

Cross-cultural adaptation of the DRS-15 Dispositional Resilience Scale:

A short hardiness measure

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#### Abstract

Language-based tests and screening tools are used extensively in psychological research and practice around the world. In order for tests to work effectively in different languages, and for meaningful cross-national comparisons to be made, they must be translated correctly and validated across cultures. This paper reports on a cross-national research project aimed at creating a more valid instrument for assessing psychological hardiness in Norway. This work was conducted during the author's Fulbright Research Fellowship in Bergen, Norway in 2006-7. A short 15-item hardiness measure ("Dispositional Resilience Scale" or DRS-15) was administered to comparable groups of Norwegian and American military cadets. Simple Delta Plot methods, and more elaborate DIF techniques including Mantel-Haenszel and logistic regression analyses were applied to American and Norwegian data sets. Results show that while most of the DRS-15 items appear to operate similarly in the Norwegian and American versions, five items display some evidence of DIF. These items were revised or replaced, leading to an improved Norwegian version of the DRS-15, as well as improvements to the original English version. The revised DRS-15 (v. 3) shows enhanced reliability and validity across a range of samples.

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#### Introduction

As has been pointed out by Hambleton, Merenda & Spielberger (2005), psychological tests are frequently translated without sufficient attention to assuring their equivalence across languages and cultures. Simple back-translation of measures, still the most common approach to translation of psychological measures, is not sufficient to assure that the translated (target) version carries the same meanings as the original (source). All too often, researchers discover too late, after their data are collected, that there were major problems with the translation of the instrument (Merenda, 2006). Rather than simple translation, tests need to be more carefully and fully “adapted” to the new language and culture (Byrne & Watkins, 2003; Hambleton, Merenda & Spielberger, 2005). The present paper describes the process of adapting a brief English language measure of psychological hardiness (resilience) to the Norwegian language and culture.

Studies of stress-related health and performance decrements have historically followed a “pathogenic” model. The typical approach has been to look for risk factors or other influences that increase vulnerability to stress (Stuhlmiller and Dunning, 2000). Despite its proven utility, this focus on risk factors for illness can lead to the overlooking of important resources or “strength” factors that can influence continued good health and effective functioning under stress. A quite promising resilience factor is personality hardiness. Since the concept was first articulated by Kobasa (1979), a growing body of

literature suggests that persons high in hardiness tend to remain healthy under stress compared to those who are low in hardiness.

Conceptually, hardiness is a personality style that develops early in life and is reasonably stable over time, though amenable to change under certain conditions (Maddi & Kobasa, 1984; Bartone, 2006). Hardy persons have a strong sense of life and work *commitment*, a greater feeling of *control*, and are more open to change and *challenges* in life. They tend to interpret stressful and painful experiences as a normal aspect of existence, part of life that is overall interesting and worthwhile. Over the past 25 years, many studies have shown that personality hardiness can be a potent resiliency resource, protecting some individuals against the ill effects of stress on health and performance (Bartone, 1989; Contrada, 1989; Kobasa & Puccetti, 1983; Wiebe, 1991).

For example, in a study of Gulf War veterans, combat-exposed soldiers who were high in hardiness showed fewer PTSD symptoms than those low in hardiness (Bartone, 1999).

Measuring hardiness was somewhat problematic in the early years. It was originally assessed by Kobasa (1979) with an amalgam of 18 different scales including over 100 items to assess the dimensions of Commitment, Control and Challenge. This original collection of items was later reduced to several shorter versions (Ouellette, 1993), but these hardiness scales still had a number of difficulties. For example, they used different metrics and response scales, had only negative items, and lacked factorial validity (Funk, 1992). A shorter and more coherent hardiness test with 50 items was developed by Bartone (1989) for use with Chicago bus drivers. Later, this scale was refined into a 45-item hardiness measure with a balance of positive and negative items, and equal numbers of items to measure the facets of commitment, control and challenge

(Dispositional Resilience Scale or DRS; Bartone, Ursano, Wright & Ingraham, 1989). In an early review of hardiness theory and research, Funk (1992) recommended the DRS as the best available hardiness measure. Also using the DRS, Sinclair & Tetrick (2000) confirmed the predicted factor structure of three dimensions, commitment control and challenge, nested under a more general hardiness construct. The DRS was subsequently shortened and improved in various ways, resulting in a 30-item version (Bartone, 1991) and then a 15-item version (Bartone, 1995). The DRS has been used extensively in military and non-military samples, with good results (Bartone, Ursano, Wright & Ingraham, 1989; Britt, Adler & Bartone, 2000, Bartone, Roland, Picano & Williams, 2008).

An early translated version of the DRS-15 hardiness scale (DRS-15 v.2) has been in use in Norway since 1998, with good results (Johnsen, Eid & Bartone, 2004; Bartone, Johnsen, Eid, Brun & Laberg., 2002). However, some problems are apparent. Reliability coefficients for the overall Norwegian hardiness scale as well as the three facets are often somewhat low, an indicator of possible problems in the translation. For example, overall scale reliability (Cronbach's alpha) in a sample of Norwegian Navy cadets was .61, and reliability coefficients for the three facets were also somewhat low (Bartone, Johnsen, Eid, Laberg & Brun, 2002). In an early evaluation of the Norwegian Hardiness scale Johnsen, Eid and Bartone (2004) reported the Cronbach's alpha to be as low as .51 for the control dimension and stated that this could be caused by problems related to the translation of the scale. However, they did report an acceptable fit of the three factor solution in a confirmatory factor analyses.

The present research was undertaken with the primary goal of creating a more valid adaptation of the DRS-15 hardiness scale to the Norwegian language and culture. To accomplish this, we apply several item analysis strategies in order to identify items that may be operating differentially in English and Norwegian versions of the instrument. At the same time, it was expected that we might gain valuable insights as to how to improve the original English version (Hambleton & Patsula, 1999).

### Methods

As a first step in the present investigation, the reliability of the Norwegian hardiness scale was directly examined in three available Norwegian samples and three U.S. samples. Then for the main study, two closely comparable samples of U.S. and Norwegian military cadets were used for a DIF analysis of hardiness items. The U.S. cadets (N = 436) completed the short hardiness scale - DRS-15 during their senior year at the U.S. Military Academy – West Point. Norwegian Navy cadets (N=297) were near the end of their first year at the Royal Norwegian Navy Academy. The Norwegian cadets have military experience before entering the Naval Academy, and are close in age (Mean=23.1 years, s.d.=2.6) to the West Point cadets (Mean=22.1, s.d.=1.1). Both samples were mostly male, with similar percentages (8-13% ) of women. Mean overall hardiness levels were slightly higher in the American sample (Mean=30.76, s.d.=4.65) compared to the Norwegian (Mean=30.03, s.d.=4.42).

We applied a DIF – Differential Item Functioning - analysis in order to identify items that may not be operating the same way in the two different languages and cultures (Allalouf, Hambleton & Sireci, 1999; Holland & Wainer, 1993). A number of techniques

are available to address this question, including methods based on Item Response Theory (Thissen, Steinberg & Wainer, 1993). However, the DIF – Delta Plot method first elaborated by Angoff (1972) is still a valuable technique for identifying potential problem items (Angoff, 1993).

In the present study, DIF analysis by the delta-plot technique (also known as “transformed item difficulty” or TID) followed several steps. First, item responses were collapsed into binary categories, with responses of 0 and 1 coded as “1” and responses of 2 and 3 coded as “2”. Next, the proportion of 2 (positive) responses was calculated for each item, within each sample. These scores were then standardized within samples and converted to the standard metric used by ETS (Educational Testing Service), with a Mean=13 and s.d.=4, as recommended for delta plots (Dorans & Holland, 1993). Finally, delta scores for each group were plotted, with scores for the American sample displayed on the x – horizontal axis, and scores for the Norwegian sample on the y – vertical axis. Each data point represents the delta scores for both groups on a particular hardiness scale item. Next, a line is drawn diagonally approximating the regression line that minimizes the distances between points. This line shows the area of perfect agreement. If both samples answered items exactly the same way, all points would fall directly on the line.

Additional DIF analyses were conducted using the "EZDIF" program developed by Waller (2004), which yields Mantel-Haenszel as well as logistic regression (odds-ratio) statistics, effect sizes and statistical significance. In the final step, Item Characteristic Curves (ICC) were computed for any items found to show DIF across the two samples. Here, we utilized an analysis of variance (ANOVA) approach as described by van de Vijver and Leung (1997). In the ANOVA approach item score is treated as the

dependent variable, while cultural group and score levels are the independent variables. Score levels are composed on the basis of total score on the instrument, and ideally, all possible score levels should be scrutinized. Most often, however, it is impossible to separate all score levels due to insufficient data in many levels. Based on van de Vijver and Leung recommendation of at least 50 persons per score level, five different levels were created (based on percentiles).

## Results

As background, Table 1 presents the Cronbach's alpha reliability coefficients for the (DRS-15 v.2) hardiness facets of commitment, control and challenge, and for the total hardiness scale in three different American and three Norwegian samples. The Cronbach's alpha coefficient provides an estimate of scale reliability, and indicates the extent to which items in the scale inter-correlate with each other to form a coherent grouping. Coefficients lower than .60 are highlighted to indicate low alpha coefficients.

Table 1 about here

These data reveal a pattern of low reliability coefficients in the Norwegian samples for the hardiness facet of Control, and marginal reliability coefficients for the Commitment facet. Reliability coefficients for the Control facet are better in the American samples, but still somewhat low, suggesting that the original English version of the DRS-15 v.2 may also need improvement in item and scale reliability.



Next, results of the DIF delta-plot analysis (Holland & Wainer, 1993) are presented in Figure 1. In the DIF plot, points that are distant from the diagonal line are suggestive of DIF – Differential Item Functioning. It can be seen that agreement between the Norwegian and English language versions is overall quite good, with 10 of 15 items showing little or no DIF (correlation between delta scores is .74). The plot also reveals that five hardiness items (out of 15) show some evidence of DIF. Potentially important DIF is apparent in items 1, 2 and 15, which the U.S. sample responds more positively to, and items 7 and 12, which the Norwegian sample responds more positively to.

Figure 1 about here

The delta-plot analysis was followed by additional DIF analyses using the (freely available) EZDIF program developed by Niels Waller. This program yields Mantel-Haenszel as well as logistic regression (odds-ratio) statistics, effect sizes and statistical significance (Waller, 2004), and classifies items according to Educational Testing Service (ETS) codes. Using these procedures, only four hardiness items showed significant DIF, as indicated by ETS (Educational Testing Service) code of C. These results are summarized in Table 2. In this analysis, the American sample (reference group) scored significantly higher on items 2 and 15, while the Norwegian sample (focal group) scores significantly higher on items 7 and 12.

Table 2 about here

Finally, ICCs (Item Characteristic Curves) were plotted and examined for the four items showing significant DIF, as well for one non-DIF reference item. Here we used the ANOVA approach as described by van de Vijver and Leung (1997). These results are presented in Figures 2-6.

Once items were identified that seemed to be operating differentially across groups, investigators sought to pinpoint the reason(s) for these differences (e.g., different cultural meanings; poor translation; presentation or test format differences; other contextual factors, etc.) A detailed conceptual analysis of Norwegian and English items by bilingual experts was conducted (Bartone, Eid, Hystad, Johnsen & Laberg, 2008). Results suggested that some of the observed DIF is due to idiomatic terms that carry different meanings when translated from English to Norwegian. Problem items were re-written and further evaluated using Norwegian bilingual students in what is known as a bilingual research design (ref). The result was a refined Norwegian DRS-15 scale with higher scale reliabilities than earlier versions. This work also led to modifications in the original English version, removing idiomatic expressions (e.g., “pays-off”) that could change meaning when translated into other languages. This improved scale is now known as the DRS-15 v.3 (version 3).

## Discussion

Resiliency under stress is highly important in many occupations. The costs of non-adaptive responses to stress can be extremely high, not only for individuals but also for organizations. The personality style of hardiness has been linked to resilient responding, and helps to explain how it is that some people remain healthy, while others

become symptomatic when exposed to highly stressful conditions. The present study makes an essential contribution by providing an improved, valid and reliable instrument for assessing resilience - hardiness in Norwegian, while also making improvements to the English language version.

The new DRS-15 v. 3 has already demonstrated validity in several Norwegian studies and in different domains. For instance, in studies of leadership training at the Royal Norwegian Naval Academy, the hardiness-challenge dimension of the revised DRS-15 v. 3 was found to predict peer ratings of leadership styles covered in the Full Range of Leadership model (Avolio & Gibbons, 1998; Bass, 1998). Leadership styles were measured before and after a stressful exercise involving a series of difficult leader tasks (Johnsen et al., 2009). After the exercise, the challenge dimension predicted transformational style, management by exception, and the laissez-faire style (negatively associated). In a similar study, Eid et al. (2008) also found that DRS-15 v.3 hardiness scores predicted increased transformational leadership levels in Norwegian Navy cadets.

In another study using the DRS-15 v.3, hardiness was related to motivation and fatigue in soldiers performing a 200 km long ski march in the arctic environment (Sandvik, Gjeldnes, Hystad, Bartone, Eid, Laberg, Rones & Johnsen, 2010). This work was followed up with a second cohort of soldiers, conducting a 250 km ski march. The soldiers participated in the ski march as the final part of the selection course for entry into the border patrol ranger forces tasked to protect the border between Norway and Russia (Johnsen, Bartone, Sandvik, Gjeldnes, Morken, Hystad & Stornaes, 2013). The revised version of the DRS-15 v.3 predicted success in completing the march, even when controlling for nutrition, physical fitness and the personality trait of sensation seeking.

The group highest in hardiness showed increased motivation over the course of the exercise. Analyses of the hardiness facets showed that the high commitment group also had higher levels of motivation and coping skills, and evaluated their performance as better than expected. Additional validity data for the DRS-15 v.3 come from the dissertation research of Sigurd Hystad at the University of Bergen (Hystad, 2011). In a confirmatory factor analysis with a sample size of over 7,000, Hystad verified a hierarchical factor structure with three factors of commitment, control and challenge nested under a general hardiness factor (Hystad, Eid, Johnsen, Laberg & Bartone, 2010). He also found that hardiness measured with the DRS-15 v.3 acts a moderator or buffer in the relation between stress and health in university students (Hystad, Eid, Laberg, Johnsen & Bartone, 2009). In yet another study, hardiness was found to predict the number of sick absences in a large cohort of Norwegian workers (Hystad, Eid & Brevik, 2011).

This research has applied multiple techniques including Differential Item Functioning (DIF) analysis to create an improved short scale for measuring hardiness, the DRS-15 v.3. In constructing this version, special efforts were made to avoid cultural and linguistic bias in the items. Early studies have shown increased reliability and validity for this instrument. This new tool should translate with greater fidelity, and should therefore be of benefit to researchers and practitioners from multiple countries who are interested in hardiness. However, it remains for additional research to assess the validity of this scale when adapted for use in other cultures.

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Table 1

Cronbach's alpha coefficients for hardiness scale (DRS v. 2) in U.S. and Norwegian samples

		USA		Norwegian		
	N=391	N=2842	N=1379	N=482	N=66	N=72
	Army officers USMA CL '98 <sup>1</sup>	Army troops Bosnia pre-dep. <sup>2</sup>	Army troops Bosnia late-dep. <sup>3</sup>	Army troops in Kosovo	Navy cadets 2001	Navy cadets 2002
Commit.	.74	.71	.73	.60	.66	.43
Control	.58	.65	.71	.53	.22	.51
Challenge	.76	.63	.60	.73	.70	.82
Hardiness	.76	.77	.79	.72	.72	.73

<sup>1</sup> U.S. Army officers surveyed 5 years after graduation from West Point, U.S. Military Academy class of 1998

<sup>2</sup> U.S. Army personnel surveyed in early 1996 prior to Bosnia deployment

<sup>3</sup> U.S. Army personnel surveyed in late 1996 while in Bosnia

Table 2

Mantel-Haenszel and Logistic Regression Results –EZDIF Analysis of DRS-15

Item	$\alpha_{MH}$	$MH - \chi^2$	MH D-DIF <sup>a</sup>	SE (MH D-DIF)	ETS-Code <sup>b</sup>
1	2.05	14.33***	-1.68	0.44	B
2	2.85	19.86***	-2.46	0.56	C
3	1.19	0.78	-0.41	0.42	A
4	2.21	3.27	-1.87	0.95	B
5	1.31	1.89	-0.64	0.44	A
6	0.71	1.38	0.81	0.62	A
7	0.37	20.84***	2.34	0.51	C
8	1.17	0.45	-0.36	0.47	A
9	1.03	0.00	-0.07	0.49	A
10	0.29	5.09*	2.92	1.24	B
11	0.83	0.78	0.44	0.45	A
12	0.43	20.46***	1.96	0.43	C
13	0.79	1.17	0.56	0.47	A
14	1.17	0.67	-0.37	0.40	A
15	3.07	25.24***	-2.63	0.53	C

Note.  $\alpha_{MH}$  = Mantel-Haenszel common odds ratio.  $MH - \chi^2$  = Mantel-Haenszel chi-square statistic. MH D-DIF = Holland & Thayer difference-in-delta statistic. ETS = Educational Testing Service.

<sup>a</sup> Positive MH D-DIF values favour the Norwegian respondents; negative MH D-DIF values favour the American respondents.

<sup>b</sup> ETS classification codes indicate negligible DIF (A), moderate DIF (B), large DIF (C).

\*  $p < .05$ ; \*\*\* $p < .001$

Reference Group: F:\dif-anal\us-436-bi.dat

Focal Group: F:\dif-anal\no-297-bi.dat

Number of Cases in Reference Group: 436

Number of Cases in Focal Group: 297

Conditioning Levels

0 4 8 12

3 7 11 15

Note:

Alpha > 1.00 favors Reference Group; Alpha < 1.00 favors Focal Group

D-DIF < 0.00 favors Reference Group, D-DIF > 0.00 favors Focal Group

Figure 1: DIF – Delta Plot Analysis of Hardiness Scale showing American vs. Norwegian sample scores

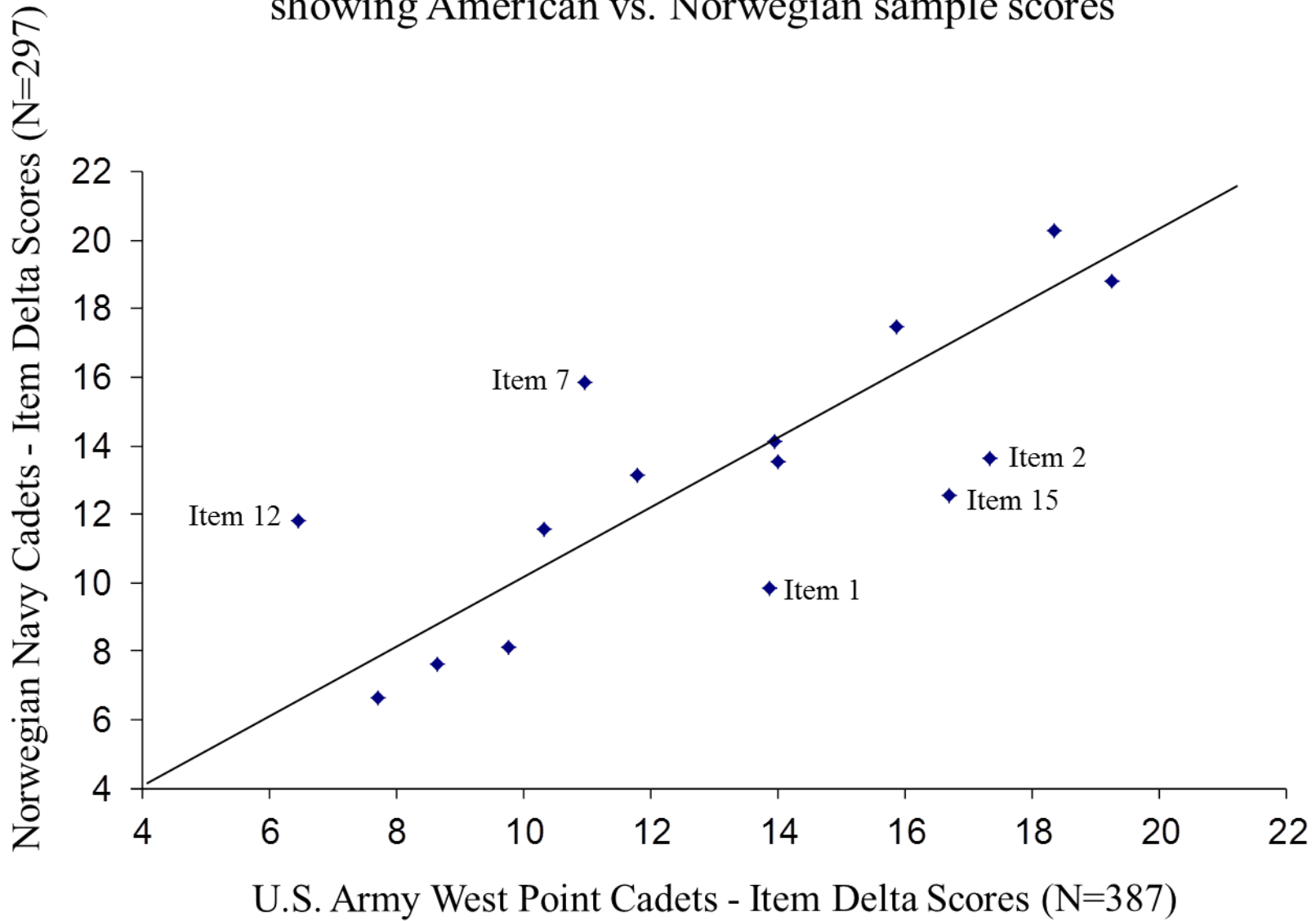
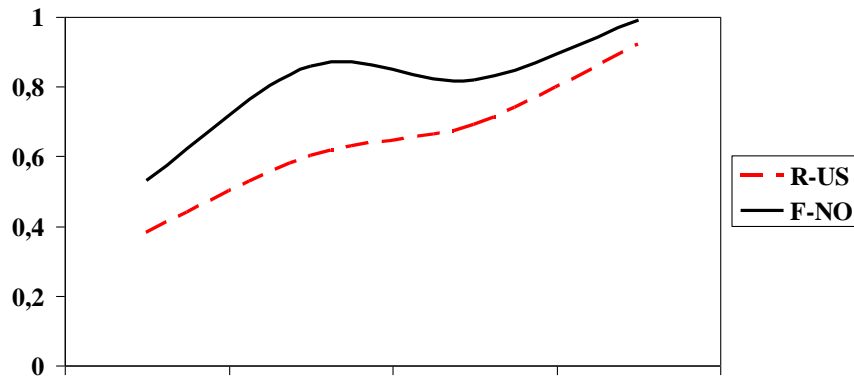
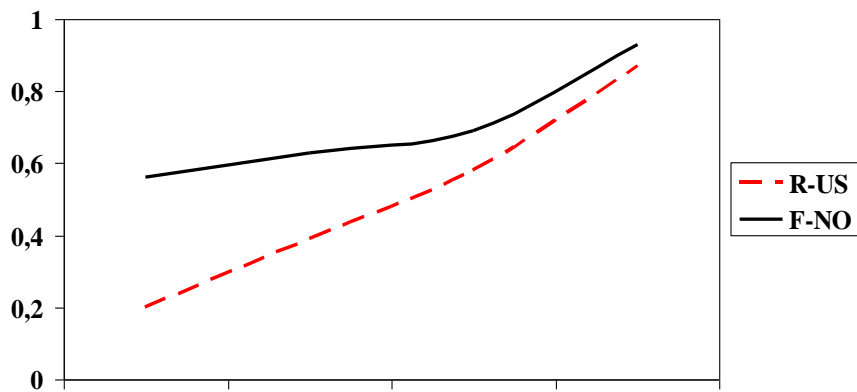


Figure 2: Item Characteristic Curve: Item 7



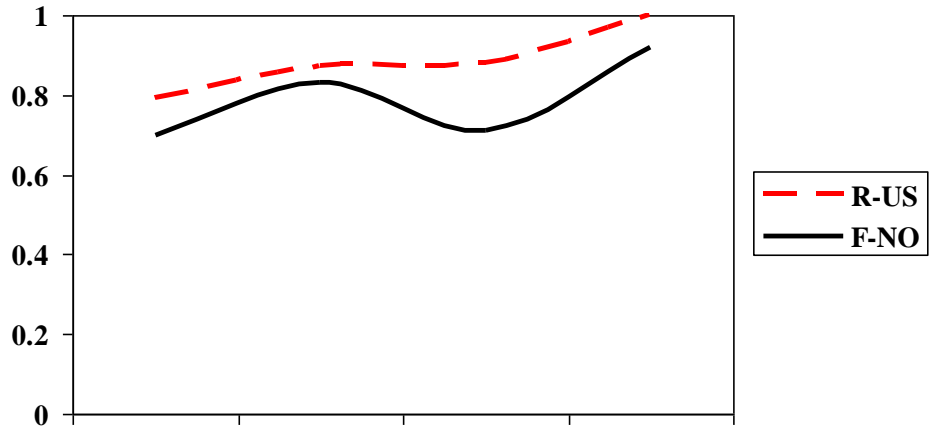
Item 7: Jeg ser virkelig frem til mitt arbeide  
(I really look forward to my work)

Figure 3: Item Characteristic Curve: Item 12



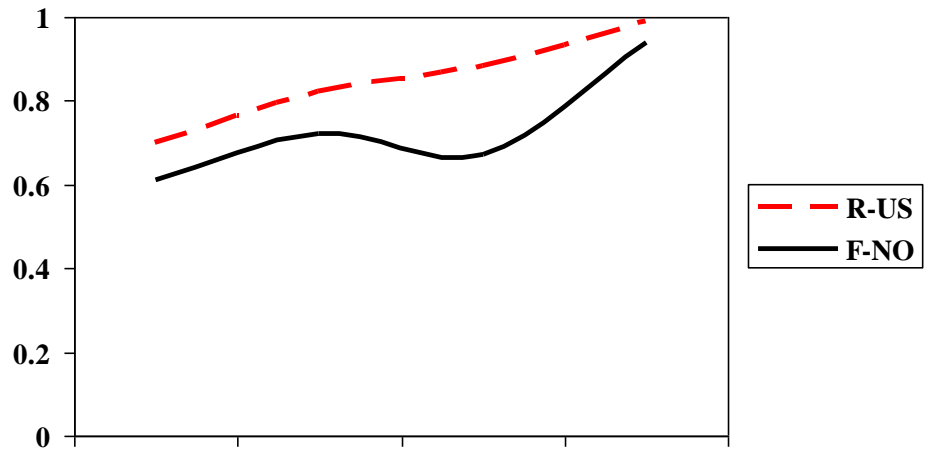
Item 12: De fleste dager er livet virkelig interessant og givende for meg  
(Most days, life is really interesting and exciting for me)

Figure 4: Item Characteristic Curve: Item 2



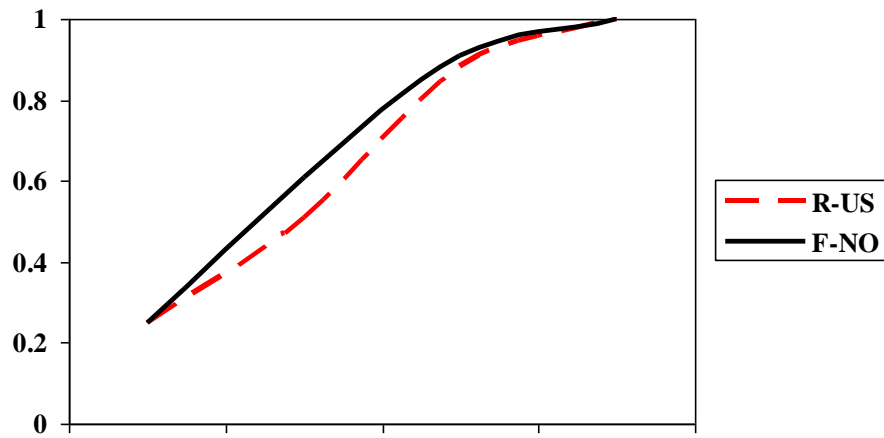
Item 2: Planning ahead can help avoid most future problems  
(Langsiktig planlegging kan bidra til å hindre de fleste fremtidige problemer)

Figure 5: Item Characteristic Curve: Item 15



Item 15: When I make plans I'm certain I can make them work  
(Når jeg legger planer er jeg sikker på at jeg kan få dem realisert)

Figure 6: Item Characteristic Curve: Item 11 (No DIF)



Item 11: It bothers me when my daily routine gets interrupted  
(Det plager meg når mine daglige rutiner blir avbrutt.)



Addendum: DRS-15( v 3.2)

Instructions: Below are statements about life that people often feel differently about. Please check a box to show how much you think each one is true for you. Give your own honest opinions... There are no right or wrong answers!

1. Most of my life gets spent doing things that are meaningful (CM)
2. By working hard you can nearly always achieve your goals (CO)
- \*3. I don't like to make changes in my regular activities (CH)
- \*4. I feel that my life is somewhat empty of meaning (CM)
5. Changes in routine are interesting to me (CH)
6. How things go in my life depends on my own actions (CO)
7. I really look forward to my daily activities (CM)
- \*8. I don't think there's much I can do to influence my own future (CO)
9. I enjoy the challenge when I have to do more than one thing at a time (CH)
10. Most days, life is really interesting and exciting for me (CM)
- \*11. It bothers me when my daily routine gets interrupted (CH)
12. It is up to me to decide how the rest of my life will be (CO)
- \*13. Life in general is boring for me (CM)
- \*14. I like having a daily schedule that doesn't change very much (CH)
15. My choices make a real difference in how things turn out in the end (CO)

Response options: 0 = Not at all true; 1 = A little true; 2 = Quite true; 3 = Completely true.  
Scoring:

\*Asterisks indicate items that are negatively keyed and must be reversed before scoring , as follows: (0 = 3; 1 = 2; 2 = 1; 3 = 0).

To obtain scale and subscale scores, sum responses to items and appropriate subscale items.  
CM=commitment; CO=control; CH=challenge  
Total hardiness = Sum of (CM+CO+CH)