Latent mean differences in the facets of achievement motivation of undergraduate students and adult workers in the US

Sang Eun Woo [a,*], Alyssa Mitchell Gibbons [b], George C. Thornton III [b]

[a] *Department of Psychology, University of Illinois at Urbana-Champaign, 603 E Daniel Street, Champaign, IL 61820, USA*
[b] *Department of Psychology, Colorado State University, Fort Collins, CO 80523-0001, USA*

Abstract

The multidimensional Achievement Motivation Inventory (AMI; Schuler, Thornton, Frintrup, & Mueller-Hanson, 2004) was used to compare achievement motivation of undergraduate students and working adults at the facet level. The AMI displayed measurement invariance across both groups as indicated by multiple group confirmatory factor analysis. Analysis of latent mean differences found students had higher levels of Ambition, while adults had higher levels of Self-Assurance and Self-Control. Findings suggest that multidimensional assessments of achievement motivation can reconcile contradictions in previous research regarding age differences.
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* Corresponding author. Tel.: +1 217 390 5985; fax: +1 217 244 5876.
  E-mail address: sewoo@cyrus.psych.uiuc.edu (S.E. Woo).

1. Introduction

Achievement motivation is known to be an important predictor of both academic and job outcomes (e.g., Bing, 2003; Collins, Hanges, & Locke, 2004; Spence, Pred, & Helmreich, 1989). However, two recent reviews have noted that the relationships between achievement motivation and many key constructs (e.g., learning, adaptation, and performance) remain muddled and unclear (Cury, Elliot, Fonseca, & Moller, 2006; DeShon & Gillespie, 2005). In some cases, such as the relationship between achievement motivation and age, existing research results are directly contradictory (cf. Costa & McCrae, 1988; Roberts, Caspi, & Moffit, 2001; Veroff, Reuman, & Feld, 1984). One reason for this confusion may be the wide variety of conceptual and operational definitions used by achievement motivation researchers.

Certainly, the conceptualization and measurement of achievement motivation has widely varied. Some have viewed it as an implicit motive that must be assessed by indirect techniques, such as the Thematic Apperception Test (TAT; McClelland, Atkinson, Clark, & Lowell, 1953). Others have treated it as a motivational trait or an explicit motive and measured it more directly; for example, as a facet of Conscientiousness in the Big Five personality framework (Costa & McCrae, 1995; Roberts, Chernyshenko, Stark, & Goldberg, 2005) or as a motivational trait in broad inventories such as the Personality Research Form (Jackson, 1984) or Edwards Personal Preference Schedule (Edwards, 1953).

More recently, researchers have begun to develop multidimensional measures of achievement motivation as a stand-alone trait. Such measures include the Motivational Trait Questionnaire (Heggestad & Kanfer, 1999), the Work Preference Inventory (Amabile, Hill, Hennessey, & Tighe, 1994), and the Achievement Motivation Inventory (Schuler, Thornton, Frintrup, & Mueller-Hanson, 2004). To date, the most comprehensive of these is the Achievement Motivation Inventory (AMI; Schuler et al., 2004), which was developed to capture as many as possible of the aspects of achievement motivation considered in the research literature. The 17 facets measured by the AMI can be clustered into three empirically-derived factors, which show measurement equivalence across several cultures (Byrne et al., 2004).

Such multidimensional measures of achievement motivation can help to resolve the inconsistencies found in previous research. Research increasingly indicates that achievement motivation has a complex, multidimensional structure (e.g., Sagie, Elizur, & Yamauchi, 1996). When different researchers study different facets of the construct, but label all of them as simply "achievement motivation", confusion becomes inevitable. In this paper, we focus on a specific area of achievement motivation research (age group differences) and examine whether a multidimensional measure of achievement motivation (the AMI; Schuler et al., 2004) can be used to clarify and resolve the contradictions in the existing literature.

The question of age differences in achievement motivation has been widely studied, but this research has produced results that are ambiguous at best. Some cross-sectional studies have reported negative relationships between age and achievement motivation (Mellinger & Erdwins, 1985; Veroff et al., 1984), whereas a few longitudinal studies (e.g., McGue, Bacon, & Lykken, 1993; Roberts et al., 2001; Stevens & Truss, 1985) found a positive maturation effect of age in achievement needs. Other studies reported no meaningful relationship between achievement motivation and age (Costa & McCrae, 1988; Ward, 1993).

In the overwhelming majority of these studies, achievement motivation was measured as a uni-dimensional construct. This may partially explain the contradictory results described above: some facets of achievement motivation may increase with age, while others may decrease. Such a pattern would be obscured by studies that considered only one or a subset of facets. For example, the Management Progress Study, a longitudinal study of managers' careers, found that "inner work standards" and self-confidence increased over time, while need for advancement and ascendancy decreased (Bray, Campbell, & Grant, 1974). Conversely, Kanfer and Ackerman (2004) proposed that the attractiveness of higher levels of effort will decline with age and that older adults may be less willing to commit to performance goals, engage in work behaviors, or exhibit persistence at tasks involving substantial effort. These proposals appear to conflict with Bray and colleagues' finding of an increase in "inner work standards". As the two sets of researchers used different definitions and sets of facets, however, these studies are not directly comparable.

An additional concern with previous research on age differences in achievement motivation is methodological: most of these studies used analyses of variance (ANOVA) to compare observed mean differences across age groups without accounting for measurement error variance. This practice can yield systematic attenuation or distortion in statistical findings (Ployhart & Oswald, 2004). Also, one should ensure that the measure functions in the same way across different groups before examining their latent mean differences. Straightforward comparisons of observed mean differences (such as ANOVA) can be misleading if the groups being compared are not using the measurement instrument in the same way. Strictly, the comparability of the findings from one group to the other is ensured only when measurement invariance holds across populations (Vandenberg & Lance, 2000). Although this is unlikely to be a concern in laboratory studies where participants are randomly assigned to conditions, age cannot be randomly assigned, and there are likely to be many differences between college students and working adults other than their achievement motivation.

In this study, we sought to address both of these limitations and demonstrate the importance of multidimensional measurement in the investigation of age differences in achievement motivation. Specifically, we compared the achievement motivation of undergraduate students and employed adults in the US at the facet level using the AMI (Schuler et al., 2004). The multidimensional nature of the AMI allows us to test for facet-level differences while holding the measurement instrument constant, avoiding the possibility that observed differences might be due to differences in item writing, questionnaire design, etc. Given the methodological considerations discussed above, we began by testing for measurement invariance across these two groups, then used mean and covariance structure analysis to compare group differences between undergraduates and adult workers at the level of latent means. Latent means (means of factor scores) are better indicators of true differences than observed scores because they are not associated with measurement error (Hancock, 1997).

Our first hypothesis was that measurement invariance would hold for the AMI across student and adult worker samples. Our second hypothesis was that both scale- and latent-level differences would appear between students and working adults on different facets of achievement motivation. Further, we expected that there would *not* be a simple main effect of age across all facets, but rather that students will score higher on some facets and working adults higher on others. For example, it has been suggested that older adults may be more motivated by intrinsic rather than

extrinsic rewards (Bourne, 1982; Bray et al., 1974). Unfortunately, the differences in terminology and the outright contradictions in previous research (cf. Bray et al., 1974; Kanfer & Ackerman, 2004) make it difficult to make further a priori predictions. We therefore considered the exact pattern of facet differences as an open-ended research question.

2. Method

2.1. Participants

Students (335) in US universities and adult workers (410) in a food processing facility in the western United States participated in the survey. The mean age of student participants was 20.74 (SD = 4.43), and the mean age of adult worker participants was 42.82 (SD = 9.89). The student sample consisted of more females (58%) than the adult worker sample (34% female). The data were obtained from the authors of the AMI, who used it for examining the reliability and validity of the scale (Schuler et al., 2004) as well as testing measurement invariance across English, German, and Hebrew versions (Byrne et al., 2004). In previous studies, the student and adult samples were combined and no attempts were made to compare the two.

2.2. Measure

The Achievement Motivation Inventory (AMI; Schuler et al., 2004) was developed to measure various facets of achievement motivation in a comprehensive way based on a trait-oriented approach. It was initially developed in German as the Leistungsmotivationsinventar (Schuler & Prochaska, 2001) and was successfully translated into English. Previous studies (Byrne et al., 2004; Schuler et al., 2004) and data in the current sample showed acceptable levels of reliability for all scales (ranging from .59 to .82, with most greater than .70). Previous research has provided evidence for construct validity, such as the factor structure and convergent–divergent relationships of different AMI facets with other variables (e.g., Big Five personality traits, academic achievement and attitudes, etc.; Schuler et al., 2004).

The AMI consists of 17 empirically derived scales as listed in Table 1. Previous research has identified a three-factor structure (Byrne et al., 2004; see Fig. 1).

2.3. Statistical analysis

Data were analyzed in three ways: (1) examination of effect sizes for observed mean differences; (2) multiple group confirmatory factor analysis (MGCFA) to test measurement invariance; and (3) latent mean analysis using the means and covariance structure (MACS) framework. The MGCFA and MACS procedures are described in more detail below.

2.3.1. Tests of measurement invariance

Following recommendations in the recent measurement invariance literature (Cheung & Rensvold, 2002; Raju, Laffitte, & Byrne, 2002; Vandenberg & Lance, 2000), we evaluated four models of measurement invariance using the MGCFA framework. Model 1 (configural invariance) was

Table 1
Facets of the achievement motivation inventory (reproduced from Byrne et al., 2004)

Facet	Brief definition and sample item
Fearlessness	Lack of fear of failing at difficult tasks; not nervous about performing in public or under time pressure. *When faced with a new job or task, I am often afraid of doing something wrong (RS)*
Flexibility	Willingness to accept change and the enjoyment of challenging new tasks. *I am open to everything new*
Independence	Tendency to take responsibility for one's own actions; would rather make own decisions than take direction from others. *When performing a difficult task, I prefer sharing the responsibility with others rather than bearing it alone (RS)*
Preference for difficult tasks	Tendency to seek out challenging rather than easy tasks; desire to seek greater challenges once difficult task is done. *When I have a difficult task, I like to work on it for a long period of time*
Confidence in success	Confidence in achieving success even when there are obstacles to overcome. *Even when faced with a difficult task, I always expect to achieve my goal*
Dominance	Need to exercise power and influence over others; tendency to take initiative and to have control over activities. *I like to decide what others should do*
Goal setting	Tendency to set high goals and to make long term plans for achieving these goals. *Generally I am not satisfied for long with something I have succeeded in doing, but instead I try to do an even better job the next time*
Eagerness to learn	Desire and willingness to spend a lot of time enlarging one's knowledge for knowledge sake. *When I see or hear something new, I try to retain as much as possible*
Competitiveness	Motivation derived from competing. A desire to be better and faster than others. *It annoys me when others perform better than I do*
Compensatory effort	Willingness to expand extra effort to avoid failing at a work task, even if this effort results in over-preparation. *So that I will not be subject to criticism, I prefer to double my effort*
Engagement	Desire to be regularly engaged in an activity, usually work related; uncomfortable if nothing to do for long periods. *Others say that I work a lot more than necessary*
Pride in success	Sense of enjoyment and accomplishment derived from doing one's best at work. *It makes me proud and happy to have mastered a difficult task*
Status orientation	Desire to attain high status in one's personal life and to progress professionally. *I know exactly what professional position I would like to hold in five years*
Flow	Ability to concentrate on something for a long time without being distracted by situational influences; tend to become lost to the outside world when absorbed in a task. *When I am busy with something interesting, I can forget the world about me*
Internality	The belief that one's successes and failure are due to internal causes rather than to situational variables. *The extent of one's professional success depends a good deal on luck (RS)*
Persistence	Willingness to exert large amounts of effort over long periods of time to reach a goal. *When I am determined to do something, and I don't succeed, then I do everything I can to still accomplish it*
Self-Control	Ability to delay gratification and to organize oneself and one's work; a form of self-discipline. *I frequently put off until tomorrow things that I should do today (RS)*

Note. Italicized sentence represents a sample item from the scale. RS = reverse coded.

specified as the baseline model to test whether the number of factors and the factor pattern matrices are equivalent across different groups. Fig. 1 illustrates the three-factor structure of the AMI facets. Model 2 (metric invariance) assumes equality of the factor loading matrices, suggesting that the constructs are manifested in the same way across groups and that the strength of the item–construct relationships is the same. These first two models must be satisfied before testing the other measurement equivalence models (Cheung & Rensvold, 2002), while the sequence of testing the next two models after the condition of metric invariance is satisfied is arbitrary (Raju
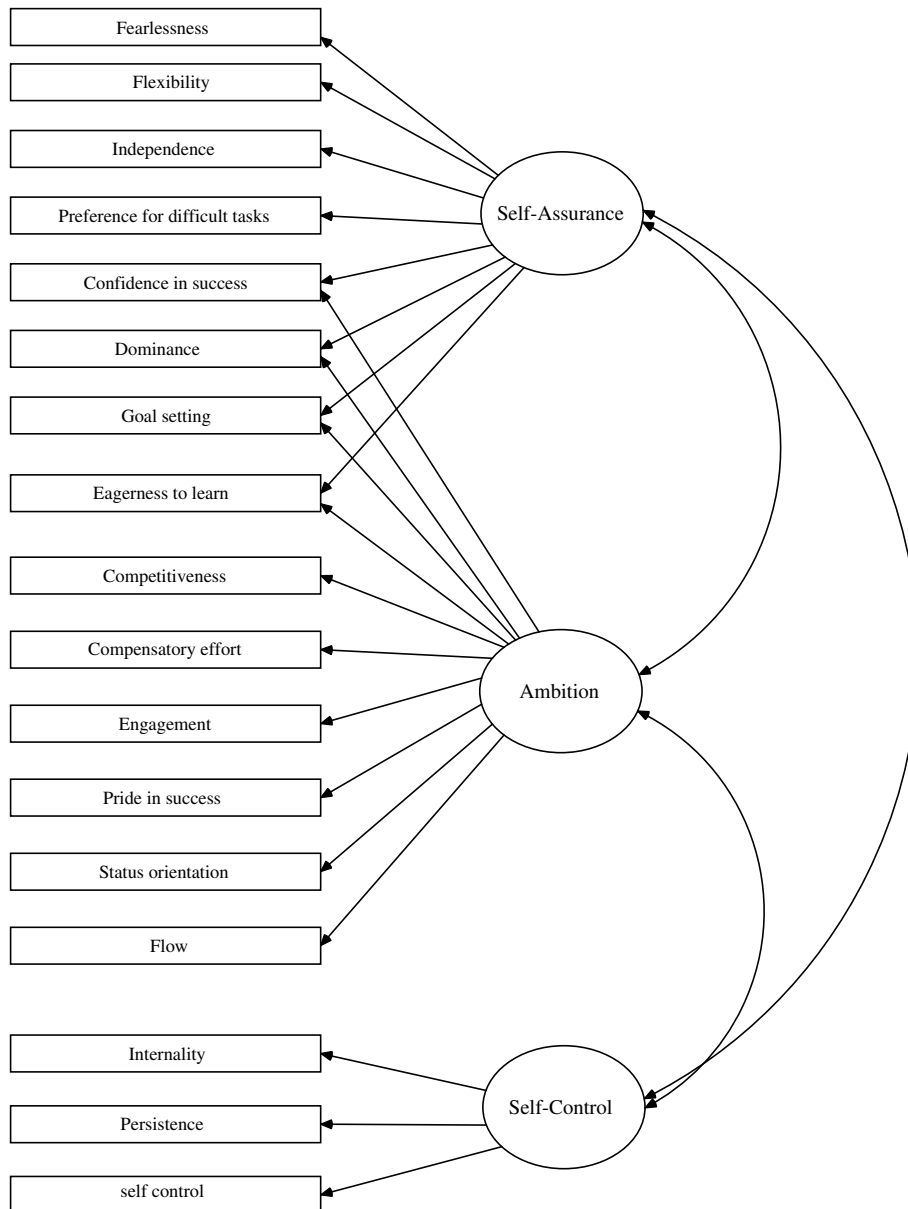
Fig. 1. The three-factor structure of the AMI.

et al., 2002). Therefore, we tested these two models independently of one another, carrying the same constraints from Model 2. Model 3 (invariance in uniqueness) hypothesizes the equality of measurement errors or residual variances across groups, which suggests that the qualities of items as measures of the underlying constructs (i.e., internal consistency) are the same across groups. Model 4 (construct invariance) hypothesizes the equivalence of factor variance-covariance

matrices, which suggests that the variability and relationships among the constructs are the same across groups.

To determine whether constraints in each model yielded a significant decrease in fit, we used change in the comparative fit index (ΔCFI) as the criterion because it has been found to be most robust and is independent of both model complexity and sample size (Cheung & Rensvold, 2002). We considered ΔCFI values higher than 0.010 as indicating a significant drop in fit.

2.3.2. Estimating latent mean differences between student and adult populations

Using the MACS framework, we sought to compare the latent means of the three AMI factors – Self-Assurance, Ambition, and Self-Control – between the two populations by estimating their mean structures as well as covariance structures. In order to estimate mean differences in latent variables, the latent means of one of the groups must be fixed to zero. As a result, the estimated latent mean for the other group represents the mean difference in the construct between the two groups.

3. Results

Table 2 contains means, standard deviations, and alpha reliabilities of the 17 AMI subscales across groups. Effect sizes (Cohen's *d*) for the observed mean differences between two groups were also computed. Positive values indicate that the adult worker group has a higher mean than the

Table 2
Means, SDs, reliabilities, and observed mean differences in the AMI subscales

AMI scales	Combined (N = 745)			Students (N = 335)			Adult workers (N = 410)			Cohen's d
	Mean	SD	Alpha	Mean	SD	Alpha	Mean	SD	Alpha	
Flexibility	47.43	7.74	0.67	47.31	7.64	0.70	47.53	7.84	0.66	0.03
Fearlessness	41.80	10.62	0.80	38.88	9.93	0.79	44.19	10.58	0.79	**0.52**
Preference for difficult tasks	44.88	8.41	0.76	42.52	8.52	0.81	46.82	7.81	0.70	**0.53**
Independence	46.88	7.45	0.59	45.34	7.64	0.63	48.14	7.05	0.54	0.38
Confidence in success	49.27	8.56	0.80	49.03	8.23	0.80	49.47	8.82	0.81	0.05
Dominance	46.23	8.85	0.76	46.94	8.70	0.77	45.66	8.94	0.75	−0.15
Eagerness to learn	45.67	8.07	0.67	44.30	7.72	0.67	46.79	8.19	0.66	0.31
Goal setting	46.30	7.97	0.63	46.67	7.74	0.64	46.00	8.15	0.63	−0.08
Compensatory effort	45.73	8.49	0.75	45.75	8.05	0.76	45.72	8.84	0.75	0.00
Status orientation	46.35	9.89	0.81	50.13	8.52	0.80	43.27	9.87	0.78	**−0.74**
Pride in success	57.12	6.85	0.78	57.09	6.60	0.77	57.15	7.07	0.80	0.01
Engagement	41.90	10.16	0.73	38.85	10.27	0.78	44.39	9.37	0.71	**0.57**
Competitiveness	41.03	10.86	0.82	44.37	11.10	0.87	38.31	9.86	0.74	**−0.58**
Flow	48.28	8.71	0.77	47.46	8.46	0.79	48.95	8.86	0.76	0.17
Internality	53.07	7.80	0.68	52.25	7.54	0.69	53.74	7.94	0.67	0.19
Persistence	46.29	9.25	0.78	42.43	8.84	0.78	49.45	8.35	0.72	**0.82**
Self-Control	44.41	8.90	0.69	40.09	8.42	0.69	47.93	7.64	0.58	**0.98**

Note. Effect sizes in bold are greater than 0.50 in absolute values.

student group for that particular scale. For Cohen's d, an effect size of 0.50 is considered to be medium and 0.80 to be large (Cohen, 1992). We found medium to large effect sizes on seven scales. Adult workers had higher scores on the scales of Fearlessness, Preference for Difficult Tasks, Independence, Persistence, Self-Control, and Engagement, while showing lower scores on the scales of Competitiveness and Status Orientation.

Table 3 contains the results of the MGCFA examining various types of measurement invariance of the AMI between student and adult worker samples. Model 1 (configural invariance) yielded fit indices that are reasonably close to good-fit values (CFI = 0.804), which is consistent with the findings of previous research on measurement invariance across German, English, and Hebrew versions of the AMI (Byrne et al., 2004). This suggests that the three-factor structure is invariant across groups. The other three models did not show a significant drop in CFI, suggesting that factor loadings, relationships among factors, and variances of the factors are invariant across groups.

Before estimating specific differences in the latent means of the three AMI factors, we performed a global test for the existence of any mean differences between the two groups by evaluating the fit of a model with equality constraints on the factor means across samples. In this model, equality constraints were made for both indicator intercepts and factor means. Goodness-of-fit indices for this model were unacceptable (CFI = 0.685; TLI = 0.669; RMSEA = 0.098), indicating that latent means are not equivalent across groups. Using the MACS framework described earlier, we then estimated latent mean differences between student and adult worker groups by constraining the factor means of the student group to zero. Hence, positive values indicate that the latent mean for adult workers is higher than that for students. To indicate these differences in a more standardized way, we again computed effect sizes using Cohen's d. As shown in Table 4, results indicated that adult workers had higher levels of Self-Assurance ($d = 0.45$) and Self-Control ($d = 0.95$), and lower levels of Ambition ($d = -0.34$).

Table 3
Tests of measurement invariance of three-factor model across student and adult worker samples ($N = 745$)

Model	Hypothesis	χ^2	df	CFI	TLI	RMSEA	Model comparison	ΔCFI	$\Delta\chi^2$	Δdf
1	Configural invariance	1366.058	224	0.804	0.763	0.083	–	–	–	–
2	Metric invariance	1416.985	242	0.799	0.774	0.081	2–1	−0.005	50.927	18
3	Invariance in uniqueness	1455.241	259	0.795	0.785	0.079	3–2	−0.004	38.256	17
4	Construct invariance	1424.720	248	0.799	0.779	0.080	4–2	0.000	7.735	6

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation. All $\Delta\chi^2$ are significant at $p < .05$.

Table 4
Estimated latent mean differences of the AMI factors between student and adult worker samples

	Students	Adult workers	Pooled SD	Cohen's d
Self-assurance	0	1.72	3.82	0.45
Ambition	0	−1.25	3.71	−0.34
Self-control	0	5.08	5.32	0.95

4. Discussion

Our latent mean analyses showed that adult workers had higher Self-Assurance and Self-Control, and had moderately lower Ambition than undergraduate students. The effect sizes for the group differences were larger in Self-Assurance ($d = 0.45$) and Self-Control ($d = 0.95$) than in Ambition ($d = -0.34$). At the facet level (i.e., observed mean differences), large effect sizes were found in Persistence ($d = 0.82$) and Self-Control ($d = 0.98$) scales, both of which load on the Self-Control factor. These findings are consistent with predictions made in previous literature that older people would respond more to intrinsic rewards such as feeling that work is a meaningful activity, while extrinsic rewards such as pay and promotion are less important to them (Bourne, 1982).

The present findings underscore the need for multidimensional assessments of achievement motivation. Students and adult workers expressed their achievement motivation differently, providing further evidence that measures that primarily assess one type of achievement motivation are deficient in the criterion sense and likely to yield contradictory results. We also found that the AMI (Schuler et al., 2004) held good measurement properties across different age groups, which can foster a better understanding of achievement motivation in the context of lifespan development.

The primary limitation of the current findings on age differences, however, is that they do not allow such inferences about *development of achievement motivation over time*. The cross-sectional design, with a sample of working adults drawn from a single organization, makes it difficult to rule out cohort effects. Nonetheless, our findings that college students and adult workers showed different patterns of achievement motivation certainly suggest useful insights for future research. First, our findings of greater Self-Control and Self-Assurance and lower Ambition among working adults are consistent with the findings of Bray et al. (1974) suggesting that older people tend to focus more on the intrinsic meaning of work ("inner work standards") rather than the attainment of short-term benefits or higher status. By contrast, the trend of declining engagement and persistence proposed by Kanfer and Ackerman (2004) did not appear in our cross-sectional study: although adult workers were less ambitious than undergraduate students, they showed much higher levels of engagement and persistence in work.

It was not entirely clear, however, whether this finding represents a general age effect or a specific difference between undergraduate students and adult workers. As a *post hoc* analysis to address this issue, we correlated age with facets of the AMI within the adult worker group and found small, but significant, negative correlations between age and the flexibility, pride in success, status orientation, and competitiveness scales. However, there were no significant relationships between age and the engagement or persistence scales, suggesting that the difference we observed may be due to participants' different life stages and not to aging effects *per se*. Further research is needed to replicate these findings, using longitudinal methods and a broader sample of adult workers from diverse jobs and organizations.

Such research is valuable because of the critical role motivation plays in all aspects of work life. While motivation is a key determinant of job performance (e.g., Campbell, McCloy, Oppler, & Sager, 1993), it appears to be an element of other important life outcomes as well. For example, Ryan and Deci's (2000) self-determination theory, supported by a sizeable body of research, suggests that autonomous motivation (consisting of intrinsic motivation and internalized extrinsic

motivation) leads to higher levels of performance, psychological well-being, organizational trust and commitment, and job satisfaction (Gagné & Deci, 2005). If facets of achievement motivation are expressed differently in different life stages, they may have differential effects on any or all of these variables at different points in time.

In conclusion, age differences in achievement motivation are complex phenomena, reflecting the multidimensional nature of the achievement motivation construct. Assuming a broad main effect of age on a unidimensional measure of achievement motivation may lead to erroneous conclusions, such as the contradictory findings that older workers are less motivated (e.g., Veroff et al., 1984), more motivated (e.g., Roberts et al., 2001), or no different (e.g., Costa & McCrae, 1988) than students or younger workers. Our results suggest that both students and adult workers may show high levels of achievement motivation, but that this motivation may be expressed differently. Using a multifaceted measure, such as the AMI, allows us to reconcile these discrepancies by addressing not only *whether* students and adults differ in motivation, but *how* they differ.

References

Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The Work Preference Inventory: Assessing intrinsic and extrinsic motivational orientations. *Journal of Personality and Social Psychology, 66*, 950–967.

Bing, M. N. (2003). The integrative model of personality assessment for achievement motivation and fear of failure: Implications for the prediction of effort and performance. *Dissertation Abstracts International Section B: The Sciences and Engineering*, *63*(8-B).

Bourne, B. (1982). Effects of aging on work satisfaction, performance and motivation. *Aging & Work, 5*, 37–47.

Bray, D. W., Campbell, R. J., & Grant, D. L. (1974). *Formative years in business: A long-term AT&T study of managerial lives*. New York: John Wiley & Sons.

Byrne, Z. S., Mueller-Hansen, R. A., Cardador, J. M., Thornton, G. C., III, Schuler, H., & Frintrup, A. (2004). Measuring achievement motivation: Tests of equivalency for English, German, and Israeli versions of the achievement motivation inventory. *Personality and Individual Differences, 37*, 203–217.

Campbell, J. P., McCloy, R., Oppler, S. H., & Sager, C. E. (1993). A theory of performance. In N. Schmitt & W. C. Borman (Eds.), *Personnel selection in organizations* (pp. 35–70). San Francisco: Jossey-Bass.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.

Collins, C. J., Hanges, P. J., & Locke, E. A. (2004). The relationship of achievement motivation to entrepreneurial behavior: A meta-analysis. *Human Performance, 17*, 95–117.

Costa, P. T., & McCrae, R. R. (1995). Domains and facets: Hierarchical personality assessment using the Revised NEO Personality Inventory. *Journal of Personality Assessment, 64*, 21–50.

Costa, P. T., & McCrae, R. R. (1988). From catalog to classification: Murray's needs and the Five-Factor model. *Journal of Personality and Social Psychology, 55*, 258–265.

Cury, F., Elliot, A. J., Fonseca, D. D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2×2 achievement goal framework. *Journal of Personality and Social Psychology, 90*, 666–679.

DeShon, R. P., & Gillespie, J. Z. (2005). A motivated action theory account of goal oriented behavior. *Journal of Applied Psychology, 90*, 1096–1127.

Edwards, A. L. (1953). *Edwards personal preference inventory*. New York: The Psychological Corporation.

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*, 331–362.

Hancock, G. R. (1997). Structural equation modeling methods of hypothesis testing of latent variable means. *Measurement and Evaluation in Counseling and Development, 30*, 91–105.

Heggestad, E., & Kanfer, R., (1999). Individual differences in trait motivation. Development of the motivational trait questionnaire. Poster presented at the Annual meetings of the Society of Industrial and Organizational Psychology, Atlanta, GA.

Jackson, D. N. (1984). *Personality research form manual* (3rd ed.). Port Huron, MI: Research Psychologists Press.

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

McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953). *The achievement motive*. New York: Appleton-Century-Crofts.

McGue, M., Bacon, S., & Lykken, D. T. (1993). Personality stability and change in early adulthood: A behavioral genetic analysis. *Developmental Psychology, 29*, 96–109.

Mellinger, J. C., & Erdwins, C. J. (1985). Personality correlates of age and life roles in adult women. *Psychology of Women Quarterly, 9*, 503–514.

Ployhart, R. E., & Oswald, F. L. (2004). Applications of mean and covariance structure analysis: Integrating correlational and experimental approaches. *Organizational Research Methods, 7*, 27–65.

Raju, N. S., Laffitte, L. J., & Byrne, B. M. (2002). Measurement equivalence: A comparison of methods based on confirmatory factor analysis and item response theory. *Journal of Applied Psychology, 87*, 517–529.

Roberts, B. W., Caspi, A., & Moffit, T. E. (2001). The kids are alright: Growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology, 81*, 670–683.

Roberts, B. W., Chernyshenko, O. S., Stark, S., & Goldberg, L. R. (2005). The structure of conscientiousness: An empirical investigation based on seven major personality questionnaires. *Personnel Psychology, 58*, 103–139.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.

Sagie, A., Elizur, D., & Yamauchi, I. (1996). The structure and strength of achievement motivation: A cross-cultural comparison. *Journal of Organizational Behavior, 17*, 431–444.

Schuler, H., & Prochaska, M. (2001). *Leistungsmotivationsinventar*. Gottingen: Hogrefe.

Schuler, H., Thornton, G. C., III, Frintrup, A., & Mueller-Hanson, R. A. (2004). *Achievement motivation inventory: Technical and user's manual*. Goettingen: Hogrefe & Huber.

Spence, J. T., Pred, R. S., & Helmreich, R. K. (1989). Achievement strivings, scholastic aptitude, and academic performance: A follow-up to Impatience versus achievement strivings in the type A pattern. *Journal of Applied Psychology, 74*, 176–178.

Stevens, D. P., & Truss, C. V. (1985). Stability and change in adult personality over 12 and 20 years. *Developmental Psychology, 21*, 568–584.

Vandenberg, R., & Lance, C. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4–69.

Veroff, J., Reuman, D., & Feld, S. (1984). Motives in American men and women across the adult life span. *Developmental Psychology, 20*, 1142–1158.

Ward, E. A. (1993). Generalizability of psychological research from undergraduates to employed adults. *The Journal of Social Psychology, 133*, 513–519.