WORK-NONWORK INTERFERENCE: PRELIMINARY RESULTS ON THE PSYCHOMETRIC PROPERTIES OF A NEW INSTRUMENT

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ABSTRACT

Orientation: Recently, a new work-nonwork interference instrument was developed to measure the interference between work and nonwork roles in the South African context (Koekemoer, Mostert & Rothmann, 2010). However, no information is available on the psychometric properties of this instrument.

Research purpose: The objectives of this study were to investigate the internal validity (construct, discriminant and convergent validity), reliability and external validity (relationship with theoretically relevant variables, including job characteristics, home characteristics, burnout, ill health and life satisfaction) of the instrument.

Motivation for the study: Work-family interaction is a key topic receiving significant research attention. In order to facilitate comparison across work-family studies, the use of psychometrically sound instruments is of great importance.

Research design, approach and method: A cross-sectional survey design was used for the target population of married employees with children working at a tertiary institution in the North West province (*n* = 366). In addition to the new instrument, job characteristics, home characteristics, burnout, ill health and life satisfaction were measured.

Main findings: The results provided evidence for construct, discriminant and convergent validity, reliability and significant relations with external variables.

Practical/managerial implications: The new instrument can be used by researchers and managers as a test under development to investigate the interference between work and different nonwork roles (i.e. parental role, spousal role, work role, domestic role) and specific relations with antecedents (e.g. job/home characteristics) and well-being (e.g. burnout, ill health and life satisfaction).

Contribution/value-add: This study provides preliminary information on the psychometric properties of a new instrument that measures the interference between work and nonwork.

INTRODUCTION

Key focus of the study and problem statement

According to Lingard and Francis (2005), individuals are involved in multiple roles in their personal lives and are under severe pressure to balance or integrate their involvement in various social roles (e.g. parental role, spousal role, leisure role, work role, homemaker role). Although several researchers have suggested that conflict could arise between the work domain and these other specific roles or domains in an individual's personal life (Doumas, Margolin & John, 2008; Glaser, Evandrou & Tomassini, 2006; Kirchmeyer, 1992; Lee & Phillips, 2006; Nordenmark, 2002), few instruments have been developed that measure the specific interference between work and other nonwork roles (Aryee, 1992; Frone & Rice, 1987; Mallard & Lance, 1998; Premeaux, Adkins & Mossholder, 2007; Small & Riley, 1990) and there is no psychometrically sound instrument in the South African context that measures the interference between work and different nonwork roles.

In a very recent attempt to address certain issues relating to the measurement of interference between work and personal life, Koekemoer, Mostert and Rothmann (2010) developed a new instrument that measures the interference between work and various nonwork roles (i.e. parental, spousal, religion/spirituality and domestic roles) in both directions (i.e. work→nonwork interference (W-NWI) and nonwork→work interference (NW-WI). Although this study provided a valuable new instrument that addressed several theoretical and measurement limitations, no evidence was provided regarding the psychometric properties of the instrument. This validation study attempts to demonstrate the empirical distinctiveness of the new instrument by examining its internal validity (i.e. construct, discriminant and convergent validity and reliability) and external validity (i.e. the relationship with job and home characteristics and well-being).

Background to the study

Within a modern society that is faced with a frantic pace of life, the interaction between work and personal life is a key topic that has received significant research attention over the past few years (Allen, Herst, Bruck & Sutton, 2000; Bulger, Matthews & Hoffman, 2007; Frone, 2003; Geurts & Demerouti, 2003; Heraty, Morley, & Cleveland, 2008; Olson-Buchanan & Boswell, 2006). This interest is attributed mainly

to dramatic changes that have occurred in family structures and in the nature of jobs and organisations during the past decade (Bailyn & Harrington, 2004; Lewis & Cooper, 1999; Lewis & Cooper, 2005; Parasuraman & Greenhaus, 2002). Individuals experience an increase in time pressures associated with the demands and activities of multiple roles and are confronted with responsibilities in a number of roles (Roxburgh, 2002). These responsibilities can become very strenuous, could relate to greater role strain and could result in poor well-being (Day & Chamberlain, 2006; Matthews & Power, 2002; Nordenmark, 2002; Perrone, Webb & Jackson, 2007). Also, the specific nature of the roles being occupied has certain implications for the well-being of individuals, as some roles may attribute to more overload than others, depending on the associated obligations of the role.

One specific aspect of significant importance that has been voiced by previous researchers is the measurement of interaction between work and personal life (Bellavia & Frone, 2005; Frone, 2003; Tetrick & Buffardi, 2006). Two fundamental issues are mentioned. The first issue pertains to the use of instruments that fail to measure the involvement of individuals in multiple social roles and the possible conflict between these multiple roles (currently, interference of work with *family* is predominantly measured, thereby neglecting valid measurement of work interference with other roles in private life). The second issue concerns the lack of thorough reporting of psychometric properties regarding the instruments being used to measure interaction between work and personal life (Parasuraman & Greenhaus, 2002; Robinson, Shaver & Wrightsman, 1991; Schultheiss, 2006; Voydanoff, 2007) (for an overview of other issues, see Koekemoer et al., 2010).

Understanding the interference between work and different nonwork roles is also problematic for South African researchers, as there is no valid and reliable instrument that measures the interference between work and nonwork roles in the South African context. Currently, the main instrument that is used in South African studies is the internationally developed 'survey work-home interaction – Nijmegen' (SWING) of Geurts et al., 2005. Although the SWING has been researched well and is psychometrically sound (see Marais, Mostert, Geurts & Taris, 2009; Mostert & Oldfield, 2009; Pieterse & Mostert, 2005; Rost & Mostert, 2007), it is not without limitations. Several of the SWING items confound with external variables, causes and consequences. The items also specifically measure time-based and strain-based interference. These are limitations raised as concerns by previous researchers (see Bellavia & Frone, 2005; Frone, 2003). Also, the SWING only measures interference between two dimensions (i.e. work and home) and fails to measure interference between work and other dimensions in the nonwork domain. This limitation is of particular importance in South Africa. In an exploratory study, Koekemoer and Mostert (2010) found that South African employees experience interference between work and various other nonwork dimensions in their lives (i.e. work interferes with family, leisure, domestic activities, exercise, community activities and the extended family). It was also reported that involvement in several nonwork roles interfered with the work role.

To address these limitations, Koekemoer et al. (2010) developed an instrument that measures interference of work with four nonwork roles (viz. work-parent interference (WPI), work-spouse interference (WSI), work-religion/spirituality interference (WRI) and work-domestic interference (WDI)) and interference of four nonwork roles with the work role (viz. parent-work interference (PWI), spouse-work interference (SWI), religion/spirituality-work interference (RWI) and domestic-work interference (DWI)). Close attention was paid to the scale development procedures described in the psychometric literature (DeVellis, 2003; Robinson et al., 1991) and they were adhered to and various of the theoretical and measurement limitations were addressed. Rasch analyses and item correlations were used.

Items were evaluated and eliminated in order to retain the best items. A total of 30 items were retained. In the final instrument, W-NWI was measured with 15 items: four WPI items, four WSI items, four WRI items and three WDI items. NW-WI was also measured with 15 items: four PWI items, four SWI items, four RWI items and three DWI items. All the items were rated on a four-point Likert scale ranging from 0 ('never') to 3 ('always').

Trends from the research literature

Psychometric properties of work-family instruments

Although a variety of instruments is found widely across international work-family conflict studies (for summaries of work-family conflict (WFC) and family-work conflict (FWC) studies, see Allen et al., 2000; Byron, 2005; Mesmer-Magnus & Viswesvaran, 2005), the use thereof may be problematic when researchers compare results without being aware of the psychometric properties (i.e. the validity and reliability) of the instruments (DeVellis, 2003; Robinson et al., 1991). Although a variety of indicators of psychometric properties of instruments measuring work-family interaction are found in the literature (i.e. internal validity, construct validity, discriminant validity, convergent validity, reliability and external validity, relationships with external variables), the reporting and use thereof are inconsistent across studies.

One of the main psychometric properties being reported across work-family scale development studies is the construct validity of instruments. However, there is not always consistency regarding the analyses employed during factor analysis (e.g. exploratory (EFA) vs. confirmatory factor analysis (CFA)). Although the use of exploratory factor analysis during the development of new instruments is highly recommended in the literature on psychometrics (DeVellis, 2003; Nunnally & Bernstein, 1994), few work-family studies have made use of exploratory factor analysis (Aryee, 1992; Grzywacz & Marks, 2000; Kopelman, Greenhaus & Connolly, 1983; Premeaux et al., 2007). Instead, the majority of work-family studies used confirmatory factor analysis, which has become a very popular data-analytic technique for the clinical and social sciences (Carlson & Frone, 2003; Curbow, McDonell, Spratt, Griffen & Agnew, 2003; Geurts et al., 2005).

An additional indicator of validity that is seldom reported or tested in work-family studies is discriminant validity. According to Small and Riley (1990), discriminant validity is the extent to which measures of different dimensions are indexing different factors (i.e. when factors do not correlate highly). Discriminant validity is used specifically to indicate clear distinctiveness between constructs in order to further provide proof of empirically distinct dimensions in instruments (Carlson & Frone, 2003). In the literature, few work-family studies tested or provided evidence for discriminant validity (Carlson & Frone, 2003; Carlson, Kacmar & Williams, 2000; Grzywacz & Marks, 2000; Small & Riley, 1990). In the majority of these studies, correlations, factor correlations from CFA or different correlates with outcomes were used as evidence for discriminant validity. Only Netemeyer, Boles and McMurrian (1996) tested for discriminant validity using the chi square (χ^2) difference test. Although the use of the chi square (χ^2) difference test is not well known among work-family studies, it has been recommended by previous researchers (Anderson & Gerbing, 1988; Deery, Erwin & Iverson, 1999).

Similar to discriminant validity, convergent validity is also not used widely in work-family studies. Of the main work-family studies, only Small and Riley (1990) tested convergent validity using correlations with similar instruments. Although not always found within the work-family field of scale development, the use of correlations with other instruments as evidence for convergent validity is widely found or tested in other scale development studies (Cowin et al., 2008; Taormina, 2004; Trout, Ryan, Vigne & Epstein, 2003). In contrast to the inconsistency in

the use and reporting of validity indicators, reliability measures (i.e. Cronbach's alpha coefficients) are found in the majority of work-family studies.

In terms of the relationship of work-family instruments with external variables (i.e. antecedents and outcomes), the majority of studies report or indicate these relationships. Some studies use correlations to indicate these relationships (Carlson & Frone, 2003; Geurts et al., 2005; Kopelman et al., 1983; Mallard & Lance, 1998; Netemeyer et al., 1996), whilst others use multiple regression analyses (Curbow et al., 2003; Grzywacz & Marks, 2000; Premeaux et al., 2007), or combine correlation analyses and multiple regression analyses (Aryee, 1992; Kirchmeyer, 1992). Some studies do not report the relationship of a work-family instrument with external variables (Small & Riley, 1990; Stephens & Sommer, 1996).

Relations with causes and consequences

In the literature there are various overview studies that summarise the relationship between WFC and FWC and various external variables, including a variety of antecedents and consequences (e.g. Geurts & Demerouti, 2003; Guest, 2002; Voydanoff, 2005a). Some of the more recent studies indicate specifically the relationship of WFC with antecedents such as work demands (i.e. time demands and strain demands), job schedule demands, emotional demands, quantitative demands, work pressures and work support (i.e. managerial support), role autonomy and role overload (Boyar, Carr, Mosley & Carson, 2007; Choi, 2008; Fu & Shaffer, 2001; Greenhaus & Powell, 2003; Lingard & Francis, 2005; Montgomery, Panagopolou & Benos, 2006; Nasurdin & Hsia, 2008; Voydanoff, 2005b). FWC has been found to be related to antecedents such as family demands (e.g. household demands), autonomy, work and family pressure and parental demands (Boyar et al., 2007; Fu & Shaffer, 2001; Greenhaus & Powell, 2003; Keene & Reynolds, 2005; Voydanoff, 2005b). Consequences related to WFC include emotional exhaustion, depersonalisation, decrease in quality of life and quality of family life, impaired career outcomes, depression, decrease in job satisfaction, decrease in organisational commitment and decrease in life stress (Aryee, Srinivas & Tan, 2005; Choi, 2008; Greenhaus, Collins & Shaw, 2002; Lingard & Francis, 2005; McLean, 2002; Montgomery et al., 2006; Nikandrou, Panayotopoulou & Apospori, 2008; Weigel, Weigel, Berger, Cook & DelCampo, 1995).

Potential value added by the study and research objectives

It is very important to use instruments that are psychometrically sound and for which there is well-established evidence of validity and reliability – proper psychometric reporting holds serious implications for the validity of relationships with other variables (DeVellis, 2003; Robinson et al., 1991). This study seeks to adhere to the call to provide sound psychometric evidence for a new instrument by providing preliminary information on its internal validity (construct, discriminant and convergent validity and reliability). In addition, for the investigation and reporting of the external validity of instruments, it is important to indicate relationships between work-family constructs and various external variables (see Carlson & Frone, 2003; Carlson et al., 2000; Geurts et al., 2005). This study will therefore also focus on the external validity of the new instrument and examine its relationship with other theoretically relevant variables.

More specifically, the objectives of this study were to investigate, in relation to the instrument, its:

- construct validity
- discriminant and convergent validity
- reliability
- relationship with theoretically relevant external variables (including job characteristics, home characteristics, burnout, ill health and life satisfaction).

What will follow

In the next section, the following hypotheses will be tested to reach the specific objectives:

Objective 1 (construct validity)

Hypothesis 1a: Work-nonwork interference is a four-dimensional construct, consisting of work-parent interference, work-spouse interference, work-religion/spirituality interference and work-domestic interference.

Hypothesis 1b: Nonwork-work interference is a four-dimensional construct, consisting of parent-work interference, spouse-work interference, religion/spirituality-work interference and domestic-work interference.

Hypothesis 2: A second-order, two-factor model that distinguishes between the different directions is superior to a one-factor model that assumes no directionality.

Objective 2 (discriminant and convergent validity)

Hypothesis 3: The four work-nonwork dimensions and four nonwork-work dimensions are, although highly related, empirically distinct constructs (i.e. there is evidence of discriminant validity).

Hypothesis 4: The work-nonwork dimensions correlate strongly with the negative work-home interference (WHI) scale of the SWING (i.e. evidence of convergent validity).

Hypothesis 5: The nonwork-work dimensions correlate strongly with the negative home-work interference (HWI) scale of the SWING (i.e. evidence of convergent validity).

Objective 3 (reliability)

Hypothesis 6: All the dimensions (i.e. work-parent interference, work-spouse interference, work-religion and/or spirituality interference, work-domestic interference, parent-work interference, spouse-work interference, religion and/or spirituality-work interference and domestic-work interference) are reliable (i.e. Cronbach's alpha coefficients ≥ 0,70).

Objective 4 (external validity)

Hypothesis 7: The different work-nonwork dimensions are related in unique ways to job characteristics and well-being.

Hypothesis 8: The different nonwork-work dimensions are related in unique ways to home characteristics and well-being.

RESEARCH DESIGN

Research approach

In order to achieve the specific research objectives, a cross-sectional survey design was used. With a cross-sectional survey design, researchers are able to assess interrelationships among variables within a population (Struwig & Stead, 2001). Cross-sectional designs entail the collection of data on more than one case at a single point in time, after which the data are examined to detect patterns of association (Bryman & Bell, 2003). With cross-sectional designs there is no time ordering of the variables; it is therefore only possible to examine relationships between variables, which makes this design suitable for the present study.

Research method

Research participants

The sample for the present study was married employees, with children, working at a tertiary institution in the North West province (n = 366). Due to the conceptual restrictions in the W-NWI scale (i.e. interference of work with the spouse and parental roles), only married parents were included in the

sample. In order to identify and establish the sample population, lists of all married employees with children were obtained from the various faculties and departments at the tertiary institution and they were given the opportunity to participate in the study. Although a total of 656 married parents were working at the institution and were given the questionnaires for participation in the study, a response rate of only 56% was obtained. According to DeVellis (2003), samples should be large enough to eliminate subject variance as a significant concern and, although a sample of 300 is generally regarded as adequate, scales have been developed successfully with smaller samples.

Although the participants were mainly white (80.35%), participants from the African (14.75%), Indian (3.00%) and coloured (0.80%) groups were also included in the sample. Males (34.70%) as well as females (65.00%) were included in the study. The majority of participants had postgraduate degrees (47.81%), while other participants had university degrees (12.57%), technical college diplomas (6.00%), technikon diplomas (8.20%) or grade 12 certificates (19.95%). In total, 26.77% of the participants worked as administrative assistants, while 25.68% worked in the administrative offices. The majority of participants worked in academic faculties, including the faculty of health sciences (13.39%), natural sciences (11.46%), education (10.38%), engineering (9.58%), arts (6.83%), economic and management sciences (6.56%) and theology (2.70%). A number of participants worked as lecturers (9.84%), senior lecturers (11.46%), associate professors (6.56%) and professors (7.10%).

Measuring instruments

Items of the job and home characteristics measures were randomly combined with items of the W-NWI and W-NWHI scales (i.e. job-related items combined with W-NWHI items and home-related items combined with NW-WI items) in order to ensure more accurate and valid responses from the participants. In each instance, the questions to the participants were phrased: 'How often does it happen that…'.

The following measures were utilised in this study:

- job demands
- job resources
- home demands
- home resources
- burnout
- ill health
- life satisfaction.

Job demands: *Work pressure* was measured with a three-item scale developed by Bakker, Demerouti and Schaufeli (2003a). The items referred to demanding quantitative aspects of the job. An example is: 'You have to work extra hard in order to meet your deadlines'. *Emotional work demands* were measured with the five-item scale of Bakker, Demerouti and Schaufeli (2003b). An example is: 'People at work upset you emotionally with their words'. *Cognitive demands* were measured by the four-item scale developed by Peeters, Montgomery, Bakker and Schaufeli (2005). An example is: 'Your work requires you to concentrate continuously'. All these job demands items were rated on a four-point Likert scale ranging from 0 ('never') to 3 ('always'). Reliable Cronbach's alpha coefficients larger than 0.70 (Nunnally & Bernstein, 1994) were found in these studies (Bakker *et al.*, 2003b; Peeters *et al.*, 2005): work pressure (α = 0.76); emotional work demands (α = 0.74) and cognitive work demands (α = 0.89).

Job resources: *Work autonomy* was measured with the scale developed by Bakker, Demerouti and Verbreke (2004) (three items, e.g. 'You have freedom in carrying out your work-related duties'). *Work support* was measured with the scale developed by Bakker *et al.* (2004) (three items, e.g. 'You ask your colleagues for help if necessary.'). *Work development possibilities* were assessed by three items that were conceptually mirrored from existing scales of home developmental possibilities developed by Demerouti, Bakker and Voydanoff (2010). An example

item is: 'Can you develop yourself sufficiently in your work?' All these job resources items were rated on a four-point Likert scale ranging from 0 ('never') to 3 ('always'). Cronbach's alpha coefficients were found that ranged between 0.68 and 0.74 for work autonomy and between 0.81 and 0.85 for work support (Bakker *et al.*, 2004; Bakker, Demerouti & Euwema, 2005).

Home demands: *Home pressure* was measured with a three-item scale developed by Peeters *et al.* (2005). The items referred to demanding quantitative aspects of the home. An example is: 'Do you find that you are busy at home?' *Emotional home demands* were also measured with a three-item scale developed by Peeters *et al.* The scale assessed whether the participants had to deal with emotionally charged situations at home and whether they were confronted by events that touched them personally. A sample item is: 'How often do emotional issues arise at home?' All of these home demands items were rated on a four-point Likert scale ranging from 0 ('never') to 3 ('always'). Peeters *et al.* (2005) reported acceptable Cronbach's alpha coefficients of 0.80 for home pressure and 0.76 for emotional home demands.

Home resources: The home resources scale was developed by Demerouti *et al.* (2010) and conceptually mirror existing scales of job resources, as several scholars have successfully used a job-related measure as a model for constructing a symmetrical home-related measure (Frone & Rice, 1987; Frone, Russell & Cooper, 1992; Parasuraman, Purohit, Godshalk & Beutell, 1996). *Home autonomy* was assessed with four items, including 'You have control over how you use your free time'. *Home support* was measured with four items, including 'If necessary, your partner or family members will help you with a particular task'. *Home developmental possibilities* were assessed by three items, including 'You can develop your talents during your free time'. All of these home resources items were rated on a four-point Likert scale ranging from 0 ('never') to 3 ('always'). Acceptable alpha coefficients were found by Demerouti *et al.* (2010).

Burnout: *Emotional exhaustion* was measured using eight items (e.g. 'I feel emotionally drained by my work') and *depersonalisation* was measured by five items (e.g. 'I do not really care what happens to some recipients') from the MBI-HSS (Maslach & Jackson, 1986). The items were rated on a seven-point scale ranging from 0 ('never') to 6 ('every day'). *Cognitive weariness* was measured using the five items of Van Horn, Taris, Schaufeli and Schreurs (2004) (e.g. 'I have trouble concentrating'). The items were rated on a seven-point scale ranging from 0 ('a few times a year') to 6 ('every day'). Van Horn *et al.* (2004) found the scale to be reliable, with an alpha coefficient of 0.92.

Ill health: Items were adapted from the general health questionnaire (GHQ; Goldberg & Williams, 1988) to measure *physical ill health* (four items, e.g. 'Have you recently been getting any headaches?'), *anxiety* (five items, e.g. 'Have you recently been getting edgy and bad-tempered?') and *depression* (four items, e.g. 'Have you recently felt that life is entirely hopeless?'). Items were rated on a four-point scale ranging from 0 ('not at all') to 3 ('much more than usual*)*. Reliable alpha coefficients were found, ranging between 0.83 and 0.81 for *physical ill health*, between 0.84 and 0.89 for *anxiety* and between 0.79 and 0.89 for *depression* (Mostert, 2009; Oldfield & Mostert, 2007).

Life satisfaction: The items used were from the satisfaction with life scale (SWLS; Diener, Emmons, Larson & Griffin, 1985) to measure *life satisfaction* (five items, e.g. 'I am satisfied with my life'; 'The conditions of my life are excellent'). Items were rated on a seven-point scale, ranging from 1 ('strongly disagree') to 7 ('strongly agree'). Diener *et al.* (1985) found the scale to be reliable and valid, with an alpha coefficient of 0.87 and test-retest reliability of 0.82.

The construct validity of these measuring instruments was tested using structural equation modelling. The results supported a six-factor model for job characteristics (work pressure, emotional

work demands, cognitive work demands, work autonomy, work support and work developmental possibilities: $\chi^2 = 398.98$ $_{(N = 366)}$, IFI = 0.92, TLI = 0.91 and CFI = 0.93, RMSEA = 0.06); a five-factor model for home characteristics (home pressure, emotional home demands, home autonomy, home support and home developmental possibilities: $\chi^2 = 161.63$ $_{(N = 366)}$, IFI = 0.97, TLI = 0.96 and CFI = 0.97; RMSEA = 0.04); a three-factor model for burnout (emotional exhaustion, depersonalisation and cognitive weariness: $\chi^2 = 422.80$ $_{(N = 366)}$, IFI = 0.92, TLI = 0.90 and CFI = 0.92; RMSEA = 0.08); a three-factor model for health (physical health, anxiety and depression: $\chi^2 = 167.49$ $_{(N = 366)}$, IFI = 0.97, TLI = 0.96 and CFI = 0.97; RMSEA = 0.07) and a one-factor model for life satisfaction ($\chi^2 = 47.20$ $_{(N = 366)}$, IFI = 0.97, TLI = 0.93 and CFI = 0.97; RMSEA = 0.15).

Research procedure

After permission was granted by the university's ethics committee, lists of all married employees with children were obtained from the various faculties and departments of the university. With the help of field workers, questionnaires were distributed personally among the selected employees and the participants were given various options for returning the questionnaires to the researchers (e.g. internal post, personal collection, personal delivery). These options were given to the participants in order to ensure a better response rate and also to enhance anonymity and confidentiality. Questionnaire booklets were handed out during the data collection. These included a section that explained the research objectives and the process. In addition, field workers also verbally communicated to the potential participants what the goal and process of the research project were. The participants were informed that they were not obliged to participate in the research. They were also informed that, if they did participate in the research and fill in a questionnaire, they were giving consent for the collected data to be used for research purposes. No personal information was or will be made available to any other organisations or persons. The participants were given two to three weeks to complete the questionnaires. The questionnaires also contained a letter that explained the goal and importance of the study and that gave them assurances regarding the anonymity and confidentiality with which the information will be handled.

Statistical analysis

In order to examine the construct validity of the newly developed instrument, confirmatory factor analysis (CFA) was used with Amos structural modelling software (Arbuckle, 2007). Although exploratory factor analysis (EFA) is usually used for analysing newly developed instruments, using a confirmatory approach is known to be very meaningful, as researchers are required to specify the number of factors according to the literature and substantive theoretical knowledge, which result in the testing of the adequacy of fit of the theoretical factor model (Bollen, 1989). CFA is a theory-driven comprehensive statistical approach for testing theory-based hypotheses that has a number of strengths. It is a very popular data-analytic technique for the clinical and social sciences and therefore the use of CFA is very appropriate for this study (Tomarken & Waller, 2005). With CFA, researchers have the ability to specify latent variable models that provide separate estimates of relations among latent constructs and their manifest indicators (the measurement model). Also, the availability of measures of global fit that can provide a summary evaluation of even complex models is known as a key strength of CFA. In addition, users can comparatively evaluate the fit of alternative models that differ in complexity via nested chi-square tests and other means.

The goodness of fit of the models was evaluated using the following absolute goodness-of-fit indices (Jöreskog & Sörbom, 1993): the likelihood-ratio chi square (χ^2), the ratio of the chi square to the degrees of freedom (χ^2/df) and the root square of approximation (RMSEA). As χ^2 is sensitive to sample size – that is the probability of rejecting a hypothesised model

increases with sample size – the use of relative goodness-of-fit measures is strongly recommended (Bentler, 1990). Therefore, the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Incremental Fit Index (IFI) were used. Values smaller than 0.08 for RMSEA are indicative of an acceptable fit, while values greater than 0.10 should lead to model rejection (Cudeck & Brown, 1993). For CFI, TLI and IFI, as a rule of thumb a value greater than 0.90 is considered a good fit (Hoyle, 1995) while a value smaller than 5.00 is acceptable for the c^2 /df statistic (Bentler & Bonett, 1980).

Because of the large number of items, it was not possible to conduct CFA analysis on a full disaggregation model. Therefore, due to the complexity, extensiveness and the conceptual directional distinction of interference, two theoretical models were tested:

- A four-factor model for W-NWI interference (consisting of work-parent interference, work-spouse interference, work-religion/spirituality interference and work-domestic interference).
- A four-factor model for NW-WI (consisting of parent-work interference, spouse-work interference, religion/spirituality-work interference and domestic-work interference).

The items identified by Koekemoer *et al.* (2010) were used as indicators of the latent factors. Because the factors are theoretically so closely related, errors were allowed to correlate. Using alternative models (Lehmann, 2001), the two hypothesised four-factor models were compared with several competing models. Similar models were tested separately for the two directions of interference (i.e. five alternative models for W-NWI and five alternative models for NW-WI). These competing models were similar to the models used in previous scales (Carlson & Frone, 2003; Carlson & Kacmar, 2000; Carlson *et al.*, 2000; Curbow *et al.*, 2003; Geurts *et al.*, 2005; Netemeyer *et al.*, 1996) and models based on theoretical knowledge.

In order to illustrate the directionality of the W-NWI instrument, an additional, second-order factor model was tested with CFA. Firstly, a one-factor model was tested. This model assumes that all the W-NWI and NW-WI dimensions load onto one factor (i.e. directionality is not distinguished). Secondly, a two-factor model was tested. This model assumes that W-NWI and NW-WI are distinct constructs, each measured with the four W-NWI and NW-WI dimensions as indicators (i.e. distinguishing between the direction of interference).

CFA analyses were also used to prove the discriminant validity of the various dimensions. Following the example of previous researchers (Anderson & Gerbing, 1988; Bagozzi & Philips, 1982; Mallard & Lance, 1998), discriminant validity was tested by making use of the chi square (χ^2) difference test. By calculating the difference between a model that allows the correlation between the constructs (with multiple indicators) to be constrained to unity (i.e. perfectly correlated) and another model that allows the correlations to be free (unconstrained model or target model), discriminant validity can be tested. If the two models do not differ significantly on a chi-square difference test, the researcher fails to conclude that the constructs differ. However, a significantly lower chi-square value for the model in which the trait correlations are not constrained to unity would indicate that the traits are not perfectly correlated and that discriminant validity is achieved (Bagozzi & Philips, 1982; Bagozzi, Yi & Phillips, 1991). According to Anderson and Gerbing (1988), discriminant validity can be assessed for two estimated constructs by constraining the estimated correlation parameter between them to 1.0 and then performing a chi-square difference test on the values obtained for the constrained and unconstrained models. This procedure was carried out for one pair of constructs at a time, thereby calculating the χ^2 difference test for all the various correlations between different dimensions.

Convergent validity was assessed by investigating the correlation coefficients between the various dimensions of the W-NWI scale and the SWING instrument (Geurts *et al.*, 2005) using the SPSS program (SPSS Inc., 2009). The SWING was selected because it is a widely used, well-researched and psychometrically sound instrument that measures the interference in both directions (work→home and home→work). The SWING has also been validated in different South African samples (Marais *et al.*, 2009; Mostert & Oldfield, 2009; Pieterse & Mostert, 2005; Rost & Mostert, 2007). Although Polit and Beck (2006) recommend that correlations greater than 0.70 may be regarded as evidence for strong correlations (or similarities) between the measures in social research, other researchers have indicated that correlation coefficients should only meet or exceed 0.35 in order to be cited as evidence for convergent validity (Hammill, Brown & Bryant, 1989). Cronbach's alpha coefficients were used to assess the reliability of the newly developed scales. Descriptive statistics (means, standard deviations) were used to describe the data. To determine the relationship between the scales and various external variables, Pearson product-momentum correlation coefficients were used. The level of statistical significance was set at $p < 0.05$. Effect sizes (Cohen, 1988; Steyn, 2002) were used in addition to statistical significance to determine the practical significance of relationships. Effect sizes indicate whether the obtained results are important, while statistical significance may often show results that are of little practical relevance (Steyn, 2002). A cut-off point of 0.30 (medium effect) (Cohen, 1988) was set for the practical significance of the correlation coefficients.

RESULTS

Construct validity of the work-nonwork interference instrument

Firstly, the four-factor hypothesised model was tested for the W-NWI scale (Hypothesis 1a). This model assumes that work will interfere differently with specific nonwork roles, resulting in four expected interference dimensions (viz. work-parent interference, work-spouse interference, work-religion/spirituality interference and work-domestic interference). Although the results showed acceptable fit for this hypothesised four-factor model ($\chi^2 = 272, 25_{(N = 366)}$, $\chi^2/df = 3.24$, IFI = 0.95, TLI = 0.94 and CFI = 0.95; RMSEA = 0.08), inspection of the modification indices and a high standardised residual covariance (3.40) between work-parent item 4 and work-spouse item 2 suggested that the hypothesised model could be improved. The hypothesised model was modified by omitting work-parent item 4, which resulted in an improved theoretical model (M1). This improved theoretical four-factor model explained the associations between the items significantly better than the initial model ($\Delta\chi^2 = 103.80$, $p \leq 0.001$). Consequently, this model was used as the final and baseline model in the subsequent analyses.

Next, various alternative factor models were systematically compared to the four-factor W-NWI theoretical model (M1). The results are summarised in Table 1.

Firstly, a one-factor model (M2) that assumes that all 15 items measuring the interference from work to nonwork roles load onto the same underlying latent variable (i.e. W-NWI) was compared to the theoretical four-factor model (M1). This alternative model assumes that items cannot be distinguished on the basis of the specific role being influenced by the work domain (see Tetrick & Buffardi (2006) for a discussion of the various factor structures in work-family research). With all 15 items loading onto one factor, the fit of M2 was significantly worse when compared to M1 ($\Delta \chi^2 (19) = 566.73$, $p \leq 0.001$).

Next, a two-factor model (M3) was compared to the theoretical model (M1). This model distinguishes between two latent variables (i.e. work-home interference and work-religion/spirituality interference) and is based on previous work-family literature and positive psychology literature, where no distinction is made between home-related roles (such as parent, spouse or domestic roles) and religion/spirituality is seen as an additional well-being dimension (Snyder & Lopez, 2002). When compared to the hypothesised model (M1), the fit of this alternative model was also significantly worse ($\Delta \chi^2 (18) = 307.25$, $p \leq 0,001$).

Two three-factor models (M4 and M5) were also compared to the theoretical model (M1). Model 4 distinguishes between the interference of domestic-related activities and family relationship interference (therefore consisting of three latent variables, i.e. work-family interference, work-domestic interference and work-religion/spirituality interference). Model 5, however, differs from Model 4 in the sense that the assumption is made that the parental items and domestic items load together to form a caretaker latent variable, in addition to the spouse latent variable and the religion/spirituality latent variable. Model 5 therefore assumes that parental activities are closely related to domestic activities and are different from the relationship with one's spouse. The results indicated that the fit of both of these models (M4 and M5) was also significantly worse than that of the theoretical model (M1) (for M4 = $\Delta \chi^2 (16) = 209.82$, $p \leq 0.001$ and M5 = $\Delta \chi^2 (16) = 179.27$, $p \leq 0.001$). Finally, all of the fit indices suggested that the theoretical four-factor model (M1) for W-NWI was a better fit for the data, with all the values (i.e. IFI, TLI, CFI) far exceeding the conventional standard of 0.90 (Hoyle, 1995).

Similar procedures were employed for the NW-WI scale, with a four-factor theoretical model of NW-WI being compared to alternative models similar to the W-NWI models (Hypothesis 1b). Firstly, a four-factor hypothesised model was tested for the NW-

TABLE 1
Goodness-of-Fit Statistics and chi-square difference tests of nested alternative Work-nonwork interference and Nonwork-work interference Models

Model		χ^2	χ^2/df	IFI	TLI	CFI	RMSEA	$\Delta\chi^2$	Δdf	p
Nested alternative work→ nonwork interference models										
M1	Four-factor 'theoretical model'	168.45	2.37	0.97	0.96	0.97	0.06	-	-	***
M2	One-factor	735.18	8.17	0.83	0.81	0.83	0.14	566.73	19	***
M3	Two-factor 'home/religion model'	475.70	5.35	0.90	0.88	0.90	0.11	307.25	18	***
M4	Three-factor 'family model'	378.27	4.35	0.93	0.91	0.93	0.10	209.82	16	***
M5	Three-factor 'caretaker model'	347.72	4.00	0.93	0.92	0.93	0.09	179.27	16	***
Nested alternative nonwork→work interference models										
M1	Four-factor 'theoretical model'	248.73	2.96	0.92	0.90	0.92	0.07	-	-	-
M2	One-factor	413.15	4.59	0.85	0.82	0.85	0.10	164.42	6	***
M3	Two-factor 'family/religion model'	354.36	3.98	0.87	0.85	0.87	0.09	105.63	5	***
M4	Three-factor 'family model'	340.28	3.91	0.88	0.85	0.88	0.09	91.550	3	***
M5	Three-factor 'caretaker model'	269.77	3.10	0.91	0.90	0.91	0.08	21.040	3	***

IFI, incremental fit index; TLI, Tucker-Lewis index; CFI, comparative fit index; RMSEA, root mean square error of approximation; *p*, probability value

TABLE 2
Goodness-of-Fit Statistics for tests of discriminant validity for the work-nonwork interference instrument

Model		χ^2	df	IFI	TLI	CFI	Versus target / constraint model	
							$\Delta\chi^2$	Δdf
Work→nonwork interference								
M1	Unconstrained model	168.45	71	0.97	0.97	0.97	-	-
M2	Constrained model: WPI.WSI = 1.00	320.43	72	0.93	0.91	0.92	151.98	1.00
M3	Constrained model: WPI.WRI = 1.00	445.78	72	0.89	0.87	0.89	277.33	1.00
M4	Constrained model: WPI.WDI = 1.00	252.60	72	0.95	0.94	0.95	84.15	1.00
M5	Constrained model: WSI.WRI = 1.00	374.33	72	0.92	0.89	0.91	205.88	1.00
M6	Constrained model: WRI.WDI = 1.00	467.71	72	0.89	0.86	0.89	299.26	1.00
Nonwork→work interference								
M1	Unconstrained model	248.73	84	0.92	0.90	0.92	-	-
M2	Constrained model: PWI.SWI = 1.00	306.35	85	0.90	0.87	0.89	57.62	1.00
M3	Constrained model: PWI.RWI = 1.00	360.01	85	0.87	0.84	0.87	111.28	1.00
M4	Constrained model: PWI.DWI = 1.00	263.95	85	0.91	0.89	0.92	15.22	1.00
M5	Constrained model: SWI.RWI = 1.00	269.39	85	0.91	0.89	0.91	20.66	1.00
M6	Constrained model: SWI.DWI = 1.00	281.76	85	0.91	0.88	0.91	33.03	1.00
M6	Constrained model: RWI.DWI = 1.00	289.58	85	0.90	0.88	0.90	40.85	1.00

Note: WPI , work-parent interference; WSI, work-spouse interference; WRI, work-religion/spirituality interference; WDI, work-domestic interference; PWI, parent-work interference; SWI, spouse-work interference; RWI, religion/spirituality-work interference; DWI, domestic-work interference; IFI, incremental fit index; TLI, Tucker-Lewis index; CFI, comparative fit index.

WI scale. This model also assumed that the interference between nonwork roles and the work domain would differ depending on the specific roles and that it would result in four expected interference dimensions (i.e. parent-work interference, spouse-work interference, religion/spirituality-work interference and domestic-work interference). The results showed acceptable fit for this hypothesised four-factor model (see Table 1 – M1 – four-factor theoretical model). All the fit indices suggested that this theoretical four-factor model (M1) for NW-WI fitted the data well, with all the values (IFI, TLI, CFI) far exceeding the conventional standard of 0,90 (Hoyle, 1995). Consequently, this model was used as the baseline model in subsequent analyses regarding NW-WI. Next, various alternative factor models were systematically compared to this four-factor NW-WI theoretical model (M1) (the results are also summarised in Table 1).

Firstly, a one-factor model (M2) was compared to the theoretical four-factor model (M1). For this alternative model (where all 15 items loaded onto one factor), the fit of M2 was significantly worse compared to M1 ($\Delta \chi^2$ (6) = 164.42, $p \leq 0.001$). Next, a two-factor model (M3) was compared to the theoretical model (M1). Upon comparison with the hypothesised model (M1), the fit of this alternative model (M3) was again significantly worse ($\Delta \chi^2$ (5) = 105.63, $p \leq 0.001$). In addition, two three-factor models (M4 and M5) were compared to the theoretical model (M1). The results indicated that the fit of both of these models (M4 and M5) was also significantly worse than that of the theoretical model (M1) (for M4 = $\Delta \chi^2$ (3) = 91.55, $p \leq 0.001$ and M5 = $\Delta \chi^2$ (3) = 21.04, $p \leq 0.001$). Although M5 showed a fit closest to M1, the fit indices suggested that the theoretical four-factor model (M1) for NW-WI was still a better fit of the data, with all the values (i.e. IFI, TLI, CFI) far exceeding the conventional standard of 0.90 (Hoyle, 1995).

These results provide support for Hypotheses 1a and 1b.

Consequently, the two second-order factor models were tested (i.e. the one-factor model and the two-factor model, Hypothesis 2). The results of the CFA analyses showed that the one-factor model indicated poor fit to the data (χ^2 = 568.02 $_{(N = 366)}$, IFI = 0.66, TLI = 0.52 and CFI = 0.66; RMSEA = 0.27), whereas the two-factor model showed a good fit to the data (χ^2 = 136.58 $_{(N = 366)}$, IFI = 0.93, TLI = 0.90 and CFI = 0.93; RMSEA = 0.13). Upon comparison of the one-factor and two-factor models, it seemed that the two-factor model fitted the data significantly better than the one-factor model ($\Delta \chi^2$ (1) = 431.44, $p \leq 0.001$), which provides support for Hypothesis 2.

TABLE 3
Correlation Coefficients between work-nonwork interference dimensions and the negative WHI and negative HWI scales of the SWING

Dimensions	Negative	
	WHI	HWI
Work→nonwork interference dimensions		
Work-parent interference	0.71[†]**	0.37[†]*
Work-spouse interference	0,75[†]**	0.34[†]*
Work-religion/spirituality interference	0,54[†]**	0.23[†]
Work-domestic interference	0,75[†]**	0.35[†]*
Nonwork→work interference dimensions		
Parent-work interference	0.36[†]*	0.49[†]*
Spouse-work interference	0.43[†]*	0.51[†]**
Religion/spirituality-work interference	0.36[†]*	0.37[†]*
Domestic-work interference	0.41[†]*	0.45[†]*

[†], Statistically significant ($p < 0.05$); *, Correlation is pratically significant $r > 0.30$ (medium effect); **, Correlation is practically significant $r > 0.50$ (large effect); WHI, work-home interference; HWI, home-work interference.

Discriminant validity

Several CFA models were compared to investigate if the dimensions of W-NWI were distinct from each other (Hypothesis 3). In the case of W-NWI and NW-WI, the target model or unconstrained model was the hypothesised four-factor model (M1 for each direction in Table 1). In each comparison model, one correlation between two different dimensions was fixed equal to 1.00. For example, in the first comparison model shown in Table 2, the correlation between work-parent interference and work-spouse interference was fixed equal to 1.00, suggesting a perfect correlation. The extent to which the target or unconstrained model fitted the data better than each of the comparison models ($\Delta\chi^2$) would support the discriminant validity for the pair of constructs for which the correlation was restricted equal to 1.00. The results of the analyses done for one pair of constructs at a time for all the various dimensions are indicated in Table 2.

As can be seen in Table 2, each of the more restricted models fits the data significantly worse than the target or unconstrained model, thereby supporting the discriminant validity of each dimension of both scales. These results provide support for Hypothesis 3.

Convergent validity

Convergent validity was tested by examining the correlation matrix (Hypotheses 4 and 5). The correlation coefficients between the W-NWI and NW-WI scales and the negative WHI and negative HWI scales of the SWING are reported in Table 3.

TABLE 4
Descriptive statistics and cronbach's alpha coefficients

Item	M	SD	α
Work pressure	1.46	0.72	0.83
Emotional work demands	0.90	0.56	0.84
Cognitive work demands	2.01	0.56	0.71
Work autonomy	1.69	0.62	0.67
Work support	1.90	0.67	0.75
Work developmental possibilities	1.74	0.69	0.81
Home pressure	1.56	0.66	0.81
Emotional home demands	0.94	0.49	0.74
Home autonomy	1.93	0.6	0.64
Home support	1.75	0.66	0.70
Home developmental possibilities	1.45	0.69	0.82
Work-parent interference	0.91	0.77	0.88
Work-spouse interference	0.67	0.63	0.88
Work-religion/spirituality interference	0.40	0.54	0.86
Work-domestic interference	0.92	0.78	0.91
Parent-work interference	0.44	0.48	0.76
Spouse-work interference	0.35	0.44	0.77
Religion/spirituality-work interference	0.20	0.34	0.74
Domestic-work interference	0.57	0.51	0.82
Emotional exhaustion	2.45	1.29	0.91
Depersonalisation	1.66	1.00	0.69
Cognitive weariness	1.89	1.09	0.87
Physical ill health	0.90	0.70	0.85
Anxiety	0.99	0.74	0.90
Depression	0.51	0.74	0.92
Life satisfaction	4.90	1.40	0.91

M, mean; SD, standard deviation; α, Cronbach's alpha

As can be seen in Table 3, the correlation analysis revealed very strong statistically and practically significant relationships between the W-NWI dimensions and negative WHI (i.e. work-parent interference $r = 0.71$, work-spouse interference $r = 0.75$ and work-domestic interference $r = 0.75$). Although the relationship between negative WHI and work-religion/ spirituality is somewhat lower ($r = 0.54$), the overall high correlations suggest that these scales measure highly related dimensions and can be indicative of convergent validity (Polit & Beck, 2006). Furthermore, stronger correlations are found between the W-NWI dimensions and negative WHI, as opposed to the weaker correlations with negative HWI. Therefore, the validity of directionality for W-NWI is relatively strong. There are significant correlations in the case of the relationship between the NW-WI dimensions and negative HWI (parent-work interference $r = 0.49$, spouse-work interference $r = 0.51$, domestic-work interference $r = 0.45$ and religion/spirituality-work interference $r = 0.37$). However, these correlations are

somewhat lower compared to the correlations between the W-NWI dimensions and negative WHI. Furthermore, although correlations with negative HWI are higher than with negative WHI, these correlations are not as distinct or clear as the W-NWI dimensions. However, considering the guideline of $r \geq 0.35$ (Hammil *et al.*, 1989), evidence for convergent validity can still be confirmed (correlations with spouse-work interference $r = 0.51$, parent-work interference $r = 0.49$, religion/spirituality-work interference $r = 0.37$ and domestic-work interference $r = 0.45$). These results provide support for Hypotheses 4 and 5.

Descriptive statistics

Following the evidence of the internal validity of the instrument, descriptive statistics for the various constructs and dimensions were analysed. Table 4 indicates the descriptive statistics and reliability coefficients of the different dimensions (Hypothesis 6).

As indicated in Table 4, the alpha coefficients of all the measuring instruments were considered acceptable compared to the guideline of $\alpha > 0.70$ (Nunnally & Bernstein, 1994), except for the measures of work autonomy, home autonomy and depersonalisation. However, Kline (1999) notes that, when dealing with psychological constructs, values below 0.70 can realistically be expected because of the diversity of the constructs being measured. Nevertheless, these constructs should be interpreted with caution. These results provide support for Hypothesis 6.

Product-moment correlations

In order to test the relations of W-NWI and NW-WI with external variables (Hypotheses 7 and 8), product-moment correlation analyses were conducted separately for, (1) the W-NWI dimensions, related job characteristics and well-being outcomes and (2) NW-WI dimensions, related home characteristics and well-being outcomes. Table 5 presents the results of the product-moment correlation coefficients of the four W-NWI dimensions with the related job characteristics and the indicators of health and well-being (i.e. burnout, health and life satisfaction). Table 6 indicates the product-moment correlation coefficients of the four NW-WI dimensions with the related home characteristics and the indicators of health and well-being (i.e. burnout, health and life satisfaction). Correlations between variables are indicated in parentheses for WPI/PWI, WSI/SWI, WRI/RWI and WDI/DWI respectively.

Job characteristics

High levels of the four W-NWI dimensions were statistically and practically significantly associated with high levels of work

TABLE 5
Product-moment correlations for job characteristics, work→nonwork interference dimensions and well-being outcomes

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Work pressure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Emotional work demands	0.48†*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Cognitive work demands	0.56†**	0.35†*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Work autonomy	-0.15†	-0.24†*	-0,01	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Work support	-0.28†	-0.43†*	-0.16†	0.47†*	-	-	-	-	-	-	-	-	-	-	-	-
6. Work developmental possibilities	-0.02	-0.14†	0.07	0.56†**	0.41†*	-	-	-	-	-	-	-	-	-	-	-
7. Work-parent interference	0.48†*	0.52†**	0.29†	-0.33†*	-0.32†*	-0.21†	-	-	-	-	-	-	-	-	-	-
8. Work-spouse interference	0.52†**	0.58†**	0.29†	-0.24†	-0.35†*	-0.13†	0.68†**	-	-	-	-	-	-	-	-	-
9. Work-religion/spirituality interference	0.38†*	0.42†*	0.21†	-0.26†	-0.25†	-0.06	0.54†**	0.61†**	-	-	-	-	-	-	-	-
10. Work-domestic interference	0.55†**	0.48†*	0.28†	-0.28†	-0.29†	-0.16†	0.78†**	0.75†**	0.55†**	-	-	-	-	-	-	-
11. Emotional exhaustion	0.59†**	0.57†**	0.41†*	-0.28†	-0.41†*	-0.27†	0.56†**	0.53†**	0.37†*	0.53†**	-	-	-	-	-	-
12. Depersonalisation	0.32†*	0.46†*	0.56†**	-0.16†	-0.26†	-0.14†	0.34†*	0.37†*	0.35†*	0.35†*	0.57†**	-	-	-	-	-
13. Cognitive weariness	0.37†*	0.32†*	0.18†	-0.14††	-0.24†	-0.16†	0.38†*	0.40†*	0.32†*	0.38†*	0.63†**	0.52†**	-	-	-	-
14. Physical ill health	0.36†*	0.49†*	0.32†*	-0.26†	-0.31†*	-0.17†	0.44†*	0.42†*	0.38†*	0.42†*	0.47†*	0.28†	0.35†*	-	-	-
15. Anxiety	0.45†*	0.55†**	0.33†*	-0.17†	-0.32†*	-0.19†	0.58†**	0.54†**	0.41†*	0.55†**	0.65†**	0.41†*	0.55†**	0.64†**	-	-
16. Depression	0.24	0.39†*	0.19†	-0.21†	-0.29†	-0.23†	0.38†*	0.42†*	0.27†	0.39†*	0.47†*	0.29†	0.49†*	0.53†**	0.69†**	-
17. Life satisfaction	**-0.17**	**-0.28†**	**-0.11†**	**0.30†***	**0.36†***	**0.44†***	**-0.31†***	**-0.33†***	**-0.20†**	**-0.34†***	**-0.39†***	**-0.21†**	**-0.33†***	**-0.35†***	**-0.46†***	**-0.54†****

TABLE 6
Product-moment correlations for home characteristics, nonwork→work interference dimensions and well-being outcomes

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Home pressure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Emotional home demands	0.31†*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Home autonomy	-0.09	-0.29†	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Home support	-0.06	-0.14†	0.41†*	-	-	-	-	-	-	-	-	-	-	-	-
5. Home developmental possibilities	-0.17†	-0.21†	0.49†*	0.31†*	-	-	-	-	-	-	-	-	-	-	-
6. Parent-work interference	0.29†	0.34†*	-0.27†	-0.11†	-0.17†	-	-	-	-	-	-	-	-	-	-
7. Spouse-work interference	0.22†	0.40†*	-0.29†	-0.21†	-0.14†	0.62†**	-	-	-	-	-	-	-	-	-
8. Religion/spirituality-work interference	0.10	029†	-0.17†	-0.03	0.01	0.51†**	0.65†**	-	-	-	-	-	-	-	-
9. Domestic-work interference	0.28†	0.34†*	-0.21†	-0.06	-0.09	0.65†**	0.55†**	0.51†**	-	-	-	-	-	-	-
10. Emotional exhaustion	0.22†	0.25†	-0.31†*	-0.13†	-0.33†*	0.29†	0.36†*	0.25†	0.31†*	-	-	-	-	-	-
11. Depersonalisation	0.03	0.16†	-0.21†	-0.13†	-0.22†	0.31†*	0.33†*	0.30†*	0.27†	0.58†**	-	-	-	-	-
12. Cognitive weariness	0.20†	0.30†*	-0.28†	-0.14†	-0.27†	0.33†*	0.34†*	0.26†	0.32†*	0.63†**	0.52†**	-	-	-	-
13. Physical ill health	0.17†	0.29†	-0.22†	-0.11†	-0.22†	0.22†	0.29†	0.32†*	0.17†	0.47†*	0.28†	0.35†*	-	-	-
14. Anxiety	0.26†	0.42†*	-0.31†*	-0.12†	-0.29†	0.33†*	0.39†*	0.37†*	0.35†*	0.65†**	0.41†*	0.55†**	0.64†**	-	-
15. Depression	0.19†	0.35†*	-0.27†	-0.20†	-0.26†	0.24†	0.39†*	0.35†*	0.22†	0.47†*	0.29†	0.49†*	0.53†**	0.69†**	-
16. Life satisfaction	-0.18†	-0.28†	0.32†*	0.43†*	0.35†*	-0.11†	-0.23†	-0.14†	-0.07	-0.39†*	-0.21†	-0.33†*	-0.35†*	-0.46†*	-0.54†**

†, Statistically significant ($p < 0.05$); *, Correlation is practically significant $r > 0.30$ (medium effect); **, Correlation is practically significant $r > 0.50$ (large effect)

pressure (0.48; 0.52; 0.38; 0.55) and emotional work demands (0.52; 0.58; 0.42; 0.48). Work-parent and work-spouse interference were statistically and practically significantly associated with low levels of work autonomy (-0.33; -0.24) and work support (-0.32; -0.35). In addition, low statistically significant correlations were found between the other W-NWI dimensions and cognitive work demands (0.29; 0.29; 0.21; 0.28), work autonomy (-0.26; -0.28), work support (-0.25; -0.29) and work developmental possibilities (-0.21; -0.13; -0.16).

Home characteristics

High levels of the parent-work, spouse-work and domestic-work interference dimensions were statistically and practically significantly associated with high emotional home demands (0.34; 0.40; 0.34) and statistically significantly associated with home pressure (0.29; 0.22 0.28). Also, statistically significant correlations were found between the NW-WI dimensions and home autonomy (-0.27; -0.29; -0.17; -0.21). High levels of parent-work and spouse-work interference were also related to statistically significant levels of home support (-0.11; -0.21) and home developmental possibilities (-0.17; -0.14).

Indicators of well-being

High levels of the four W-NWI dimensions were statistically and practically significantly associated with high levels of emotional exhaustion (0.56; 0.53; 0.37; 0.53), depersonalisation (0.34; 0.37; 0.35; 0.35) and cognitive weariness (0.38; 0.40; 0.32; 0.38). Spouse-work interference was statistically and practically significantly associated with high levels of emotional exhaustion (0.36), depersonalisation (0.33) and cognitive weariness (0.34). Parent-work interference was also statistically and practically significantly associated with high levels of depersonalisation (0.31) and cognitive weariness (0.33), whilst religion/spirituality-work interference was only statistically and practically significantly associated with high levels of depersonalisation (0.30). Lastly, parent-work interference was statistically and practically significantly associated with high levels of depersonalisation (0.31) and cognitive weariness (0.33).

Indicators of ill health

High levels of the four W-NWI dimensions were statistically and practically significantly associated with high levels of physical ill health (0.44; 0.42; 0.38; 0.42), anxiety (0.58; 0.54; 0.41; 0.54) and depression (0.38; 0.42; 0.39) and only statistically significantly related with religion/spirituality-work interference (0.27). High levels of all four NW-WI dimensions were statistically and practically significantly associated with high levels of anxiety (0.33; 0.39; 0.37; 0.35). Moreover, religion/spirituality-work interference was statistically and practically significantly associated with high levels of physical ill health (0.32) and depression (0.35). High levels of spouse-work interference were

also statistically and practically significantly associated with high levels of depression (0.39).

Life satisfaction

High levels of work-parent, work-spouse and work-domestic interference were statistically and practically significantly associated with low levels of life satisfaction (-0.31; -0.33; -0.34). Only low statistically significant associations were found between life satisfaction and parent-work, spouse-work and religion/spirituality-work interference (-0.11; -0.23; -0.14).

These results provide support for Hypotheses 7 and 8.

DISCUSSION

Several concerns were recently raised in literature on the work-family conflict. These concerns include the lack of instruments that measure the interference between work and the multiple roles in private life, the use of scientific scale development procedures and the thorough investigation and reporting of the psychometric properties of work-family conflict instruments (Frone, 2003; Parasuraman & Greenhaus, 2002; Robinson *et al.*, 1991; Schultheiss, 2006; Voydanoff, 2007). In order to address the first two limitations, Koekemoer *et al.* (2010) recently developed a new work-nonwork interference instrument that measures the interference between work and four nonwork roles (parental role, spousal role, domestic role and religious/spiritual role) in both directions (i.e. the work role interfering with nonwork roles and the nonwork roles interfering with the work role). However, the psychometric properties of this new instrument have not yet been tested. The general objective of this study was therefore to provide preliminary evidence of the internal and external validity of the new instrument.

The first objective was to test the construct validity of the new instrument. It was hypothesised that W-NWI is a four-factor construct (work-parent interference, work-spouse interference, work-religion/spirituality interference and work-domestic interference, Hypothesis 1a), that NW-WI is also a four-factor construct (parent-work interference, spouse-work interference, religion/spirituality-work interference and domestic-work interference, Hypothesis 1b) and that one can distinguish between the directions of influence (work influencing nonwork roles and nonwork roles influencing work) (Hypothesis 2). These hypotheses were tested using CFA analyses. Competing models were tested and compared with the hypothesised four-factor models for each direction of interference (i.e. W-NWI and NW-WI). The use of CFA analyses and hypotheses was based on previous work-family studies (Carlson & Frone, 2003; Curbow *et al.*, 2003; Geurts *et al.*, 2005; Netemeyer *et al.*, 1996). Regarding

W-NWI, the results indicate that the four-factor hypothesised model of W-NWI explains the associations between the items significantly better than the competing models that were tested (the one-factor model, the two-factor home/religion model, the three-factor family model and the three-factor caretaker model), providing support for Hypothesis 1a. However, inspection of the modification indices and a high standardised residual covariance between work-parent item 4 and work-spouse item 2 suggest an improvement in the hypothesised model. It was therefore decided to delete one problematic item (work-parent item 4). The results of the comparison of the four-factor NW-WI model and the competing models also indicate that the hypothesised model explains associations between the 15 items significantly better than the alternative models, providing support for Hypothesis 1b.

In order to provide additional evidence for the two directions of interference, a second-order two-factor model that distinguishes between the different directions was compared with a one-factor model. The results indicate that the second-order two-factor model fits the data significantly better than the one-factor model. It is therefore clear that the interference between the work role and the different roles in private life is bi-directional, that is, W-NWI consists of two dimensions (work role to nonwork role interference and nonwork role to work role interference) and is congruent with previous work-family studies that indicate that the interference between work and family or personal life is two different constructs (Carlson & Frone, 2003; Curbow *et al.*, 2003; Geurts *et al.*, 2005; Grzywacz & Marks, 2000; Netemeyer *et al.*, 1996). On the basis of these results, Hypotheses 2 is also accepted.

Closely related to construct validity is the aspect relating to the empirical distinctiveness of the dimensions of the two constructs (i.e. proving discriminant validity for the various dimensions of the instrument).The second objective was therefore to determine the discriminant and convergent validity. It was hypothesised that the dimensions of W-NWI and NW-WI are related, although empirically distinct (Hypothesis 3). Discriminant validity was tested using CFA analyses (i.e. the chi square (χ^2) difference test). The results provide support for Hypothesis 2, indicating that the dimensions relating to W-NWI and NW-WI are, although highly related, indeed distinct. For example, interference between the work and parent role is a different dimension than interference between the work and spouse role. These results contribute to the existing literature on work-family interference as they indicate that employees experience interference between the work role and different roles in their private life. The results are also in line with some of the limited studies available on the interference between work and different nonwork roles (Aryee, 1992; Frone & Rice, 1987; Kirchmeyer, 1992; Mallard & Lance, 1998; Premeaux *et al.*, 2007; Small & Riley, 1990).

In terms of the convergent validity between the new instrument and the SWING, it was hypothesised that the W-NWI and NW-WI dimensions correlate strongly with the two scales of the SWING (Hypotheses 4 and 5). The results indicate that overall high correlations are found between the four W-NWI dimensions and the negative WHI scale of the SWING (Geurts *et al.*, 2005), which suggests that these scales measure highly related dimensions (providing support for Hypothesis 4). The strong correlations were expected, as the SWING is a well-known measurement of work-family relations (i.e. measuring interference between work and home). However, a weaker relationship is found between negative WHI and the work-religion/spirituality role. This finding could possibly be attributed to the uniqueness of the religion/spirituality interference dimension in work-family research and to the fact that the SWING does not differentiate between specific roles or dimensions of interference, as it was merely developed to measure the overall interaction with the home dimension.

Although significant relationships are found between NW-WI and the negative HWI dimension of the SWING, these are somewhat weaker than the relationships between the W-NWI dimensions and negative WHI. This may relate to the prevalence of WFC, as it has been well established that WFC is more prevalent than FWC (Geurts & Demerouti, 2003), which could also be true in the case of W-NWI and NW-WI. A further interesting finding regarding the correlations of the NW-WI dimensions is that, although high correlations with negative HWI were reported, these correlations are not as distinct as the W-NWI, as the majority of these correlations are somewhat similar in strength. These findings may suggest that it is more difficult for individuals to differentiate between the interference that originates from the nonwork roles than the interference that originates from the work role; individuals may be unable to recognise how various nonwork roles in their private lives interfere with their work in distinct ways. Individuals may therefore find it easier to recognise overall interference from their home domain in their work (i.e. negative HWI measured with the SWING) than specific interferences originating from specific nonwork roles that influence their work domain (NW-WI measured with the new instrument). Nevertheless, Hypothesis 5 is supported.

The third objective was to determine if all the scales are reliable. It was expected that all the scales would show acceptable reliability, with Cronbach's alpha coefficients higher than 0.70. Hypothesis 6 is accepted – acceptable Cronbach's alpha coefficients have indeed been obtained for all the dimensions of W-NWI (WPI, α = 0.88; WSI, α = 0.88; WRI, α = 0.86; WDI, α = 0.91) and NW-WI (PWI, α = 0.76; SWI, α = 0.77; RWI, α = 0.74; DWI, α = 0.82), indicating that the instrument is a reliable instrument that measure interference between work and nonwork roles.

The final objective was to provide evidence of external validity. It was hypothesised that W-NWI interference is significantly related to job characteristics, burnout, ill health and life satisfaction (Hypothesis 7). Support has been found for this hypothesis – the results indicate that the W-NWI dimensions are differentially related to various job characteristics and indicators of well-being. The four dimensions of W-NWI are associated with high levels of work pressure and emotional work demands, which correspond with the assumption that certain job characteristics may lead to interference between work and nonwork roles. Although all four dimensions of W-NWI are related to work pressure and emotional work demands, these correlations are somewhat different in strength, indicating the unique relationships with the various W-NWI dimensions. In addition, work-parent interference and work-spouse interference are associated with low levels of work autonomy and work support, indicating that individuals experience difficulty (interference) in their relationship with their spouse and children when they do not have enough support or autonomy at work. These findings are in line with previous studies (Boyar *et al.*, 2007; Choi, 2008; Fu & Shaffer, 2001; Greenhaus & Powell, 2003; Lingard & Francis, 2005; Montgomery *et al.*, 2006; Nasurdin & Hsia, 2008; Voydanoff, 2005b).

High levels of the four W-NWI dimensions are associated with high levels of emotional exhaustion, depersonalisation, cognitive weariness, physical ill health, anxiety and depression (again the correlations differed in strength). Only high levels of work-parent, work-spouse and work-domestic interference are associated with low levels of life satisfaction, indicating that when individuals' work interferes with their relationships with their spouse and children and their domestic activities, their levels of satisfaction in life decrease. These results are also in accordance with previous research (Greenhaus *et al.*, 2003; Lingard & Francis, 2005; Montgomery *et al.*, 2006; Weigel *et al.*, 1995).

With regard to NW-WI, it was hypothesised that significant relationships exist with home characteristics, burnout, ill health and life satisfaction (Hypothesis 8). Support has also been found for this hypothesis – the NW-WI dimensions are differentially

related to several home characteristics and indicators of well-being. High levels of the parent-work, spouse-work and domestic-work interference are associated with high emotional home demands and home pressure. High levels of parent-work and spouse-work interference are also related to home support and home developmental possibilities. Prior studies also indicated the relationship of FWC with antecedents such as family demands (e.g. household demands), autonomy, work and family pressure and parental demands (Boyar *et al.*, 2007; Fu & Shaffer, 2001; Greenhaus & Powell, 2003; Keene & Reynolds, 2005; Voydanoff, 2005b). High levels of all four NW-WI dimensions are associated with high levels of anxiety (although the strength of these relationships differed). In addition, religion/spirituality-work interference was associated with high levels of physical ill health and depression. High levels of spouse-work interference are also associated with high levels of depression. Only low statistically significant associations are found between life satisfaction and parent-work, spouse-work and religion/spirituality-work interference.

To conclude, this study contributes to existing work-family research by validating a new instrument that measures interference between work and different nonwork roles. Evidence of the internal validity (i.e. construct, discriminant and convergent validity and reliability) and external validity (i.e. relationship with theoretically relevant external variables) of the instrument was reported. The study further demonstrated the empirical distinctiveness of the various W-NWI and NW-WI dimensions.

Although the research showed promising results, the current study is not without its limitations. The first and obvious limitation of this study was the use of a cross-sectional design, which means that no hard conclusions could be drawn with regard to causation in terms of the relationship with external variables. The second limitation was the exclusive use of self-report measures, which could increase the problem of common method variance. The third limitation of this study was the use of individuals in only one specific occupation, namely tertiary educators. This limits the study's ability to generalise the findings and to develop a comprehensive conceptual model that can be applied to a variety of job settings and groups of workers. The sample size of this study was also relatively small and no advanced structural models could be tested. As a result of these limitations, the instrument would need to be validated further in different occupational settings, submitted for classification as a psychological test and pass the classification review process before it can be used with confidence in South Africa. The instrument should also be investigated for culture and gender fairness and should be tested on larger samples in future research. However, it can be used with caution and treated as a test under development.

Recommendations for future research include the use of the instrument in various occupations. Future analyses could also include more advanced statistical analyses to further prove the distinctiveness of the various dimensions with external variables and could possibly include the testing of a structural model (i.e. multiple regression or path analyses). It is also recommended that various occupations and their job characteristics and family situations be investigated. As working conditions are unique within the different occupations – but are still related to the work-nonwork interface and health – the investigation of heterogeneous populations is important.

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