations between the first two factors and other factors were investigated. Two large correlations were observed between OO-LC and OC, $r = -.314$ and IGE and OO-WT, $r = .350$. Within OO-LC, an additional five items were found to share a correlation above .3 with OO-WT. These items were "OGS3 - My workplace provides learning and development opportunities that meet my needs," "OGS6 - Learning and development are important goals at my workplace," "OGE14 - In my workplace, I have the opportunity to participate in training," OGE15 - I have access to learning and development advice within my workplace," and "OGE18 - In my workplace, my co-workers are supportive of learning and development." Internal consistency of the first factor was .914 after the deletion of these items, which was marginally reduced to .912 after the deletion of the item, "OGE19 - In my workplace, my supervisor is supportive of learning and development." After the deletion of these six items, the correlation between OO-LC and OC had dropped to $r= -.294$.

Within IGE, one item exhibited a correlation of $r= .397$ with OO-WT, "IGE5 - I design better ways of doing my job when it becomes challenging." Upon deletion of this item, the internal consistency was still good, reduced from .860 to .831. Furthermore, deletion of ÍGE1, "I am willing to work hard at developing new work skills" had a minimal impact on internal consistency, which was reduced to .823. However, even with these two items deleted, the correlation between IGE and OO-WT was still $r= .326$. Two out of four items OO-WT shared a correlation of above 0.3 with the second factor, which were "OGE1 - Learning new knowledge and skills is important for my job" and "OGE2 - In my job, I have to make difficult decisions". Of these two items, the deletion of OGE1 was found to have less of an impact on internal consistency, reducing it from .814 to .785. With OGE1, IGE1 and IGE5 deleted, the correlation between IGE and OO-E was $r= .297$. Following item reliability analysis, the LDS was reduced to 30 items, with all factors except for OO-LC reduced to six or fewer items.

Repeat of Exploratory Factor Analysis

The EFA was repeated on the remaining 30 items. The factor structure was similar to the first analysis reported in this paper. However, "OGE20 - In my workplace I am given useful feedback to improve my skills" and "OGE21 - In my workplace, there are rewards for taking part in learning and development activities" were found to cross load onto a seventh factor containing these two items only. After their deletion the first factor contained only 6 items, which resulted in a 28 item survey. Ordering of factors also differed, with OC and IGS explaining a greater proportion of the variance in LDS scores than IGE and OO-WT respectively. The total variance explained by the Learning and Development Survey in the second factor analysis of 30 items, with the total variance explained 63.63%, although the factor structure remained a poor fit to the data $\chi^2(246) = 348.752$, p<0.01, an improvement on the first factor analysis of 84 items. The internal consistency, eigenvalue and total variance explained by each factor of the revised LDS is reported in Table 4. Descriptive statistics based on the revised LDS are included in Table 5.

Table 4: Factor Loadings and Internal Consistencies of the Revised Learning and Development Survey

Factors	Number of items	Chronbach's alpha	Eigenvalue	Proportion of variance explained
Organisational Opportunities – Learning Climate	6	α =.888	6.659	21.56%
Organizational Constraints	6	α =.856	3.725	12.42%
Individual Goal Engagement	6	α =.823	3.308	11.03%
Individual Goal Selection	4	α =.801	1.967	6.57%
Organisational Opportunities – Work Tasks	3	α =.785	1.900	6.33%
Individual Goal Disengagement	3	α =.752	1.720	5.73%

Table 5: Means and Standard Deviations of each Factor, and Intercorrelations

	OO-LC	OC	IGE	IGS	OO - WT	IGD
Mean	16.07	20.55	11.38	7.24	6.59	11.60
SD	4.22	3.77	2.68	2.48	2.05	1.95
Minimum	6 (0.9%)	12 (0.9%)	6 (4.4%)	4 (13.3%)	3 (7.1%)	3 (0.9%)
Maximum	30 (0.9%)	30 (0.9%)	18 (2.7%)	20 (0.9%)	13 (0.9%)	15 (7.15%)
Skewness	.837	-.059	.095	1.690	.552	-.942
Kurtosis	.866	-.311	-.149	6.471	.802	2.813
OO-LC	1					
OC	.285**	1				
IGE	.082	-.115	1			
IGS	.243**	.022	.268**	1		
OO-WT	.153	-.102	.297**	.289**	1	
IGD	-.095	.227*	-.202*	-.112	-.192*	1

*p<0.05 ** p<0.01

Criterion Validity Assessment

A one way multivariate analysis of variance was conducted to identify the impact of age and occupation on the LDS subscales. Box's test of equality of covariance matrices was significant, so the Pillai's trace statistic was used due to robustness to violations of homogeneity of variance (Tabachnick & Fidell, 2006). Significant differences were found for age and age*occupation on LDS scores, which are shown in Table 6. The partial h^2 values indicate that 21.9% and 12.8% of the variance in LDS scores were accounted for by age and the interaction of age and occupation respectively.

Table 6: Multivariate Tests of Demographic Effects on LDS Scores

Effect	Pillai's Trace Value	F	Hypothesis df	Error df	Significance	Partial Eta Squared
Age	.219	4.347	6	93	.001	.219
Age*Occupation	.128	2.282	6	93	.042	.128

A series of ANOVAs on the dependent variables (OO-LC, OC, IGE, IGS, OO-WT and IGD) were conducted as follow up tests to the MANOVA. A Bonferroni adjustment was used, such that each ANOVA was tested at the 0.008 level. A significant main effect for age was detected for IGE, and an age*occupation interaction was observed for OO-LC. Table 7 shows that 12.6% of the variance in IGE scores is attributable to age, while 8.4% of the variance in OO-LC scores is attributed to the age*occupation interaction respectively. Age accounted for 13.8% of the variance in IGE scores.

Table 7: Significant ANOVA tests for

Source	Dependent Variable	df	Mean Square	F	Significance	Partial Eta Squared
Age	IGE	1	83.091	14.174	.000	.126
Age*Occupation	OO-LC	1	152.059	8.945	.004	.084

Significant differences between means and standard deviations for OO-LC and IGE scores by age and occupation are shown in Table 8. Lower scores for younger workers on IGE indicate that younger workers are more likely to agree with this construct than older workers. When occupation group was considered for OO-LC, a discrepancy was observed for younger and older blue collar workers, but not white collar workers. This indicates that older blue collar workers are less likely to agree with items of the OO-LC construct, than either younger blue collar workers or white collar workers, regardless of age.

DISCUSSION

The dual aims of this study were to refine the psychometric properties of the LDS by reducing the scale length, and to validate the survey against the demographic indicators of age, education and job type. Following the deletion of a severely non normal item, a repeat of the initial factor analysis removed 10 items from the original scale while a further 22 items were deleted via reliability analysis procedures. The factor analysis was repeated a second time, and two more items removed, which resulted in a 28 item scale with three to six items per factor.

Table 8: Mean (SD) Scores for OO-LC and IGE by Age and Age by Occupation Interactions

LDS scale	Less than 45 years			More than 45 years		
	White collar	Blue collar	Overall	White collar	Blue collar	Overall
OO-LC	15.77 (3.41)	13.80 (3.39)	Not significant	15.14 (4.42)	18.80 (5.31)	Not significant
IGE	Not significant		10.30 (2.43)	Not significant		12.33 (2.37)

Six factors were identified in the study:

1. Organisational Opportunities – Learning Climate accounted for 21.56% of the variance in LDS scores, and contained items regarding opportunities for training and skill development in the workplace. Originally, this factor housed 24 items, and exhibited strong conceptual overlap with two other factors. Items deleted due to large covariance with the OO-WT factor related to a positive learning climate at work, while items removed owing to cross loading or correlation with IGD concerned the workplace's adaptation of goals to suit employee needs.

2. Organisational Constraints claimed 12.42% of the variance in LDS scores. Reduced from 10 to six items, this factor covers constraints to attaining learning and development goals at work due to age discrimination.

3. Individual Goal Engagement was the third factor, and accounted for 11.03% of the variance in LDS scores. Originally, this factor shared a strong conceptual overlap with OO-WT and IGS, particularly for items emphasizing goal striving behaviours at work.

4. Individual Goal Selection became the fourth factor, which explained a smaller proportion of the variance in LDS scores at 6.57%. Two items related to a preference for learning and development goals were removed from this scale due to strong covariance with IGE.

5. Organisational Opportunities – Work Tasks was the fifth factor, accounted for a similar proportion of variance in LDS scores, which was 6.33%. Originally housing twice as many items, this factor was reduced due to conceptual overlap with OO-LC and IGE.

6. Individual Goal Disengagement accounted for the lowest proportion of variance at 5.73%, as was unchanged from its original structure.

Factors of the revised LDS shared correlations less than +/- .3, which suggested that independent constructs were measured by each scale. However, there was support for conceptual links between the constructs as well. Two types of employee/ employment scenarios are apparent: the engaged and the disengaged. Employees engaged in learning and development goals, marked by agreement with items from the IGS and IGE constructs, perceive opportunities for learning at work, both in terms of training and development and challenging work tasks, evidenced by agreement with both organisational opportunity constructs. By contrast, employees who report strong agreement with the IGD construct are not engaged in learning and development. They perceive constraints for learning and development at work and a lack of opportunity for training and development, or report limited challenge from performing work tasks, marked by a profile of disagreement with both organisational opportunity constructs, and agreement with OC items.

Validation of the LDS against demographic indicators revealed that older workers reported lower scores on the IGE construct compared to younger workers, which is consistent with lower scores on Optimisation and Compensation scales reported in the literature (Brandtstadter & Baltes-Gotz, 1990; Brandtstadter & Renner, 1990). The age differences for OO-LC were found to be restricted to blue collar workers, as older blue collar workers reported the poorest learning climate, compared to older white

collar workers and younger workers overall. From these findings, it is implied that older workers might be less engaged in learning and development goals than younger workers overall. However, these age differences in learning engagement may be partly attributable to job type, with a greater discrepancy for blue collar workers than white collar workers as a result of reduced opportunities for training and development at work amongst older blue collar workers. These findings contradict Heckhausen's (1997) earlier finding of pursuit of growth related goals in high status workers, as discrepancies related to job type were evident for perception of opportunities, rather than individual constructs. Subsequent lifespan development psychology literature places a greater emphasis on age related social structures for opportunity and constraints than earlier literature from the 1990's, which was individual focused (Wrosch et al, 2006).

Limitations

Given that the current study was exploratory and a component of an ongoing project, there were several limitations. Firstly, the sample size was small, and recruited from a regional area. As such findings may not be generalisable to employees in metropolitan areas, as the demographic profile of regional areas may differ. In addition, organisational factors were observed to account for the majority of variance in LDS responses, which were observed to vary by job type within the current study, and would be expected to vary in different organizations due to organisational climate or culture. Participation was also voluntary, and employees who did not respond may have exhibited different demographic and LDS profiles to participants.

Implications and Conclusions

The current study illustrated that the psychometric properties of the LDS were sound, and therefore the LDS contributes to the research literature, and has implications for organizations and individuals. Organisational opportunities and constraints were observed to have a larger impact on LDS scores than individual selection and engagement factors. The impact of OO-LC was moderated by job type, with a dramatic difference in opportunities for older blue collar workers, compared to younger blue collar workers. It is inferred that differences in learning engagement amongst populations might be more influenced by opportunities and constraints at work and in the job market, rather than differences in individuals' motives for learning and development. However, given that the sample was limited to one organisation, further testing of the instrument would be required, including confirmatory factor analysis and stability testing. Administration to larger and more diverse samples would allow the LDS to be validated against specific populations in the workforce, such as women or indigenous workers. For organizations, this study shows that opportunities for learning and development at work are crucial to individual engagement in learning and development goals. As human capital becomes increasingly valuable to employers, this study highlights the role of the organisation in supporting employee learning and development via the provision of training and development appropriate to workers' needs, as well as interesting, challenging work tasks.

REFERENCES

Abraham, J. D., & Hansson, R. O. (1995). Successful aging at work: an applied study of selection, optimisation, and compensation through impression management. *Journal of Gerontology: Psychological Sciences, 50B*(2), 94-103.

Bajor, J. K., & Baltes, B. B. (2003). The relationship between selection optimization with compensation, conscientiousness, motivation, and performance. *Journal of Vocational Behavior, 63*, 347-367.

Baltes, B. B., & Dickson, M. W. (2001). Using life-span models in industrial-organizational psychology: the theory of selective optimization with compensation. *Applied Developmental Science, 5*(1), 51-62.

Baltes, P. B., Rosler, F. & Reuter-Lorenz, P. A. (2006). Prologue: biocultural co-constructivism as a theoretical metascript. In P. B. Baltes, F. Rosler & P. A. Reuter-Lorenz (Eds.), *Lifespan Development and the Brain: The Perspective of Biocultural Co-Constructivism.* (pp. 3-39). Cambridge: Cambridge University Press.

Brandtstadter, J., & Baltes-Gotz, B. (1990). Personal control over development and quality of life perspectives in adulthood. In P. B. Baltes & M. M. Baltes (Eds.), *Successful Aging: Perspectives from the Behavioural Sciences* (pp. 197-224). Cambridge: UK: Cambridge University Press.

Brandtstadter, J., & Renner, G. (1990). Tenacious goal pursuit and flexible goal adjustment: explication and age related analysis of assimilative and accommodative strategies of coping. *Psychology and Aging, 5*(1), 58-67.

Brandtstadter, J., & Rothermund, K. (2002). The life-course dynamics of goal pursuit and goal adjustment: a two process framework. *Developmental Review, 22*, 117-150.

Boyle, G. J. (1991). Does item homogeneity indicate internal consistency or item redundancy in psychometric scales? *Personality and Individual Differences, 12*(3), 291-294.

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: a theory of socioemotional selectivity. *American Psychologist, 54*(3), 165-181.

Fabrigar, L. R., MacCallum, R. C., Wegener, D. T., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272-299.

Finney, S. J. & DiStefano, C. (2006). Non-normal and categorical data in structural equation modeling. In G. R. Hancock & R. O. Mueller (Eds). *Structural Equation Modeling: A Second Course.* (pp. 269-312). Greenwich: Conneticut: Information Age Publishing.

Freund, A. M., & Baltes, P. B. (2002). Life-management strategies of selection, optimization, and compensation: measurement by self-report and construct validity. *Journal of Personality and Social Psychology, 82*(4), 642-662.

Green, S. B., & Salkind, N. J. (2005). *Using SPSS for Windows and Macintosh: analyzing and understanding data* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Heckhausen, J. (1997). Developmental regulation across adulthood: primary and secondary control of age-related challenges. *Developmental Psychology, 33*(1), 176-187.

Heckhausen, J. (2001). Adaption and resilience in midlife. In M. E. Lachman (Ed.), *Handbook of Midlife Development* (pp. 345-394). New York: NY: John Wiley & Sons.

Heckhausen, J., & Schultz, R. (1999). Selectivity in life-span development: biological and societal canalizations and individuals' developmental goals. In J. Brandtständter & R. M. Lerner (Eds.), *Action and Self-Development: Theory and Research Through the Life Span* (pp. 67-103). California: Thousand Oaks.

Ilmarinen, J. (2006), Towards a longer work life! Ageing and the quality of worklife in the European Union, Finnish Institute of Occupational Health, Ministry of Social Affairs and Health, Helsinki, Finland.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods, 1*(1), 104-121.

Kanfer, R., & Ackerman, P. L. (2004). Aging, adult development, and work motivation. *Academy of Management Review, 29*(3), 440-458.

Kohn, M. L., & Schooler, C. (1973). Occupational experience and psychological functioning: an assessment of reciprocal effects. *American Sociological Review, 38*, 97-118.

Kohn, M. L., & Schooler, C. (1978). The reciprocal effects of the substantive complexity of work and intellectual flexibility: a longitudinal assessment. *American Journal of Sociology, 84*(1), 24-52.

Li, S-C., & Freund, A. M. (2005). Advances in lifespan psychology: a focus on biocultural and personal influences. *Research in Human Development, 2*(1&2), 1-23.

Riediger, M., Li, S-C., & Lindenberger, U. (2006). Selection, optimization, and compensation as developmental mechanisms of adaptive resource allocation: review and preview. In J. E. Birren & K.

Schaie (Eds.), *Handbook of the Psychology of Ageing.* (pp. 289-314). Burlington, MA: Academic Press.

Robson, S. M. & Hansson, R. O. (2007). Strategic self development for successful aging at work. *International Journal of Aging and Human Development, 64*(4), 331-359.

Robson, S. M., Hansson, R. O., Abalos, A. & Booth, M. (2006). Successful aging: criteria for aging well in the workforce. *Journal of Career Development, 33*(2), 156-177.

Staudinger, U. M., Marsiske, M., & Baltes, P. B. (1993). Resilience and levels of reserve capacity in later adulthood: perspectives from life-span theory. *Development and Psychopathology, 5*, 541-566.

Tabachnick, B. G., & Fidell, L. S. (2006). *Using multivariate statistics* (5 ed.). Boston, MA: Allyn & Unwin.

Thijssen, J. G. L., van der Heijden, B. I. J. M., & Rocco, T. S. (2008). Toward the employability-link model: current employment transition to future employment perspectives. *Human Resource Development Review, in press.*

Tones, M. & Pillay, H. (2007). Selection, Engagement and Disengagement of Learning Goals in Older Workers and their Respective Employers: Preliminary Findings in a Sample of Mature Age Australians. *Human Resource Development in Asia: Developing Talents for Organizations & Nations, 6*th *International Conference of the Academy of HRD (Asia Chapter), 2-5*th November 2007, Beijing Friendship Hotel.

Wiese, B. S., Freund, A. M. & Baltes, P. B. (2002). Selection, optimization, and compensation: an action-related approach to work and partnership. *Journal of Vocational Behaviour, 57,* 273-300.

Wrosh, C., Heckhausen, J., & Lachman, M. (2006). Goal management across adulthood and old age: the adaptive value of primary and secondary control. In D. Mroczek and T. Little (Eds.), *Handbook of Personality Development.* (pp. 399-421), Florence, Kentucky: Routlege.

Biographical Note

Megan Tones is a research assistant and postgraduate student in the School of Learning and Professional Studies. Her research and interests include adult learning engagement, industry-based training, chronic illness and identity, and learning and cognition.

Professor Hitendra Pillay is in the School of Learning and Professional Studies. His research and interests include adult education, industry-based training, learning and cognition, spatial problem solving, and technology based learning environments.