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Passion: Does One Scale Fit All? Construct Validity of Two-Factor Passion Scale and Psychometric Invariance Over Different Activities and Languages

Herbert W. Marsh
University of Western Sydney, University of Oxford, and King Saud University

Robert J. Vallerand
Université du Québec à Montréal

Marc-André K. Lafrenière
University of Maryland

Philip Parker and Alexandre J. S. Morin
University of Western Sydney

Noémie Carbonneau
Université du Québec à Montréal

Sophia Jowett
Loughborough University

Julien S. Bureau
Université de Montréal

Claude Fernet
Université du Québec à Trois-Rivières

Frédéric Guay
Université Laval

Adel Salah Abduljabbar
King Saud University

Yvan Paquet
Université de la Réunion

The Passion Scale, based on the dualistic model of passion, measures 2 distinct types of passion: Harmonious and obsessive passions are predictive of adaptive and less adaptive outcomes, respectively. In a substantive-methodological synergy, we evaluate the construct validity (factor structure, reliability, convergent and discriminant validity) of Passion Scale responses (N = 3,571). The exploratory structural equation model fit to the data was substantially better than the confirmatory factor analysis solution, and resulted in better differentiated (less correlated) factors. Results from a 13-model taxonomy of measurement invariance supported complete invariance (factor loadings, factor correlations, item uniquenesses, item intercepts, and latent means) over language (French vs. English; the instrument was originally devised in French, then translated into English) and gender. Strong measurement partial invariance over 5 passion activity groups (leisure, sport, social, work, education) indicates that the same set of items is appropriate for assessing passion across a wide variety of activities—a previously untested, implicit assumption that greatly enhances practical utility. Support was found for the convergent and discriminant validity of the harmonious and obsessive passion scales, based on a set of validity correlates: life satisfaction, rumination, conflict, time investment, activity liking and valuation, and perceiving the activity as a passion.

Keywords: Two-Factor Passion Scale, exploratory structural equation modeling (ESEM), measurement invariance, substantive-methodological synergy, convergent/discriminant validity

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Herbert W. Marsh, Centre for Positive Psychology and Education, University of Western Sydney, Penrith, New South Wales, Australia; Department of Education, University of Oxford, Oxford, England; and School of Education, King Saud University, Riyadh, Saudi Arabia. Robert J. Vallerand, Laboratoire de Recherche sur le Comportement Social, Université du Québec à Montréal, Montréal, Québec, Canada. Marc-André K. Lafrenière, Department of Psychology, University of Maryland. Philip Parker and Alexandre J. S. Morin, Centre for Positive Psychology and Education, University of Western Sydney. Noémie Carbonneau, Laboratoire de Recherche sur le Comportement Social, Université du Québec à Montréal. Sophia Jowett, School of Sport & Exercise Sciences, Loughborough University, Loughborough, England. Julien S. Bureau, Department of Psychology, Université de Montréal, Montréal, Québec, Canada. Claude Fernet, Department of Management Sciences, Université du Québec à Trois-Rivières, Trois-Rivières, Québec, Canada. Frédéric Guay, Département des Fondements et Pratiques en Éducation, Université Laval, Québec, Québec, Canada. Adel Salah Abduljabbar, School of Education, King Saud University, Riyadh, Saudi Arabia. Yvan Paquet, Department of Sciences and Techniques of Sports and Physical Activities, Université de la Réunion, Saint-Denis, Réunion, France.

Correspondence concerning this article should be addressed to Herbert W. Marsh, Centre for Positive Psychology and Education, University of Western Sydney, Locked Bag 1797, Penrith, NSW, 2751 Australia. E-mail: h.marsh@uws.edu.au

The present investigation is a substantive-methodological synergy (Marsh & Hau, 2007) that brings together research into important substantive issues with theoretical, practical, and policy implications, using sophisticated methodology appropriate to the task. The substantive focus is on the dualistic model of passion (Vallerand, 2010; Vallerand et al., 2003) and the two-factor Passion Scale derived from this theory, apparently the only psychometric instrument specifically designed to measure passion. The Passion Scale has been applied to a number of activities described in the present investigation but, as such, maintains the same content. The methodological focus is on new and evolving applications of exploratory structural equation modeling (ESEM) that integrate many of the best features of exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modeling (SEM) as applied to responses from diverse studies using the Passion Scale.

Substantive Focus: The Dualistic Model of Passion

In recent years, an increasing amount of research in psychology has dealt with providing a better understanding of what makes people's lives more fulfilling. This new "positive psychology" explores "how people's lives can be most worth living" (Seligman & Csikszentmihalyi, 2000, p. 5). Although several concepts have been found useful for shedding light on what leads to a better life (see Snyder & Lopez, 2009), 10 years of research has shown that the concept of passion represents one important answer to this question. Indeed, individuals who wake up in the morning with a smile on their face "because today is baseball day," musicians who work many hours per day on a new CD, and people who work hard for a cause all have a passion that makes their lives worth living. Passion can fuel motivation, enhance well-being, and provide meaning in everyday life. However, passion can also arouse negative emotions, lead to inflexible persistence, and interfere with achieving a balanced, happy life.

The dualistic model of passion (Vallerand, 2010; Vallerand et al., 2003) defines passion as a strong inclination toward a self-defining activity, object, or person that one loves, finds important, and invests a significant amount of time and energy in. It should be noted that the source of a passion can be oriented toward an activity (e.g., playing the piano), a person (e.g., one's romantic partner), or an object (a baseball card collection). This model further proposes the existence of two distinct types of passion: Harmonious Passion (HP) and Obsessive Passion (OP), which can be differentiated in terms of how the passion has been internalized into one's identity. Past research has shown that values and regulations concerning uninteresting, though important, activities can be internalized in either an autonomous or a controlled fashion (Deci, Eghrari, Patrick, & Leone, 1994). Internalization represents the process through which individuals transform socially sanctioned values and behaviors into personally endorsed ones (Deci & Ryan, 2000). When the internalization process is autonomous, people voluntarily recognize these principles as important, assimilate them into their identity and, thus, fully accept them as their own. However, when the internalization process is controlled, people are compelled to identify with these principles, and thus behaviors and values may either remain external or be only partially internalized in the identity. In the same vein, Vallerand et al. (2003) proposed that these two types of internalization should take place for sources of passion and that these processes should be conducive to HP and OP, respectively.

HP refers to a strong desire to freely engage in the activity and results from an autonomous internalization of the passion into the person's identity. Such internalization process occurs in contexts where the person willingly accepts their passion as important, instead of feeling pressured, either internally or externally, to do so (Vallerand et al., 2003). The source is thus part of an integrated self-structure (Hodgins & Knee, 2002). Consequently, this passion occupies a significant but not overriding space in the person's identity and is thus in coherence with other aspects of the person's life. Therefore, to the extent that individuals are predominantly HP, they should show more openness and less defensiveness to what is occurring while engaging in the activity (Hodgins & Knee, 2002). People with a predominant HP should thus experience positive outcomes not only during (e.g., positive affect, concentration, flow) but also after task engagement (e.g., general positive affect, psychological adjustment, etc.).

OP refers to an uncontrollable urge to partake in the passion and results from a controlled internalization of the passion into one's identity. This process originates from intrapersonal and/or interpersonal pressure because particular contingencies are attached to the passion, such as feelings of social acceptance. While this phenomenon leads to the passion becoming part of the person's identity, individuals with an OP come to develop ego-invested self-structures toward the source of their passion (Deci & Ryan, 2000; Hodgins & Knee, 2002). Consequently, the passion occupies a significant space in the person's identity but overwhelms other aspects of the person's life. Therefore, to the extent that they are predominantly OP, individuals should show more sensitivity and defensiveness to what is occurring in the activity (Hodgins & Knee, 2002). Moreover, when a passion represents such a dominant role in one's identity, it is not easily put aside. Individuals with a predominant OP thus experience an uncontrollable urge to engage in their passion; their passion must run its course, as they come to be dependent on it. As a result, they run the risk of experiencing conflict with other life domains and negative consequences (e.g., negative affect, rumination) during and after engagement in the passion and, eventually, lower levels of psychological adjustment.

Empirical findings support this conceptualization of passion. Exploratory and confirmatory factor analyses supported the two-factor structure of the Passion Scale (e.g., Carbonneau, Vallerand, Fernet, & Guay, 2008; Vallerand, Rousseau, Grouzet, Dumais, & Grenier, 2006, Study 1; see Vallerand, 2010, for a review). The Passion Scale has shown high levels of internal consistency as well as predictive, discriminant, construct, and external evidence of validity in diverse activities (Stenseng, 2008; Vallerand et al., 2003; see Vallerand, 2010). Moreover, test–retest correlations, over a 3-month period, revealed moderately high stability values (Carbonneau et al., 2008). Furthermore, results using this scale revealed that both HP and OP were positively correlated with each other and with measures of the perceived value of the passion, of the activity being perceived as a passion, and inclusion of the passion in the person's identity (Vallerand et al., 2003, Study 1). However, the two types of passion are differentially associated with various outcomes. HP is positively related, whereas OP is either unrelated or even negatively related, with psychological adjustment indices (Vallerand et al., 2003, Study 2; Vallerand et

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al., 2007), and with positive emotions and flow during activity engagement (Lafrenière, Jowett, et al., 2008, Study 2; Vallerand et al., 2003, Study 1; Vallerand et al., 2006, Study 2). Finally, HP is negatively related, whereas OP is positively related, with the experience of conflict between one's passion and other life activities (Vallerand et al., 2003, Study 1; Vallerand, Paquet, Philippe, & Charest, 2010).

Application of ESEM to Assess Measurement Invariance and Construct Validity

Historically, psychological researchers have relied primarily on EFAs for the development, refinement, and assessment of psychological measures. However, many tests of assumptions that underpin assessment research cannot be easily performed with EFA. For example, tests of measurement invariance (in relation to multiple groups, time, and covariates) cannot be appropriately evaluated with traditional EFAs. Nevertheless, in many instances, item-level CFAs fail to provide clear support for instruments that apparently had been well-established by EFA research (e.g., Marsh et al., 2009, 2010). Common problems typically are associated with goodness of fit, differentiation of factors, measurement invariance across groups or time, and differential item functioning. Marsh et al. (Marsh et al., 2009, 2010; Marsh, Lüdtke, et al., 2012; Marsh, Nagengast, et al., 2011) argued that part of the problem is linked to the overly restrictive independent cluster models of CFA (ICM-CFA) in which items are required to load on one, and only one, factor, with all nontarget loadings constrained to be zero. Failure to incorporate nonzero cross-loadings can substantially bias relations among the factors and their relations with other constructs (Asparouhov & Muthén, 2009; Marsh et al., 2009; Sass & Schmitt, 2010; Schmitt & Sass, 2011). This issue is particularly relevant to the present investigation, because the correlation between the two passion factors and support for their convergent and discriminant validity in relations with validity criteria are critical to testing the Passion Scale. Following from previous applications of ESEM, we hypothesize that the fit of the ESEM model will be substantially better than the corresponding ICM-CFA model and that the correlation between PH and PO will be substantially smaller for ESEM factors.

Methodological issues with practical implications for the use of the Passion Scale include tests of measurement invariance (i.e., Marsh et al., 2009; Meredith, 1964, 1993) in relation to language (French vs. English), activity, and gender. Originally, the Passion Scale was in French, but it was subsequently translated into English using the translation/back-translation technique (Brislin, 1970; Vallerand, 1989). We hypothesize that the factor structures for the French and English versions are equivalent. However, before combining responses from these two languages, it is critical to test this hypothesis through systematic tests of measurement invariance and to properly adjust subsequent analyses if the hypothesis is not supported. This methodological approach has broad generalizability to cross-cultural studies.

Respondents to the Passion Scale are asked to describe the activity about which they are passionate prior to completion of the instrument. For present purposes these are broadly characterized as leisure (e.g., reading novels, playing the guitar), sport (e.g., basketball, swimming), social (e.g., parenting, romantic relationships), work, and education. An implicit assumption underlying this research is that the same 12 Passion Scale items are equally appropriate when applied to each of these activities. Although it might be possible to develop separate instruments specific to different activities, there are important practical and theoretical advantages to having a common set of items that are used by all respondents (e.g., comparison of levels of passion across the different activities). Again, we address this issue with a detailed evaluation of the measurement invariance of responses to different passion activities. Similarly, the implicit assumption that responses to the Passion Scale are reasonably invariant over gender has not been tested rigorously. This is important, in that comparison of gender differences in the passion factors relies on the implicit assumption that there is measurement invariance across gender. The methodological approaches, as well as empirical findings to this question, have broad generalizability to other research that relies on a single generic scale to measure the same psychological constructs in different contexts and for different subgroups of participants.

Finally, in extended ESEM models, we added a set of validity correlates to the model to evaluate support for the construct (convergent and discriminant) validity of the passion scale latent factors. In line with the definition of passion, a set of four single-item criteria of passion used elsewhere (e.g., Vallerand et al., 2003) were used: that is, time investment, activity liking, valuing the activity, and perceiving the activity as a passion. Because the four single-item ratings of the passion activity are intended to represent different components of passion, it is expected that all of them will be substantially related to both passion factors. However, liking and valuing are expected to be more related to harmonious passion, whereas time is expected to be more correlated with obsessive passion, in line with Vallerand et al. (2003; Study 1). Nevertheless, although support for these predictions would provide support for convergent validity, it would not provide strong tests of divergent validity. In contrast, the multi-item validity correlates (conflict, life satisfaction, and rumination) considered in additional analyses do provide tests for both convergent and discriminant validity. In particular, in line with the dualistic model of passion (Vallerand, 2010; Vallerand et al., 2003), conflict and rumination are hypothesized to be substantially more strongly related to OP than harmonious passion, whilst life satisfaction is expected to be substantially more strongly correlated with HP than OP. In summary these a priori predictions provide a good basis for testing both the convergent and discriminant validity of the HP and OP scales.

Method

Participants

This archival data set of Passion Scale responses consists of a diverse, heterogeneous collections of 19 nonclinical, unscreened samples based on a combination of published and unpublished data not previously used for psychometric validation of the Passion Scale, described in more detail in Table 1: 3,570 individuals (2,017 men, 1,514 women, and 39 unspecified; M_{age} = 23.28, SD_{age} = 9.84). Participants had been involved in their passionate activity for an average of 7.16 years (SD = 5.13) and were currently devoting to it an average of 11.24 hr (SD = 9.58) per week. Participants in various studies were recruited through a variety of means (e.g., e-mail, online advertising, in person) and invited to

participate. All prospective participants were informed about the general aim of the respective study and were invited to complete a questionnaire containing demographic questions and the Passion Scale.

Passion Scale and Correlates

The two-factor passion scale is designed to measure HP and OP, each assessed by six items on a 7-point response scale: 1 (*strongly disagree*) to 7 (*strongly agree*). The two-factor structure is supported by many factor analysis studies (e.g., Carbonneau et al., 2008; Lafrenière, Jowett, et al., 2008, Study 2; Vallerand et al., 2003, Study 1; Vallerand et al., 2008, Study 1). The wording of the 12 items and the Cronbach alpha estimates of reliability are provided in Appendix 1 (all references to Appendix 1 refer to the online supplemental materials). Particularly given the modest length of the Passion Scale, the reliability based on data from the present investigation is good for both HP (.83) and OP (.86).

In various studies included in the analyses, some included the following multi-item validity correlates (see Appendix 1 for item wording): Diener's (1985) measure of life satisfaction ($\alpha = .85$, $n = 1{,}646$) and two additional scales developed specifically for passion research (see Vallerand et al., 2003; rumination ($\alpha = .88$, $N = 354$); conflict ($\alpha = .84$, $N = 220$). In addition, we considered a set of four single-item ratings: time ($N = 2{,}792$; I spend a lot of time doing this activity); like ($N = 2{,}792$; I like this activity); value ($N = 2{,}796$; this activity is important for me); passion ($N = 2{,}788$; this activity is a passion for me). All scales were assessed on a 7-point response scale: 1 (*strongly disagree*) to 7 (*strongly agree*). In most cases, the varying *N*s primarily reflect the number of studies in which these measures were used, rather than participants not responding to items (see subsequent discussion of missing data strategies). The correlates available for each sample are presented in Table 1.

Statistical Analyses

The ICM-CFA and ESEM approaches. All CFAs and ESEM analyses were done with Mplus 6.1 (L. K. Muthén & Muthén, 2008–2011), using robust maximum-likelihood estimator (MLR) with standard errors and tests of fit that are robust in relation to nonnormality of observations and the use of categorical variables when there are at least four or more response categories (e.g., Beauducel & Herzberg, 2006; DiStefano, 2002; Dolan, 1994; B. O. Muthén & Kaplan, 1985; Rhemtulla, Brosseau-Liard, & Savalei, 2010). The initial focus is the application of ESEM to responses to the 12 Passion Scale items and how this compares to the traditional ICM-CFA model, in which all cross-loadings are constrained to be zero (see Panels A and B in Figure SM1 in the online supplemental materials). The ESEM approach differs from

Table 1
Documentation of the 19 Samples of Data Used in the Present Investigation

Sample	*N*	Activity	Language	Milieu	Age (*SD*)	% Men	Correlates[a]	Source
1	106	Work	French	Canada	35.5 (10.8)	91%	1 2 3 4 6 7	Lafrenière, Jowett, et al., 2008, Study 2
2	105	Sport	French	Canada	24.5 (4.8)	72%	1 2 3 4 5	Donahue, Lafrenière, Vallerand, 2008, Study 1
3	114	Mixed activities	English	International	19.9 (2.4)	65%	1 2 3 4 6 7	Lafrenière, Donahue, & Vallerand, 2008, Study 3
4	140	Sport	French	Canada	14.9 (1.2)	0%	1 2 3 4 6	Lafrenière, Donahue, & Vallerand, 2007, Study 2
5	199	Mixed activities	French	Canada	23.3 (4.6)	48%	1 2 3 4	Lafrenière, Vallerand, Donahue, 2012, Study 3
6	258	Education	French	Canada	21.1 (2.6)	69%	1 2 3 4 5	Lafrenière, Vallerand, et al., 2011, Study 3
7	245	Sport	French	Canada	15.2 (1.6)	98%	1 2 3 4	Lafrenière, Donahue, & Vallerand, 2007, Study 2
8	96	Mixed activities	French	Canada	24.6 (4.4)	56%	1 2 3 4 5	Lafrenière & Vallerand, 2012c, Study 2
9	225	Social	French	Canada	21.1. (2.3)	79%	5	Carbonneau, Vallerand, & Paquet, 2012, Study 2
10	107	Work	English	England	42.3 (7.9)	10%	1 2 3 4	Lafrenière, Jowett, Vallerand, & Carbonneau, 2011
11	458	Social	French	Canada	36.7 (13.5)	59%	5	Carbonneau, Vallerand, & Paquet, 2012, Study 3
12	80	Education	French	Canada	26.0 (7.6)	85%		Lafrenière & Vallerand, 2012c, Study 1
13	483	Sport	French	Canada	15.0 (2.0)	76%	1 2 3 4	Lafrenière, Vallerand, & Donahue, 2012, Study 3
14	101	Mixed activities	French	Canada	24.6. (4.9)	73%	1 2 3 4	Lafrenière & Vallerand, 2012a, Study 1
15	233	Mixed activities	French	Canada	24.1 (7.0)	53%	1 2 3 4 5	Lafrenière & Vallerand, 2012a, Study 2
16	207	Leisure	English	International	26.5 (10.2)	39%	1 2 3 4 5	Lafrenière, Vallerand, & Donahue, 2012, Study 4
17	149	Leisure	French	Canada	20.8 (2.8)	27%	1 2 3 4 5	Lalande et al., 2012, Study 1
18	65	Mixed activities	French	Canada	21.5 (5.6)	15%	1 2 3 4	Lafrenière & Vallerand, 2012b, Study 1
19	198	Mixed activities	French	Canada	23.2 (5.7)	3%	1 2 3 4 6	Lafrenière & Vallerand, 2012b, Study 2

Note. Mixed activities imply that participants were asked to identify their passionate activity, and thus, within these samples, a variety of activities are represented.

[a] The correlates consist of four single-item scales (1 = time, 2 = like, 3 = value, 4 = passion) and three multi-item scales (5 = life satisfaction, 6 = ruminate, 7 = conflict). Different sets of correlates were used in different studies; the numbers in this column designate the correlates included in each study.

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the typical ICM-CFA approach in that all factor loadings are estimated, subject to constraints necessary for identification (for further details, see Asparouhov & Muthén, 2009; Marsh, Liem, Martin, Morin, & Nagengast, 2011; Marsh et al., 2009). Indeed, even when CFA does provide an acceptable fit to the data according to current standards, ESEM typically provides a better fit and representation of the data, and results in latent factors that are much more differentiated (i.e., less correlated) given that ESEM uses two estimates of overlap between factors (overlap in factor loadings and correlation between factors), whereas CFA uses only one (correlation between factors). Diagrams of the ICM-CFA and ESEM model of the Passion Scales are presented in Figure SM1.

For present purposes we used a target rotation, taking advantage of the fact that a few items from each factor are relatively pure measures of the factor (i.e., factor cross-loadings are near-zero; see online supplemental materials for further discussion). As emphasized by Browne (2001; also see Asparouhov & Muthén, 2009; Dolan, Oort, Stoel, & Wicherts, 2009) this strategy reflects a compromise between the rationales for ESEM and ICM-CFA, based on partial knowledge of the factor structure and is appropriate for analyzing the Passion Scale given that the a priori factor structure (i.e., the expected pattern of main loadings and cross-loadings) of the passion scale is well documented.

MIMIC models of gender and age effects. We applied the traditional multiple-indicator-multiple-cause (MIMIC) model to assess how gender and age are related to the two passion scales. Because the age range was substantial (12 to 100 years), with a positively skewed distribution, we used a percentile normalizing transformation ($M = 0$, $SD = 1$). In addition to main (first-order) effects of gender and age, we also considered the nonlinear (quadratic) components of age and the age-by-gender interaction. Although like a traditional multiple regression approach, the MIMIC model has the added advantage that the outcome variables (HP and OP) are latent factors. Demonstrating the flexibility of the ESEM approach, we integrated the MIMIC structure in the ESEM analyses (see Figure SM1; Marsh, Nagengast, & Morin, 2012).

Multigroup tests of invariance and latent mean differences: Taxonomy of invariance. Marsh et al. (2009) introduced a taxonomy of 13 ESEM models (see Appendix 2 in the online supplemental materials; note that all further mentions of Appendix 2 refer to the online supplemental materials) designed to test measurement invariance that integrates factor analysis (e.g., Jöreskog & Sörbom, 1993; Marsh, 1994, 2007; Marsh & Grayson, 1994) and measurement invariance (e.g., Meredith, 1964, 1993) traditions to evaluate full measurement invariance: *configural invariance* (all parameters are freely estimated in all groups but the underlying measurement structure is held constant across groups; Model 1 in Appendix 2); *weak measurement invariance* (factor loadings are invariant; Model 2); *strong measurement invariance* (invariance factor loadings and item intercepts; Model 5) and *strict measurement invariance* (invariance of factor loadings, item intercepts, and item uniquenesses; Model 7). This taxonomy expands the measurement invariance tradition to include tests of latent means invariance and of the factor variance-covariance matrix and various combinations of invariance constraints across different sets of model parameters (see the remaining models in Appendix 2). This taxonomy provides an ideal approach to evaluating invariance, starting with a simple model with no invariance constraints (configural invariance) and moving to a highly restrictive model in which all parameters (factor loadings, factor variances and covariances, factor uniquenesses, item intercepts, and finally latent factor means) are constrained to be invariant across the solutions, based on responses by different (language, gender or activity) groups. Although these tests require full invariance of all parameter estimates for all groups, Byrne, Shavelson, and Muthén (1989; also see Marsh, 2007) have argued for the usefulness of a less demanding test of partial invariance in which a subset of parameters are not constrained to be invariant (see online supplemental materials for further discussion of the consequences of a lack of measurement invariance and our extended taxonomy).

Extended models. In the extended models, we evaluate the construct validity of Passion Scale factors by relating them to correlates, validity criteria particularly relevant to the theoretical basis of the instrument. Because the data were based on a variety of different studies, and each study only included some of the correlates, there were complications associated with the large number of missing values. Importantly, there were nearly complete data for all materials that were administered to a particular group, but not all correlates were administered to participants in different studies. We juxtaposed the results from two strategies to cope with this problem of missing data.

For the three multi-item scales (conflict, life satisfaction, and rumination) for which only a small amount of data was available, separate analyses were conducted for each scale. The first strategy was a combination of listwise deletion and imputation. More specifically, analyses were conducted only for the groups that had been administered the items for each scale (groups that had not even been administered the items were excluded listwise). For this first strategy, there were very few missing responses, and these were handled with full-information maximum likelihood (FIML; e.g., Enders, 2001, 2010; Graham, 2009). The second strategy relied completely on imputation, in that analyses were done on all cases. Again, FIML was used to handle the missing data, but the number of missing responses for the correlates (but not the OP and HP items) was very large. Using similar strategies for missing data, we then considered the entire set of four correlates in a single model (time investment, liking, valuing, and passion).

Goodness of fit. Model fit was evaluated based on sample size independent indices (e.g., Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005) such as the root-mean-square error of approximation (RMSEA), the Tucker–Lewis index (TLI), and the comparative fit index (CFI)—as well as the χ^2 test statistic and an evaluation of parameter estimates. Values greater than .90 and .95 on the CFI and TLI, as well as RMSEA values lower than .06 and .08, typically reflect acceptable and excellent fits to the data. However, for purposes of model comparison, comparison of the relative fit of models imposing more or fewer invariance constraints is more important than the absolute level of fit for any one model—so long as the fit of the best fitting model is acceptable. Chen (2007) and Cheung and Rensvold (2001) suggested that if the decrease in fit for the more parsimonious model is less than .01 for incremental fit index CFI, then there is reasonable support for the more parsimonious model. Chen (2007) suggested that when the RMSEA increases by less than .015 there is support for the more constrained model. For indices that incorporate a penalty for lack of parsimony such as the RMSEA and TLI, it is also possible for

a more restrictive model to result in a better fit than a less restrictive model (Marsh, 2007; Marsh et al., 2005). Following recommendations and typical practice with single-group models, as well as studies based on multiple groups (e.g., Marsh et al., 2009, 2010), we apply the guidelines for model comparisons based on CFI to the TLI. An advantage of the TLI is that it incorporates a control for parsimony, whereas the change in CFI does not, making TLI particularly relevant to model comparisons (for further discussion, see Marsh et al., 2005).

Results and Discussion

Passion Factor Structure and Correlations: ESEM Versus CFA

The critical starting point for the present investigation is the hypothesis that ESEM provides a better fit to responses to the Passion Scale items than a traditional ICM-CFA and that it reduces the size of the typically large factor correlations. The ICM-CFA solution provides an unacceptable fit to the data (CFI = .879, TLI = .850, RMSEA = .092; see TG1CFA in Table 2). However, the fit of the corresponding ESEM solution is marginally acceptable (CFI = .929, TLI = .892, RMSEA = .077; see TG1ESEM in Table 2). In evaluating the modification indices for both solutions, it was evident that the inclusion of two correlated uniquenesses would improve the fit (one between HP Items 1 and 5, and one between OP Items 3 and 4; see Appendix 1 for the wording of the items). Although, ex post facto, the same two correlated uniquenesses were evident in both CFA and ESEM solutions, their inclusion did not meaningfully alter other parameter estimates, and an inspection of the wording of the items suggests that the inclusion of the correlated uniquenesses is reasonable. With the inclusion of these correlated uniquenesses, the fit of the ICM-CFA solution is marginal (CFI = .919, TLI = .896, RMSEA = .075; see TG3CFA in Table 2), whereas that of the ESEM solution is good (CFI = .962, TLI = .938, RMSEA = .025; see TG3ESEM in Table 2). In summary, the highly restrictive ICM-CFA model in which all nontarget loadings are constrained to be zero is, apparently, overly restrictive, as evidenced by differences in goodness of fit. However, what are the implications in terms of actual parameter estimates—particularly correlations between OP and HP factors?

In order to evaluate this question we next evaluated parameter estimates in the ESEM and ICM-CFA solutions. In terms of the 12 target factor loadings (the boldface values in Table 3), the loadings for all items are statistically significant and substantial. When both target and nontarget factor loadings are considered together, the ICM-CFA and ESEM solutions resulted in a very similar pattern, with a profile similarity index (PSI, the correlation between the 24 ESEM factor loadings and the corresponding CFA values) = .953, suggesting that the ESEM and ICM-CFA factor loadings were highly related. However, an evaluation of the factor correlations among the OP and HP factors demonstrates a critical advantage of the ESEM approach over the ICM-CFA approach. In particular, as is consistent with a priori predictions, the correlation between HP and OP was substantially smaller for the ESEM solution (r = .175) than for the ICM-CFA solution (r = .451).

In summary, the ESEM model is clearly better in terms of goodness of fit. In particular, even though the model fits for

Table 3
ESEM and CFA Solutions: Two Passion Factors Based on Responses to 12 Items

Item	ESEM solution			CFA solution		
	HP	OP	Uniq	HP	OP	Uniq
HP1	**.647**	−.084	.594[a]	.556	0	.690[a]
HP2	**.555**	.150	.640	.628	0	.606
HP3	**.546**	.306	.550	.672	0	.548
HP4	**.566**	.213	.592	.666	0	.557
HP5	**.693**	.045	.507[a]	.664	0	.559[a]
HP6	**.776**	.031	.389	.733	0	.463
OP1	−.023	**.659**	.570	0	.642	.588
OP2	.060	**.749**	.419	0	.756	.428
OP3	.184	**.595**	.574[b]	0	.650	.578[b]
OP4	.157	**.617**	.560b	0	.664	.560[b]
OP5	.145	**.721**	.423	0	.768	.410
OP6	−.039	**.718**	.493	0	.692	.522
Factor correlations						
Harmonious	1.000	1.000				
Obsessive	.175	1.000	.451	1.000		

Note. Uniq = item uniqueness. The exploratory structural equation model (ESEM) and the confirmatory factor analysis (CFA) model each posited two a priori passion factors: HP (Harmony Passion) and OP (Obsessive Passion). (See model TG3ESEM in Table 2 for goodness-of-fit statistics.) All parameter estimates are completely standardized. A priori target loadings appear in boldface type for the ESEM solution. (See Table 2 for the goodness-of-fit statistics.)
[a] correlated uniqueness between HP1 and HP5: .226 (ESEM) .312 (CFA). [b] correlated uniqueness between OP3 and OP4: .373 (ESEM) .374 (CFA).

Table 2
Summary of Goodness of Fit: Total Group (TG)

Model	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	Description
TG1-CFA	1,607	53	.879	.850	.091 (.087–.094)	CFA no CUs
TG1-ESEM	950	43	.929	.892	.077 (.073–.081)	ESEM no CUs
TG2-CFA	1,282	52	.904	.879	.081 (.078–.085)	CFA 1 CU
TG2-ESEM	614	42	.955	.930	.062 (.078–.085)	ESEM 1 CU
TG3-CFA	1,088	51	.919	.896	.075 (.072–.079)	CFA 2 CUs[a]
TG3-ESEM	536	41	.962	.938	.058 (.054–.063)	ESEM 2 CUs[a]

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; CI = confidence interval; CFA = confirmatory factor analysis; ESEM = exploratory structural equation model; CU = correlated uniqueness.
[a] See Table 3 for parameter estimates.

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ICM-CFA were marginally acceptable, the requirement that nontarget loadings are constrained to be zero is overly restrictive and results in systematically inflated correlations among the factors. Hence, the superiority of the ESEM model has practical implications in relation to the usefulness of the factors.

Multiple Group Tests of Measurement Invariance

In the previous section we demonstrated that ESEM fitted responses to the Passion Scale better than did the traditional ICM-CFA model, and selected the best fitting model (TG3-ESEM in Table 2). In this section we evaluate how well this factor structure generalizes over language, gender, and passion activity, based on a comprehensive taxonomy of measurement invariance (see Appendix 2).

Invariance across language (French vs. English). Different studies included in the analysis were based on either the French or the English version of the Passion Scale. The inclusion of responses using both languages in the same analyses is based on the strong assumption that the two versions are equivalent. This consideration is of broad interest to the evaluation of many psychological assessment instruments that have been translated from one language to another. Although the typical approach is to select a "best" model and to evaluate the implications of noninvariance, the results here provide strong support for the complete invariance of the two solutions (Table 4). Particularly for indexes of fit that incorporate a control for parsimony (TLI and RMSEA)—invariant models are much more parsimonious—the addition of each set of invariance constraints resulted in almost no changes in the goodness of fit (see Appendix 2 for a presentation of the nesting relations among models in this taxonomy that is a basis for comparing different models). Thus for example, the TLI and RMSEA were .936 and .059, respectively, for configural invariance (MG-M1); .939 and .057 for weak invariance (MG-M2); .936 and .059 for strong invariance (MG-M5); .935 and .059 for strict invariance (MG-M7); and .933 and .060 for complete invariance, including latent means (MG-M13). This consistency in fit is also evident from the 90% confidence intervals for RMSEA. In summary, the results provide remarkably strong support for the invariance of measurements across the French and English versions of the Passion Scale.

Invariance across gender (men vs. women). Do men and women perceive passion similarly? More specifically, is the factor structure for responses to the Passion Scale similar for men and women? Again, the taxonomy of invariance models (see Appendix 2) provides an ideal approach with which to evaluate this question. Importantly, the results provide strong support for the complete invariance of the factor structure over responses by men and women. Particularly for indexes of fit that incorporate a control for parsimony (TLI and RMSEA), the addition of each set of invariance constraints resulted in almost no changes or in a slight improvement in the goodness of fit (see Table 4). Thus, for example, the TLI and RMSEA were .935 and .060, respectively (for MG-M1, configural invariance), .944 and .055 for weak invariance (MG-M2), .945 and .055 for strong invariance (MG-M5), .951 and .052 for strict invariance (MG-M7), and .951 and .052 for complete invariance including latent means (MG-M13). In summary, the results provide remarkably strong support for the invariance of measurements by men and women.

Invariance across passion activity groups. The Passion Scale is based on the implicit assumption that the same set of 12 items is equally appropriate for the myriad activities that might be the focus of passion for each individual. Support for this pragmatic assumption is critically important, providing an appropriate basis for comparing scores for individuals involved in very different activities in a way that would not be possible if a unique set of items were developed separately for each activity. However, the assumption is a highly demanding one that requires a detailed evaluation of measurement invariance over different activity groups considered here (leisure, sport, social, work, and education).

The results for Model MG-M1 (Table 5) provide reasonable support for configural invariance (CFI = .950, TLI = .919,

Table 4
Multiple Group (MG) Tests of Measurement Invariance Over Language (French vs. English) and Gender

	Language invariance					Gender invariance				
Model	*df*	χ^2	CFI	TLI	RMSEA (90% CI)	χ^2	CFI	TLI	RMSEA (90% CI)	Description
MG-M1	82	590	.960	.936	.059 (.054–.063)	599	.960	.935	.060 (.055–.064)	None (configural)
MG-M2	102	703	.953	.939	.057 (.054–.062)	654	.957	.944	.055 (.051–.059)	FL (weak)
MG-M3	114	800	.946	.938	.058 (.054–.062)	666	.957	.950	.052 (.049–.056)	FL, Uniq
MG-M4	105	740	.950	.937	.058 (.054–.062)	661	.957	.945	.055 (.051–.059)	FL, FVCV
MG-M5	112	806	.946	.936	.059 (.055–.063)	710	.953	.945	.055 (.051–.059)	FL, Inter (strong)
MG-M6	117	841	.943	.936	.059 (.055–.063)	673	.956	.951	.052 (.048–.056)	FL, Uniq, FVCV
MG-M7	124	901	.939	.935	.059 (.056–.063)	721	.953	.950	.052 (.049–.056)	FL, Uniq, Inter (strict)
MG-M8	115	844	.943	.934	.060 (.056–.063)	716	.953	.946	.054 (.051–.058)	FL, FVCV, Inter
MG-M9	127	942	.936	.934	.060 (.056–.064)	728	.953	.951	.052 (.048–.055)	FL, FVCV, Uniq Inter
MG-M10	114	825	.944	.935	.059 (.055–.063)	728	.952	.944	.055 (.051–.059)	FL, FMn, Inter
MG-M11	124	901	.939	.935	.059 (.056–.063)	721	.953	.950	.052 (.049–.056)	FL, Uniq, Inter, FMn
MG-M12	117	864	.941	.934	.060 (.056–.064)	734	.952	.946	.055 (.051–.058)	FL, FVCV, Inter, FMn
MG-M13	129	963	.935	.933	.060 (.057–.064)	745	.952	.951	.052 (.048–.056)	FL, FVCV, Inter, FMn, Uniq (complete)

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; CI = confidence interval. In the 13-model taxonomy of invariance tests, the sets of parameters constrained to be invariant across the multiple groups are combinations of factor loadings (FL), factor variance-covariances (FVCV), item intercepts (Inter), item uniquenesses (Uniq), and factor means (FMn).

Table 5
Measurement Invariance for Passion Activity Groups

Model	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	Invariance constraints
Measurement invariance over five activity groups						
MG-M1	796	205	.950	.919	.064 (.059–.068)	None (configural)
MG-M2	1,175	285	.925	.913	.066 (.062–.070)	FL (weak)
MG-M2p	1,107	277	.930	.916	.065 (.061–.069)	FL-p (weak)
MG-M3	1,616	325	.891	.889	.075 (.071–.078)	FL-p, Uniq
MG-M4	1,218	289	.921	.910	.067 (.063–.071)	FL-p, FVCV
MG-M5	1,865	317	.869	.864	.083 (.079-.086)	FL-p, Inter-p (strong)
MG-M5p	1,280	305	.917	.911	.067 (.063–.071)	FL-p, Inter-p(p)
MG-M6	1,754	337	.880	.882	.077 (.073–.080)	FL-p, Uniq, FVCV
MG-M7	1,900	354	.869	.878	.078 (.075–.082)	FL-p, Uniq, Inter-p (strict)
MG-M8	1,492	325	.901	.900	.071 (.067–.075)	FL-p, FVCV, Inter-p
MG-M9	2,152	368	.849	.865	.082 (.079–.086)	FL-p, FVCV, Uniq Inter-p
MG-M10	1,953	313	.861	.854	.086 (.082–.089)	FL-p, FMn, Inter-p
MG-M11	2,623	362	.809	.826	.094 (.090–.096)	FL-p, Uniq, Inter-p, FMn
MG-M12	2,101	325	.850	.847	.087 (.084–.091)	FL-p, FVCV, Inter-p, FMn
MG-M13	2,845	377	.791	.817	.096 (.092–.099)	FL-p, FVCV, Inter-p, FMn, Uniq
Extended models with validity criteria						
MGM2EX	1,723	485	.916	.896	.067 (.064–.071)	MG-M2p with 4 validity criteria
MGM2EX-IV	1,954	517	.902	.886	.070 (.067–.074)	MGM2EX with invariant correlations
MGM2EX-IVp3	1,783	511	.913	.898	.067 (.063–.070)	MGM2EXIV with partial invariance

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; CI = confidence interval; MG = multiple group. See Table 2 for a more detailed description of the Models M1–M13. For multiple group invariance models, the following are sets of parameters constrained to be invariant across the multiple groups: factor loadings (FL), factor variance-covariances (FVCV), item intercepts (Inter), partial invariance of item intercepts (Inter-p), item uniquenesses (Uniq), and factor means (FMn). Models with a suffix p are partial invariance models. Models with FL-p or Inter-p are based in partial invariance constrains in relation to factor loadings and intercepts.

RMSEA = .064; see MG-M1 in Table 5). Hence, we now proceed to evaluate results from key models in the 13-model taxonomy of invariance (Appendix 2) to evaluate: How generalizable is the Passion Scale factor structure over different activities? Are there systematic differences in latent means for the passion scales across the various activities and are the underlying assumptions met, justifying interpretations of these results?

Weak factorial/measurement invariance (MG-M1 vs. MG-M2 in Table 5) tests whether the unstandardized factor loadings are the same across the five activity groups. The fit for MG-M2 is reasonable (CFI = .925, TLI = .913, RMSEA = .066), and in particular the change in CFI (ΔCFI = .950–.925 = .025) is marginal in relation to cutoffs typically used to reject the more parsimonious model. However, ΔRMSEA (.002) and ΔTLI (.006) provide reasonable support for the model in relation to traditional cutoff values. Nevertheless, we explored partial invariance models in which relations between some items and the latent factor were freed ex post facto. For the final partial invariance model (MG-M2p in Table 5; also supplemental materials), there was only one item (OP6) that did not have invariant factor loadings, and this partial invariance model was used as the basis of subsequent tests of invariance. The fit of this partially invariant model improved marginally (CFI = .925, TLI = .916, RMSEA = .065; see MG-M2p in Table 5) as did change in fit relative to MG-M1. In summary, these results provide reasonable support for at least the partial invariance of factor loadings.

Strong measurement invariance requires that item intercepts—as well as factor loadings—are invariant over groups. The critical comparison here is between Models MG-M2 and MG-M5, although any pair of models differing only in the item intercepts being free or constrained to invariance could also be used to complement this comparison. Nonsupport for this model would imply differential item functioning (although it would still be possible to posit partial invariance; see Marsh et al., 2009, 2010), whereas strong support for this model would imply that differences between groups at the item level can be explained in terms of differences at the latent factor mean level. However, fit indices for MG-M5 were substantially poorer than those of MG-M2 (ΔCFI = .056, ΔTLI = .049, ΔRMSEA = .017). These results suggest that there is differential item functioning and call into question the comparison of latent mean differences for the five activity groups. Again, we pursued partial invariance models in which invariance constraints for item intercepts were freed one at a time (based on modification indexes) until a reasonable fit was achieved. Based on a total of 60 intercepts (5 groups × 12 items), 48 intercepts were able to be held invariant without a large decline in fit; only 12 out of 60 intercepts had evidence of noninvariance in the final model (see online supplemental materials, syntax for model MG-M5p).[1] Because 80% of the intercepts were invariant, and there was a reasonable number of items for each factor, it is reasonable

[1] In Model MG-M5p (Table 6), a total of 12 of 60 (5 groups × 12 intercepts per group) were freed in a model of partial intercept invariance. Across the five groups these were: Leisure: ph1, hp6, po5, po6; sport: hp2, hp4, po6; social: hp2, po2, po3, po5; work: po4. There was no obvious pattern in that freed intercepts represented a mix of items from the HP and OP scales, and no one item freed in more than two of the five groups. Also see the online supplemental materials for Mplus syntax for this model.

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to interpret latent mean differences on the basis of this partial invariance model. The fit of this partially invariant model improved marginally (CFI = .917, TLI = .911, RMSEA = .067; see MG-M5p in Table 5) as did change in fit relative to MG-M2p. Nevertheless, the ex post facto nature of this model dictates caution in the interpretation of latent mean differences.

Strict measurement invariance (MG-M5 vs. MG-M7) requires that item uniqueness, item intercepts, and factor loadings are all invariant across groups. A lack of support for this model would suggest that measurement error differs in the five groups, and thus precludes the comparison of manifest scale scores (i.e., simple unweighted averages or sums of responses to items designed to measure each factor that is the basis of a typical analysis of variance). Introduction of invariance of uniquenesses resulted in substantial amounts of misfit in MG-M7 compared to MG-M5p (ΔCFI = .048, ΔTLI = .033, ΔRMSEA = .011). Thus it is not reasonable to assume that measurement is invariant across the five groups. It would be possible to pursue a partial invariance strategy in relation to item uniquenesses. However, an important advantage of the latent approach (ESEM or CFA) is that this is not a necessary requirement for latent factors that are disattenuated in relation to measurement error. Because our focus is on latent factors, it was not necessary to constrain item uniquenesses at all, and so partial invariance models were not pursued.

Factor variance-covariance invariance (e.g., MG-M2 vs. MG-M4) typically is not a focus in studies of measurement invariance, particularly ones that focus on single constructs. However, this is frequently an important focus of studies of the discriminant validity of multidimensional constructs that might subsequently be extended to include relations with other constructs. Although the comparison of correlations across different groups is common in applied research, typically this is based on manifest scores that do not control for measurement error (particularly if measurement error differs for the groups) and makes implicit invariance assumptions that are rarely tested. The introduction of the invariance of factor variance/covariances resulted in only small amounts of misfit in MG-M4 compared to MG-M2p (ΔCFI = .009, ΔTLI = .006, ΔRMSEA = .002; Table 5). When constrained to be invariant across the five groups, the correlation between HP and OP was r = .203. We note, however, that because there is only one correlation in each group, the goodness-of-fit statistics are dominated by the many other parameters in the model. For this reason we also inspected the size of the correlation between the two passion factors separately in each group. In all five groups the correlation was small and positive. However, compared to the r = .203 when the correlation is constrained to be invariant, only the correlation for the Sport group (r = .314, SE = .040) differs by more than two standard errors.

Latent factor mean comparison across activity groups. Finally, we are now in a position to address the issue of the invariance of the factor means across the five activity groups. In the taxonomy the final four models (MG-M10–MG-M13 in Table 5; also see Appendix 2 for a more detailed presentation of nesting relations among the different models) all constrained mean differences to be invariant over groups—in combination with the invariance of other parameters. Again, there are several models that could be used to test mean invariance across the activity groups: MG-M5 vs. MG-M10; MG-M7 vs. MG-M11; MG-M8 vs. MG-M12; MG-M9 vs. MG-M13. Evaluation of the fit indices for each of these pairs of models shows a consistent pattern (e.g., ΔCFIs > .045), which indicates that the mean levels for OP and HP factors do vary across the five activity groups.

Next we evaluated latent mean differences in relation to the MG-M5p (with partial invariance of item intercepts). For purposes of these analyses (see Table 6, based on Model MG-M5p considered above), latent means were fixed at zero for one group and freely estimated for the other groups. In this respect, all estimated differences are in relation to one group (Leisure in the present investigation, although the pattern of group differences is independent of particular group chosen). Latent means and their standard errors are presented in Table 6. In relation to other groups, HP is high for the social, work, and sport groups (and low for the leisure and education groups). OP is high for the sport and work groups, but low for the leisure and education groups. Both HP and OP are consistently low for the leisure and education groups and consistently high for the sport and work groups. Only for the social group is there a substantial difference for the two passion factors, with the HP being substantially higher.

How Does Passion Vary as a Function of Age, Gender, and Their Interaction?

How do levels of passion change with age? Do age differences in passion vary for men and women? We addressed these questions with the traditional MIMIC model (Table 7) in which the demographic variables were regressed on the two latent passion factors. Demonstrating the flexibility of the ESEM model, the MIMIC structure was integrated into the ESEM approach (based on Model

Table 6
Latent Mean Differences and Correlations Between Harmonious Passion (HP) and Obsessive Passion (OP) for Each Passion Activity Group

	Passion activity group				
Variable	Leisure	Sport	Social	Work	Education
Latent means[a]					
Harmonious	0.000	0.760 (.074)	0.811 (.076)	1.312 (.170)	−0.035 (.073)
Obsessive	0.000	0.972 (.057)	0.173 (.067)	0.671 (.090)	−0.057 (.084)
Correlation					
HP with OP	.187 (.056)	.294 (.038)	.094 (.143)	.232 (.085)	.027 (.075)

Note. Latent means (with standard errors in parentheses) for each group are based on multiple group Model 5 (with partial invariance of item intercepts; see model MG-M5p in Table 5).

Table 7
MIMIC Models Relating Gender and Age to Harmonious Passion (HP) and Obsessive Passion (OP)

Variable	Correlations		Paths	
	HP	OP	HP	OP
AGE-Lin	.030	−.239	.019	−.244
AGE-Quad	.032	.225	.026	.214
MALE	−.034	.062	.004	.055
AGE-Lin × MALE	−.004	−.189	.004	−.157
AGE-Quad × MALE	−.065	.015	−.063	−.023
R^2			.005	.139

Note. A Multiple Indicators and Multiple Causes (MIMIC) model was fitted in which Age-linear (AGE-Lin), Age-quadratic (AGE-Quad), Gender (1 = female, 2 = male), and the Age-Linear × Gender interaction added to Model TG3-ESEM (see Tables 1 and 2) such that these additional variables were regressed on the two passion factors. Presented are the simple correlation, corresponding path coefficients, and the multiple R^2 (amount of variance in the two passion scales predicted by gender and age). All coefficients greater than .05 are statistically significant ($p < .05$).

TG3ESEM; Table 2). Because age and gender are reasonably independent (and due to the normalizing transformation of age), path coefficients and correlations were similar. For HP, there were only very small or nonsignificant effects of gender, age, or their interaction (the total variance explained by the set of variables was nonsignificant, despite the large sample size). However, for OP, there were statistically significant effects of gender, age and their interaction (see Figure 1). Although OP declines with age (the negative linear effect), there is a significant nonlinear effect such that beyond about age 40, the decline in OP levels off and it begins to increase. Although there is a tiny, statistically significant gender difference in OP in favor of women, this gender difference interacts with age. Separate (unreported) analyses of responses by men and women indicate that OP was unrelated to the linear component of age for women but was negatively related to age-linear for men. However, the quadratic (U-shaped) effect of age was similar for men and women (as shown by the nonsignificant effect of the Age Quadratic × Gender interaction; see Figure 1).

Construct Validity of Passion Scale Responses: Extended ESEM Model

We now evaluate the construct validity of responses to the two passion factors in relation to three multi-item scales and four single-item ratings (Table 8). Because these validity correlates were not included in all the studies considered in the present investigation, we have used several strategies to handle the missing data. For the three multi-item scales where there are few cases, we did a separate analysis of each scale using both a quasi-listwise deletion and a complete data analysis based on FIML (see earlier discussion). Because the general pattern is similar for both sets of analyses (Table 8) we focus on the complete data analysis: correlations and paths leading from the passion factors to the conflict, life satisfaction, and rumination outcomes. Consistent with a priori predictions (see earlier discussion) based on the content of the factors, rumination and conflict are substantially related to OP and relatively uncorrelated with HP. In contrast, life satisfaction is substantially positively related to HP and slightly negatively related to OP. The pattern of results supports the convergent and discriminant validity of the two Passion factors.

Next we evaluated relations between the two Passion factors and the four single-item ratings designed to tap different aspects of the passion activity: time, liking, value, and passion (see Appendix 1 for wording of the items). As each of these components is posited to reflect an aspect of passion, we expected that all would be at least moderately (positively) correlated with both HP and OP. Again the results are reasonably consistent across the two missing data strategies, and so we focus on complete data analysis (with FIML). As expected, all the correlations and path coefficients are positive, but there are distinctions between them. Time is significantly more highly correlated with OP than HP, whilst liking and valuing are more highly correlated with HP. Interestingly, the single-item passion item (i.e., this activity is a passion for me) is similarly correlated with both Passion factors, reinforcing our assumption that both are important aspects of passion.

Finally, we asked how predictable are the validity criteria in each of the activity groups, considered separately. For the purposes of these analyses, we consider only the four single-item validity correlates (time, liking, value, and passion) for which there were a sufficient number of cases across the five groups. The general pattern based on the total sample (Table 8) is also evident in each group considered separately (Table 9)—with a few notable exceptions. In the social activity group, all four criteria tend to be less well predicted—particularly in relation to OP. Time is better predicted for the Work group, with both passion factors making substantial contributions. Liking is better predicted in the Work and Education groups, whereas Value is better predicted in the Leisure group. Although the correlation between the two Passion factors is relatively small for all five groups, it is somewhat larger for the Sport (.294) and Work (.232) groups, but not statistically significant for the Social and Education groups (see Table 6). These results might reflect the observation that it is more socially

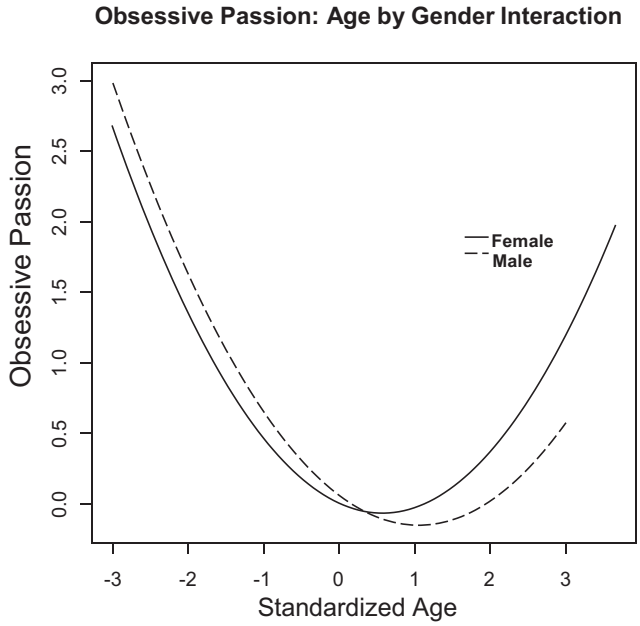

Figure 1. The Age × Gender interaction for obsessive passion.

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Table 8
Extended Models Relating Latent Passion Factors (Harmonious Passion [HP]; Obsessive Passion [OP]) to Validity Correlates

	FIML					Quasi-Listwise				
	Correlations		Paths			Correlations		Paths		
Variable	HP	OP	HP	OP	R^2	HP	OP	HP	OP	R^2
Multi-item scales										
Conflict	.046	.672	−.073	.685	.457	.137	.634	−.072	.643	.406
Life Satisfaction	.465	−.068	.492	−.153	.239	.501	−.102	.504	−.114	.264
Ruminate	.272	.807	.135	.784	.669	.284	.788	.066	.769	.625
Single-item scales										
Time	.376	.552	.290	.503	.387	.407	.574	.280	.503	.403
Like	.549	.219	.527	.129	.318	.562	.254	.531	.120	.329
Value	.583	.418	.527	.327	.444	.608	.453	.528	.320	.466
Passion	.541	.505	.468	.425	.468	.569	.536	.463	.419	.488

Note. FIML = full-information maximum likelihood. Separate models were fitted separately for each of the multi-scales and for the set of single-item scales. In the structural equation model the two passion scales predicted the validity correlates. All scales were assessed on a 7-point response scale: 1 (*strongly disagree*) to 7 (*strongly agree*). Presented are the simple correlation and the corresponding path coefficients. For quasi-listwise deletion, analyses were based on only the groups who were administered items for the validity correlates (excluding groups who were not administered the items for the validity correlates). For the complete data, all cases were included. In both set of analyses, missing responses were based on FIML.

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acceptable—maybe even encouraged—to be obsessive in work and sport than other activities, so that OP is more highly correlated with the more socially desirable HP for these groups. Future research would do well to explore this issue.

Summary and Implications

The present investigation is a substantive-methodological synergy with a substantive focus on the Passion Scale based on the dualistic model of passion (Vallerand, 2010; Vallerand et al., 2003) and a methodological focus on new and evolving applications of ESEM that provide stronger tests of psychological assessment instruments. Particularly relevant to this substantive-methodological synergy focus are tests of measurement invariance over test language (French, the language of the original instrument, and English), gender and different activity groups. The measurement invariance over language was not surprising (and was an implicit assumption in some earlier studies), but the strength of support (invariance of factor loadings, intercepts, uniquenesses, factor variance/covariances, and latent means) was remarkable. Although tests of measurement invariance are common in cross-cultural research, the test demonstrated here (use of ESEM with

Table 9
Extended Models Relating Latent Passion Factors to Validity Correlates Separately for Each Passion Activity Group (Standardized Regression Coefficients Relating Passion Factors to Outcomes)

	Passion activity group				
Variable	Leisure	Sport	Social	Work	Education
Time on					
Harmonious	.233 (.037)	.264 (.033)	.420 (.105)	.302 (.077)	.308 (.056)
Obsessive	.437 (.035)	.503 (.027)	.214 (.123)	.580 (.050)	.450 (.057)
MR-sq	.283 (.030)	.400 (.025)	.239 (.109)	.509 (.052)	.305 (.052)
Like on					
Harmonious	.471 (.038)	.493 (.033)	.461 (.097)	.522 (.056)	.632 (.046)
Obsessive	.068 (.041)	.047 (.030)	.028 (.081)	.359 (.052)	.218 (.052)
MR-sq	.239 (.036)	.259 (.030)	.216 (.090)	.489 (.056)	.455 (.058)
Value on					
Harmonious	.607 (.030)	.489 (.033)	.364 (.111)	.447 (.095)	.512 (.055)
Obsessive	.365 (.035)	.232 (.030)	.230 (.084)	.391 (.068)	.264 (.055)
MR-sq	.585 (.031)	.359 (.029)	.201 (.083)	.433 (.063)	.339 (.058)
Passion on					
Harmonious	.496 (.032)	.391 (.034)	.332 (.127)	.493 (.063)	.460 (.052)
Obsessive	.421 (.035)	.354 (.029)	.416 (.083)	.355 (.053)	.471 (.058)
MR-sq	.502 (.029)	.360 (.026)	.309 (.088)	.451 (.059)	.445 (.061)

Note. The set of four (single-item) validity criteria was related to the two passion scales separately for each activity group (see Table 7 for the results based on the total group). Presented are path coefficients relating the two passion scales to the four validity criteria and the corresponding squared multiple correlations (MR-sq). Also presented are the correlations between the two passion factors (Harmonious Passion and Obsessive Passion) and their latent means (in parentheses) for each of the five activity groups.

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13-model taxonomy of invariance) is apparently unique and is potentially stronger than tests typically applied in cross-cultural research.

Similarly, tests of measurement invariance over gender are interesting from both substantive and methodological perspectives. Although gender differences are routinely assessed in relation to most psychological instruments, a comparison of simple means is based on a complicated set of implicit assumptions that typically are not evaluated. Again, the results of the present investigation demonstrated that even the most demanding test of complete measurement invariance over gender received remarkably strong support.

The extensive tests of measurement invariance over passion activity groups are apparently a new application of our approach to measurement invariance, with substantively important implications for the use of the Passion Scale but also having potentially important implications for psychological assessment research more generally. There has been an implicit, untested assumption in our Passion research generally, that the12-item scale was appropriate across a range of passion activities. Here we have made this assumption explicit, and reformulated it as a series of tests of measurement invariance over five passion activity groups. Importantly, the results showed that there was reasonable support for strong measurement invariance (partial invariance of factor loadings and item intercepts), thus justifying our previously untested, implicit assumption. Although invariance was only partial, invariance was established for most of the items in terms of both factor loadings and intercept invariance, providing a cautious basis for comparing passion across different activity groups as well as a strong basis for the typical comparison of passion within a single activity group. The logic and methodology of these tests apparently have broad applicability to other psychological assessment instruments that assume that a common set of items is equally appropriate over different domains or groups. For example, in educational research it is often assumed that the same set of items is equally appropriate for groups of students studying different school subjects (e.g., multiple dimensions of academic self-concept can be measured with the same set of items—or sets of items with strictly parallel wording—in mathematics, English, science, and other school subjects; see Marsh, 1990).

Consistent with a priori predictions, ESEMs not only fitted the data better than traditional ICM-CFAs but also resulted in much better differentiation (lower correlations) between the OP and HP factors. Extended ESEM models showed that the OP and HP were differentially related to a range of background and validity criteria, providing support for both the convergent and discriminant validity of the two factors. Although there was gender invariance with respect to the factor structure, MIMIC models showed that age effects interacted with gender. Specifically, OP was higher for males than females and had a nonlinear relation with age (a negative linear effect and a U-shaped quadratic effect). However, no effects were found with respect to HP. Of additional interest, and as is consistent with theoretical predictions, time, liking, value, and passion were all positively related to both OP and HP. However, time was more highly correlated with OP, liking and valuing were more highly correlated with HP, and the single-item passion item was similarly correlated with both OP and HP. Even stronger support for discriminant validity was found with the multi-item validity criteria specifically selected for this purpose. Thus, rumination and conflict were substantially more related to OP and relatively uncorrelated with HP, whilst life satisfaction was substantially positively related to HP and slightly negatively related to OP.

Substantively, the most important contribution of the present investigation is in providing good support for the psychometric properties of the Passion Scale. The instrument has a strong theoretical underpinning, being derived from the dualistic model of passion that has its roots in Ancient Greek philosophy, as well as from modern psychology (particularly positive psychology). It has proved to be substantively useful in an extensive research program by Vallerand and colleagues (see Vallerand, 2010, for a review). It fills a critical gap in the growing arsenal of constructs that are central to the positive psychology movement, and nicely complements related research in self-concept, self-esteem, and identity formation. The Passion Scale provides a brief, psychometrically strong outcome measure for research seeking to measure, understand, or intervene in relation to participants' engagement in a specific task. In this respect passion is useful as an outcome measure, a potential moderator variable (people who are passionate are fundamentally different to those who are not), and a focus of growth modeling studies that evaluate how passion changes over time and predictors (individual differences or multilevel studies of contextual/climate variables associated with groups or organizations) of these changes.

In conclusion, the present findings demonstrate that the Passion Scale has a sound factor structure, good internal consistency, and construct validity. Of additional interest, the same instrument can be used in research irrespective of participants' gender, language (at least in respect of French and English), and passion activity domain. It would thus appear that the Passion Scale is an exciting new measure that has much to contribute to psychological assessment in diverse fields of psychology.

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