

VALIDATION OF A SHORTENED ASSESSMENT OF PHYSICAL SELF IN ADULTS¹

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Summary.—The purpose was to adapt a brief tool, the Physical Self Inventory-Version b, for the assessment of physical self in adults. The inventory is a refined version of the previously validated version, which was derived from the Physical Self Inventory (25 items). This French validation of the Physical Self-Perception Profile of Fox and Corbin includes a global self-esteem scale. As in the earlier version the current one has 6 single items to assess dimensions of global self-esteem, physical self-worth, sport competence, physical condition, attractive body, and physical strength. Rating is performed on a visual analog scale. Items in the new inventory were stated in the first person and in more general terms to be acceptable to a wider range of subjects. An item of measurement error was added. Analysis of responses of 185 men and 148 women to the new version supported the hierarchical structure. Significant correlations between the scores and constructs like masculinity, neuroticism, and depression indicated external validity. The new inventory showed acceptable psychometric properties for use in idiographic studies.

Dynamic social psychology has emphasized research on intra-individual measures of self-perception (Vallacher, Nowak, Froehlich, & Rockloff, 2002). Studies provide new properties of self over time, such as instability (Kernis, Grannemann, & Mathis, 1991; Amorose, 2001) and dynamics (Vallacher, *et al.*, 2002). Researchers require time series including a great number of repeated individual observations. Nevertheless, it is impossible to ask a participant to complete a classical questionnaire daily which includes 30 items, still more a battery.

The use of classical inventories of physical self-perceptions hierarchically organized is inconceivable for this purpose. For example, the Physical Self-Perception Profile (Fox & Corbin, 1989) measures physical self-worth in four subdomains (physical condition, sport competence, physical strength, and attractive body) with 30 items. The French version, the Physical Self Inventory, with inclusion of a global self-esteem scale, was validated with 25 items (Ninot, Delignières, & Fortes, 2000). In the fields of sports and exercise rehabilitation, participants often declare that they do not have enough time to complete long inventories. Moreover, they complain of having to answer repeatedly to the “same” question. Such attitudes lead them to skip

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questions, respond randomly, and engage in other test-taking behaviors that contribute to invalidate protocols.

An alternative strategy could be to use brief tools composed of a single item per assessed dimension, on the assumption that the loss of internal consistency may be compensated by its ease of use for repeated administration. A single-item measure eliminates item redundancy and therefore reduces fatigue, frustration, and boredom associated with answering highly similar items repeatedly (Robins, Hendin, & Trzesniewski, 2001). To reduce response memorization and increase the sensitivity of such an inventory, the response protocol of a visual analog scale (VAS) seems better adapted than the classic Likert scales (Huskisson, 1974; Robins, *et al.*, 2001).

Recent studies have proposed such single-item measures for global self-esteem (Robins, *et al.*, 2001) and physical self (Ninot, Fortes, & Delignières, 2001). A single item can provide an acceptable balance between practical needs and psychometric concerns (Robins, *et al.*, 2001). Single-item self-report scales are not useful for assessing all psychological dimensions. It is unlikely that a single item would be valid for a multifaceted complex concept. A single self-report item may be adequate when the construct is likely to be activated in a wide range of situations and is therefore likely to be chronically accessible in adulthood (Robins, *et al.*, 2001).

Ninot, *et al.* (2001) validated a brief questionnaire, the Physical Self Inventory with six items (PSI6-a), to examine the dynamics of the physical self. This shortened version of the original Physical Self Inventory (25 items) is based on a single-item self-assessment related to each dimension of the hierarchical structure (Table 1). The authors provided support for the internal structure of this version, as well as for its construct validity (Ninot, *et*

TABLE 1
ITEMS OF VALIDATED PHYSICAL SELF INVENTORY-6A (PSI6-A) AND EXPERIMENTAL
VERSION NAMED PHYSICAL SELF INVENTORY-6B (PSI6-B)

Scale	Version PSI6-a	Version PSI6-b
Global self-esteem	Globally, you have a good opinion of yourself.	Globally, I have a good opinion of myself.
Physical self-worth	You are proud of who you are and what you can do physically.	I am proud of what I can do physically.
Physical condition	You should be good in an endurance test.	I am satisfied with my physical endurance.
Sport competence	You manage well in all the sports.	I am satisfied with my sport competencies.
Physical strength	When you come to situations requiring strength, you are among the first to step forward.	I am satisfied with my physical strength.
Attractive body	You think that you have a body pleasant to look at.	I am satisfied with my body appearance.
Measurement error		Draw a mark in the center of the horizontal line.

al., 2001). Also, this 6-item version was validated using a 10-cm horizontal VAS anchored by 0.0: Not at all, on the left and 10.0: Absolutely, on the right.

Nevertheless, the PSI6-a version had three weaknesses in terms of practical application. First, the sentences used the second person. For daily assessment, the first person is more personalized and should evoke better activation of self-schemata (Robins, *et al.*, 2001). Second, the items were selected from factorial analysis of the original Physical Self Inventory's 25 items, performed on data from healthy young adults (Ninot, *et al.*, 2001). Each item was the best representative of its subjacent factor. However, the use of the PSI6-a with a particular population (elderly persons, for example, or those with disabilities) clarified the inadequacy of some items, which were judged to be too specific and not adapted to the habits of such populations (Table 1). Third, the PSI6-a lacked an item which functions both to assess the standard measurement error with use of a VAS and to invalidate aberrant responses associated with visual problems or inattention.

Consequently, the aim of the present paper was to validate a version of the PSI6-a which responds satisfactorily to these objections. These items were derived from the original inventory and were chosen as being the most representative of each original factor (Ninot, *et al.*, 2000). The items of the new inventory, version PSI6-b, were worded in the first person and in more general terms to be acceptable by a wider range of subjects (Table 1). For global self-esteem, only the PSI6-a item was rewritten in the first person. For physical self-worth domain, the committee deleted "who you are" to suppress ambiguity between physical competencies and global self-esteem. For subdomains, the four items were assessed as fitting more appropriately and specifically to these concrete dimensions of self-perception and related to PSI6-a items (Table 1). An item of measurement error was added. Participants have to "draw a mark in the center of the horizontal 10-cm VAS." The difference between the true center value (5 cm) and the obtained value was designated an estimate of measurement error or misuse of the items (cognitive troubles, visual problems, or fallacious responses).

The validation of this kind of questionnaire cannot follow exactly the procedures traditionally advocated for the validation of psychological inventories (Ninot, *et al.*, 2001; Robins, *et al.*, 2001). A set of specific requirements, in fact, could be defined to declare the validity of brief questionnaires. (1) Generally, single-item questionnaires are designed to assess dimensions previously measured with more conventional, multi-item inventories. A brief questionnaire should provide measurement equivalent to those of previously validated tools. The first requirement thus should be to obtain close relationships between scores on the items of the new questionnaire and on the corresponding dimensions of previously validated inventories. In the present case, the six dimensions of the PSI6-b should present significant correla-

tions with their counterpart items of the PSI6-a and dimensions of the Physical Self Inventory. (2) The equivalence of the new questionnaire and the earlier versions should also be checked in terms of level of response for each item. No significant differences in average response should be evidenced between corresponding items or dimensions. (3) An important step in the validation of psychological inventories concerns construct validity, generally checked by the presence of theoretically hypothesized correlations between the new inventory and earlier ones measuring related dimensions. (4) Often questionnaires contain multiple dimensions, which theoretically are more or less correlated. This was the case, for example, for the Physical Self-Perception Profile and the Physical Self Inventory, whose dimensions were organized according to the hierarchical structure previously presented. A shortened questionnaire should obviously reproduce an internal organization identical to that described with earlier tools. Traditional test-retest reliability cannot be conducted given the specific nature of the inventory (one-item subscales). Two measures over a 1-mo. period are not theoretically relevant. This property means that global self-esteem and physical self dynamics are only related to random fluctuations around a defined value over time in an environment without endogenous and exogenous stimulation—as is the measurement error item. This suggests that individuals actively resist change and return to a local reference. Nevertheless, recent studies using the PSI6-a showed in ecological conditions the daily dynamics of global self-esteem and physical self are not stable or stationary in adults over a 3-mo. period (Delignières, Fortes, & Ninot, 2004; Ninot, Fortes, & Delignières, 2005).

This study was designed to check the internal structure of the PSI6-b and to assess construct validity by studying the correlations with scores on other questionnaires measuring global self-esteem, physical self, neuroticism, masculinity, and depression. The PSI6-b scores should correlate with the scores on other global self-esteem and depression inventories. In addition, significant relationships reported in the literature were expected here between global self-esteem of our inventory and depression (Beck, Steer, & Garbin, 1988) or traits such as neuroticism (Many & Many, 1975; Francis, 1996; Robins, *et al.*, 2001) and masculinity (Bem, 1974; Whitley, 1983; Allgood-Merten & Stockard, 1991; Delignières, Marcellini, Legros, & Brisswalter, 1994). As neuroticism and masculinity are conceived as global personality constructs, a closer relationship with the apex level of Corbin and Fox's 1989 model than with the subdomain level should appear (see Fig. 1).

METHOD

Procedure

Three hundred and thirty-three adults (185 men and 148 women with mean ages of, respectively, 25.5 ± 6.0 and 25.9 ± 6.8 yr.) volunteered. Each

participant completed the PSI6-b and a battery of six paper-and-pencil inventories. (1) The original version of the Physical Self Inventory (Ninot, *et al.*, 2000) including six scales (global self-esteem scale 5 items; physical self-worth 5 items; physical condition 5 items; sport competence 4 items; physical strength 3 items; attractive body 3 items) and having satisfactory internal consistency (with Cronbach α of subscales ranging from .77 to .90), good test-retest reliability ($r = .90$ to $.96$ over a 1-mo. interval), and good hierarchical organization (by way of partial correlations and confirmatory factor analyses). (2) The PSI6-a (Ninot, *et al.*, 2001) and PSI6-b, previously described, and (3) the French version of the Self-esteem Inventory (Coopersmith, 1984), and (4) The Eysenck Personality Inventory (Eysenck & Eysenck, 1968) and validated in French by Ganansia (1971) were given. This inventory is composed of two 24-item scales which measure the extraversion-introversion and the neuroticism-stability dimensions of personality. (5) The Bem Sex-Role Inventory (Bem, 1974, as validated in French by Delignières & Matkowski, 1997). The French version has two 10-item scales measuring, respectively, masculinity and femininity. (6) The Beck Depression Inventory (Beck & Steer, 1993), validated in French by Gauthier, Morin, Theriault, and Lawson (1982), is a 21-item inventory which yields an overall depression score with demonstrated relationships with global self-esteem (Beck, *et al.*, 1988).

Statistical Analyses

The normality of the distribution was tested using the Shapiro-Wilks test. As results evidence satisfactory normal distribution, Pearson correlation coefficients were used for assessing interscale relationships.

To confirm the hierarchical structure of the physical self, Fox (1990) outlined the four conditions that had to be met: (a) physical self-worth exhibits the strongest relationship with global self-esteem, (b) the four subdomain dimensions have stronger relationships with physical self-worth than with global self-esteem, (c) relationships between subdomains and global self-esteem are extinguished when the effect of physical self-worth is removed by partial correlation, and (d) relationships between subdomain dimensions are weaker than their relationships with physical self-worth and are extinguished or reduced when the effect of physical self-worth is controlled (Page, Ashford, Fox, & Biddle, 1993). Zero-order and partial correlation coefficients were calculated to evaluate support for the proposed hierarchical structure among perceived dimensions.

A one-way multivariate analysis of variance using a between-participants design with the independent variable (sex) was used to verify the effects of sex for each questionnaire. If multivariate analysis of variance showed significant differences on one or more of dependent variables, Scheffé *post hoc* tests were conducted on each scale to identify sex differences ($p < .05$).

RESULTS

The descriptive data for PSI6-a, PSI6-b, and the original Physical Self Inventory are presented in Table 2. The mean and standard deviation for the measurement error item of PSI6-b were 5.06 ± 0.16 . The multivariate analysis of variance did not show significant differences between perceived dimension scores from PSI6-a and PSI6-b (Wilks lambda = 0.98, $R/Rao_{6,66} = 1.67$, $p = .13$). Correlations showed good agreement between the items of PSI6-b and their PSI6-a counterparts (Table 3). Reasonable agreements were also found with the respective subscales of the Physical Self Inventory. The best correlation between PSI6-b and Physical Self Inventory or PSI6-a was systematically obtained with the same dimension (Table 3).

TABLE 2
DESCRIPTIVE STATISTICS OF PHYSICAL SELF INVENTORY AND TWO SHORTENED VERSIONS

Physical Self Inventory (Original)		Physical Self Inventory			
		Original	Rescaled	PSI6-a	PSI6-b
Global self-esteem	<i>M</i>	4.45	6.89	6.49	6.45
	<i>SD</i>	0.85	1.69	1.67	1.65
Physical self-worth	<i>M</i>	4.12	6.24	6.26	6.20
	<i>SD</i>	0.90	1.78	1.85	1.84
Physical condition	<i>M</i>	4.05	6.07	6.03	5.73
	<i>SD</i>	1.32	2.65	2.37	2.13
Sport competence	<i>M</i>	3.76	5.50	6.04	5.82
	<i>SD</i>	1.03	2.07	2.05	2.00
Attractive body	<i>M</i>	4.44	6.86	6.25	6.25
	<i>SD</i>	0.92	1.84	2.06	1.99
Physical strength	<i>M</i>	3.22	4.42	5.54	5.74
	<i>SD</i>	1.12	2.23	2.15	2.00

Note.—Original Physical Self Inventory rated on a Likert scale with 7 points (anchors of 1: Not at all and 7: Absolutely); rescaled Physical Self Inventory rated on the interval [0; 10]; PSI6-a and PSI6-b rated on a 10-cm horizontal visual analogue scale anchored by 0: Not at all and 10: Absolutely.

Fig. 1 presents the proposed hierarchical structure with correlations obtained with the Physical Self Inventory, PSI6-a, and PSI6-b. As expected, physical self-worth of PSI6-b exhibited the strongest relationship with global self-esteem. The four subdomain dimensions of the PSI6-b showed stronger relationships with physical self-worth than with global self-esteem. The relationships with global self-esteem of the PSI6-b subdomains were reduced when the effect of physical self-worth was removed by use of partial correlation. The relationships among subdomain dimensions of the PSI6-b were weaker (from .45 to .59) than their relationships with physical self-worth (from .54 to .74) and were extinguished or reduced when the effect of physical self-worth was removed (from -.03 to .37).

TABLE 3
CORRELATIONS BETWEEN SCORES ON ITEMS OF THE PSI6-B AND OTHER INVENTORIES

Physical Self Inventory	PSI6-b					
	1	2	3	4	5	6
				PSI6-b		
	.95‡	.71‡	.37‡	.33‡	.51‡	.39‡
		.89‡	.56‡	.39‡	.65‡	.44‡
1. Global self-esteem	.65‡		.76‡	.45‡	.48‡	.34‡
2. Physical self-worth	.56‡	.65‡		.65‡	.42‡	.40‡
3. Physical condition	.41‡	.39‡	.42‡		.72‡	.40‡
4. Sport competence	.36‡	.32‡	.40‡	.41‡		.77‡
5. Attractive body	.50‡	.57‡	.24‡	.24‡	.64‡	
6. Physical strength	.39‡	.51‡	.15‡	.27‡	.29‡	.54‡
			Original PSI			
Self-esteem Inventory	.19‡	.13†	.20‡	.19‡	.26‡	.15†
Beck Depression Inventory	-.43‡	-.36‡	-.33‡	-.31‡	-.24‡	-.28‡
Eysenck Personality Inventory						
Neuroticism	-.23‡	-.17†	-.20‡	-.19‡	-.19†	-.12*
Extraversion	-.02	-.03	.00	.09	-.04	.05
Bem Sex-Role Inventory						
Masculinity	.21‡	.17†	.22‡	.19†	.13*	.29‡
Femininity	-.07	-.02	.01	.02	-.05	-.04

* $p < .05$. † $p < .01$. ‡ $p < .001$.

The relationships between the items of PSI6-b and the other inventories are reported in Table 3. As expected, significant coefficients were obtained between the Neuroticism scale of the Eysenck Personality Inventory and the items of PSI6-b. The highest correlation was for global self-esteem. On the other hand, there was no relationship between the items of the PSI6-b and scores on Eysenck and Eysenck's Extraversion scale.

The observed relationships between the items of PSI6-b and scores on the Masculinity and Femininity subscales of the Bem Sex-Role Inventory were in general consistent with our hypothesis. Masculinity was correlated with all PSI6-b items, and no correlation was observed with Femininity (Table 3). Table 4 showed the same consistent correlation for men and women separately. For men, correlations showed good agreement between the items of PSI6-b and Masculinity, except attractive body, and no significant relationships with Femininity. For women, negative correlations were obtained between the physical self items of PSI6-b and Masculinity and a positive correlation for the attractive body item and Femininity (Table 4).

There were significant positive correlations between the items of the PSI6-b and the general score of the Self-esteem Inventory. This correlation was lower for global self-esteem than for the attractive body item. As expected, negative correlations obtained between the Beck Depression Inventory score and the six items of PSI6-b. The highest negative correlation was obtained for global self-esteem and the overall depression score (Table 3).

Model Level

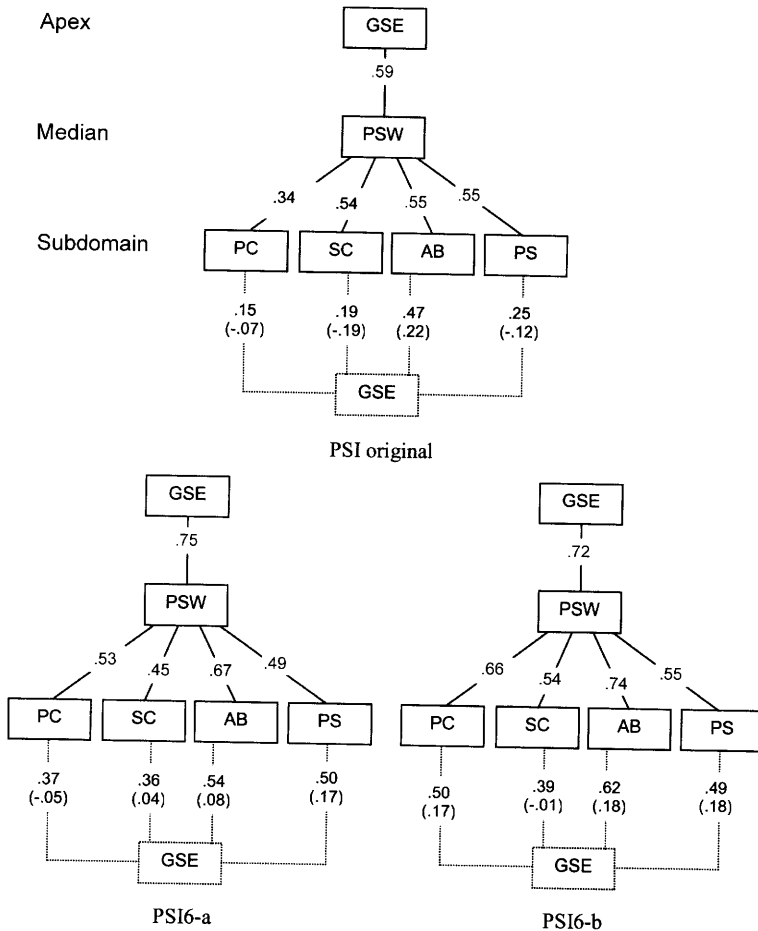


FIG. 1. Correlations and partial correlations among six dimensions of Fox and Corbin's hierarchical model (1989). *Note.*—Correlations between adjacent dimensions in the model are reported in the upper part of each Physical Self Inventory (PSI) panel. In the lower part (with dotted lines), correlations between subdomains and global self-esteem are indicated. Partial correlations controlling for physical self-worth are in parentheses.

To test sex differences on global self-esteem and physical self scores, the multivariate analysis of variance executed simultaneously for all scales of a questionnaire showed a significant difference, respectively, for the original Physical Self Inventory (Wilks lambda=0.94; $F=3.18$, $p=.0004$), PSI6-a (Wilks lambda=0.94; $F=3.20$, $p=.0004$), and PSI6-b (Wilks lambda=0.94; $F=3.02$, $p=.0001$). The Scheffé test showed that males presented higher

TABLE 4
CORRELATIONS BETWEEN ITEMS OF THE PSI6-B AND SUBSCALES OF
BEM SEX-ROLE INVENTORY IN WOMEN AND MEN

Subscale	Men		Women	
	Masculinity	Femininity	Masculinity	Femininity
Global self-esteem	.24‡	-.09	-.12	-.09
Physical self-worth	.17†	-.04	-.20‡	-.04
Physical condition	.22‡	.05	-.26‡	-.12
Sport competence	.17†	.04	-.25‡	-.03
Attractive body	-.06	.01	-.26‡	.16*
Physical strength	.26‡	-.02	-.35‡	.12

* $p < .05$. † $p < .01$. ‡ $p < .001$.

scores on all scales than females for PSI6-a and PSI6-b ($p < .05$). The Scheffé test showed significant differences between men and women for each version of the inventory, except for global self-esteem with the original version of the Physical Self Inventory (Table 5).

TABLE 5
COMPARISON OF MEAN SCORES OF PHYSICAL SELF INVENTORY, PSI6-A, AND
PSI6-B IN WOMEN ($n = 148$) AND MEN ($n = 185$)

Subscale	Physical Self Inventory					
	Original		PSI6-a		PSI6-b	
	Women	Men	Women	Men	Women	Men
Global self-esteem	4.4	4.5	6.1	6.8 ‡	3.5	3.5 ‡
Physical self-worth	3.8	4.4 ‡	5.9	6.6 ‡	2.8	2.9 ‡
Physical condition	3.8	4.3 ‡	5.5	6.5 ‡	6.2	6.7 ‡
Sport competence	3.5	4.0 †	5.7	6.3 †	5.8	6.5 †
Attractive body	4.3	4.5 ‡	5.9	6.5 ‡	5.3	6.1 ‡
Physical strength	2.8	3.5 ‡	4.8	6.1 ‡	5.5	6.1 ‡

† $p < .01$. ‡ $p < .001$.

DISCUSSION

The analyses showed no significant difference between scores on the PSI6-a and PSI6-b for any dimension. The differences for global self-esteem and physical self-worth were minimal, respectively, .04 and .06 higher on the PSI6-a. The differences were higher for the physical abilities items of physical condition (.30), sport competence (.22), and physical strength (.20). Correlation indicated good agreement between the two brief versions as well as with the original inventory.

The internal validity of the PSI6-b was satisfactory as it reproduced the hierarchical structure of the model of Fox and Corbin (1989) and the previously validated versions of the original Physical Self Inventory (Ninot, *et al.*, 2000) and the brief version PSI6-a (Ninot, *et al.*, 2001). The results also showed the same internal structure for the three inventories. The coefficients

were higher when variables were directly linked in the model and lower or not significant when the link was indirect (for example, between the apex and the subdomain level). Moreover, the partial correlation procedure, controlling for the median level of the model, reduced most of the correlations to nonsignificance. These results agreed with the postulated hierarchical structure of the version of the Physical Self-Perception Profile (Fox & Corbin, 1989) and the French version of the Physical Self Inventory (Ninot, *et al.*, 2000).

Concerning the external validity of the PSI6-b, the relationships between Neuroticism and the highest levels of the PSI6-b (global self-esteem and physical self-worth) were expected (Many & Many, 1975; Delignières, *et al.*, 1994; Francis, 1996; Robins, *et al.*, 2001). The relationships obtained between the PSI6-b and other inventories were identical to those described for the validation of the original version of the Physical Self Inventory (Ninot, *et al.*, 2000) and the PSI6-a (Ninot, *et al.*, 2001).

The positive correlation between the global self-esteem score of the PSI6-b and the general self-esteem score of the Coopersmith Self-esteem Inventory (Coopersmith, 1984), and the negative correlation between the global self-esteem score of the PSI6-b and the Beck Depression Inventory score, confirmed the hypotheses. According to Beck, *et al.* (1988), low global self-esteem is considered as central to depression.

The positive relationship between Masculinity and global self-esteem was also expected. Masculinity is highly linked with self-confidence, self-efficacy, and global self-esteem (Whitley, 1983; Allgood-Merten & Stockard, 1991; Delignières, *et al.*, 1994).

The significant differences between women and men indicated that men presented higher scores in global self-esteem and physical self-perceptions (physical self-worth, physical condition, sport competence, attractive body, and physical strength) than women. The only nonsignificant difference was the global self-esteem score of the Physical Self Inventory. This result underlines the influence of sex in adults' global self-esteem and physical self-perception and is in line with the literature (Kling, Hyde, Showers, & Buswell, 1999). Numerous studies have shown that males have higher perceptions than females for attractive body and sport competence (for a review see Fox, 1997).

Attractive body, however, had the strongest relationship of any of the subdomain scales with both global self-esteem and physical self-worth. This result was supported by the higher correlation between the Self-esteem Inventory general score and that for an attractive body, as compared to the correlation between the Self-esteem Inventory general score and the global self-esteem scale. As indicated in a previous study (Sonstroem, Speliotis, & Fava, 1992), these data seem to indicate a health-conscious, middle-age sample actively pursuing health goals. Conversely to men, attractive body was

positively correlated with Femininity and negatively correlated with Masculinity in women. This result supports the difference in importance attributed to physical self subdomains. Authors suggested that men attributed higher importance to physical disposition (strength, endurance, and sport skills) compared to women who attributed higher importance to body appearance (Sonstroem, *et al.*, 1992; Fox, 1997).

There is no argument whether single-item self-report scales are generally useful in psychological assessment. A single-item measure would be advantageous in longitudinal studies and experience sampling studies in which the aim is to obtain time series of individual psychological factors (Reis & Gable, 2000). Nevertheless, the use of a visual analogue scale is not advised with elderly persons (more than 90 years), young children (under 6 years), or patients presenting with cognitive troubles, spatiotemporal disorientation, or linguistic difficulties (Paice & Cohen, 1997). Cognitive limits decrease understanding of nuance and self-judgment as well as inaccuracies due to personal inexperience with geometric presentation (Carlson, 1983).

To conclude, the results yielded acceptable psychometric properties for the internal structure and external validity of the PSI6-b according to previous procedure for checking psychometrics of a brief test (Ninot, *et al.*, 2001; Robins, *et al.*, 2001). Although the PSI6-b had very high convergent validity with the French version of the Physical Self-Perception Profile, the original Physical Self Inventory items, and with the PSI6-a in adults, this study does not indicate this shortened inventory based on a single item per dimension could replace the long version in all research contexts (Robins, *et al.*, 2001). The present results provide a practical complement to the Physical Self-Perception Profile, potentially to assess daily intra-individual dynamics of global self-esteem and physical self in adults. Individual differences in stability and dynamics could be psychologically meaningful (Amorose, 2001; Ninot, *et al.*, 2005). Moreover, the PSI6-b would be extremely interesting to use in exploration of the causal flow in the hierarchical structure of physical self perceptions, which remains largely unknown (Marsh & Yeung, 1998).

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