EMPIRICAL ARTICLE

Dimensions of Identity Development Scale: Confirmatory factor analysis, gender invariance, and external validity of the Persian version

Pardis Salehi Yegaei[1] | Thomas M. Achenbach[2] | Elizabeth Trejos-Castillo[3] |
Stefanos Mastrotheodoros[4,5] | Balal Izanloo[6] | Mojtaba Habibi Asgarabad[1,7,8,9]

[1]Health Promotion Research Center, Iran University of Medical Sciences, Tehran, Iran

[2]Department of Psychiatry, University of Vermont, Burlington, Vermont, USA

[3]Department of Human Development and Family Sciences, Texas Tech University, Lubbock, Texas, USA

[4]Research Center for Adolescent Development, Faculty of Social and Behavioral Sciences, Utrecht University, Utrecht, The Netherlands

[5]Department of Psychology, University of Crete, Crete, Greece

[6]Faculty of Psychology, Kharazmi University, Tehran, Iran

[7]Department of Psychology, The Norwegian University of Science and Technology, Trondheim, Norway

[8]Department of Health Psychology, School of Behavioral Sciences and Mental Health (Tehran Institute of Psychiatry), Iran University of Medical Sciences, Tehran, Iran

[9]Positive Youth Development Lab, Human Development and Family Sciences, Texas Tech University, Lubbock, Texas, USA

Correspondence
Mojtaba Habibi Asgarabad, Department of Psychology, Norwegian University of Science and Technology, 7491 Dragvoll, Trondheim, Norway.
Email: mojtaba.h.asgarabad@ntnu.no

Abstract
The present study was conducted to examine the psychometric properties and gender invariance of the Iranian version of the Dimensions of Identity Development Scale (DIDS). A total of 1453 adolescents (50.8% female; 14–18 years old, mean = 15.48) participated in a cross-sectional study and completed the DIDS and the Youth Self-Report of behavior problems. The Confirmatory Factor Analysis supported the six-factor model of the DIDS, echoing past studies showing the original 5th factor (Exploration in Depth) being divided into Exploration in Depth and Reconsidering the Commitment. The invariance testing showed comparable measurement properties of the DIDS across males and females (strict measurement invariance). Further, behavior problems were associated positively with Ruminative Exploration and negatively with Commitment Making, Identification with Commitments, Exploration in Depth, and Reconsideration of Commitments, whereas the opposite was true for academic performance. A six-factor DIDS was shown to be a valid and reliable measure for the assessment of identity development dimensions among Iranian adolescents. Future studies in the Iranian context evaluating the identity clusters derived from identity dimensions and their gender differences are warranted.

KEYWORDS
adolescence, behavior problems, gender invariance, identity development, measurement model

INTRODUCTION

Developing a coherent sense of self and identity is a crucial developmental task during adolescence. Identity is defined as an overall sense the person has regarding who they are, in the present time and the future (Erikson, 1968). Marcia (1966) first conceptualized the identity status paradigm and distinguished between two core processes of identity formation: exploration and commitment. However, the identity status paradigm represented a rather stable picture of identity, and later theoretical and measurement accounts conceptualized identity development as consisting of several subprocesses of exploration and commitment. Hence, Luyckx et al. (2005) elaborated on Marcia's model by

extending exploration and commitment to five dimensions in a dual-cycle model. That is, in the first cycle, teenagers attempt to investigate and choose a suitable alternative to form their identity through Exploration in Breadth (EB; exploring and gathering information about diverse identity alternatives related to their goals and abilities before establishing commitment) and Commitment Making (CM; the degree to which the individuals adopt decisions toward identity alternatives and serious identity-related issues). In the second cycle, evaluation and integration of identity are concerned, which are obtained with Exploration in Depth (ED; collecting information about chosen alternatives to evaluate their compatibility with the person's values and standards) and Identification with Commitment (IC; the extent to which an individual is confident about and can identify with their selected identity). In case those evaluations yield satisfactory results, integration of those new commitments may occur. This process may also lead to the development of a maladaptive type of exploration, Ruminative Exploration (RE; excessive reappraisal of different identities to pursue, which hinders identity formation by being obsessive about choosing a perfect identity), which may contribute to continuous exploration that is not conducive to commitments (Luyckx et al., 2006; Luyckx, Schwartz, et al., 2008).

Based on those theoretical assumptions, the Dimensions of Identity Development Scale (DIDS; Luyckx, Schwartz, et al., 2008) was developed to capture the five-dimensional model of identity development, consisting of 25 items and five subscales. The five-factor model of the DIDS has been already established by the confirmatory factor analysis (CFA) in different countries such as Belgium (Luyckx, Schwartz, et al., 2008), Turkey (Morsunbul & Cok, 2014), Italy (Crocetti et al., 2011), Switzerland and France (Zimmermann et al., 2015), Japan (Nakama et al., 2015), and the USA (Schwartz et al., 2011). Previous studies have also suggested adequate levels of internal reliability (Crocetti et al., 2011; Luyckx, Schwartz, et al., 2008; Morsunbul & Cok, 2014) of the DIDS in different contexts (for more information, see Table 1). Nevertheless, Zimmermann et al. (2015) suggested that a six-factor structure with subdividing ED into Exploration in Depth (ED) and Reconsideration of Commitment (RC) fitted the French-speaking and Swiss sample data better. RC refers to the point when the comparison of the current unfavorable commitments with potential alternatives leads adolescents to reconsider or discard their present commitments (Crocetti et al., 2015; Zimmermann et al., 2015). This aspect of identity formation implies that hesitation about the current commitments and collecting further information about them may urge adolescents to reassess/reconsider them (Beyers & Luyckx, 2016). While ED had a negative relationship with RE, RC was shown to be positively associated with RE (Zimmermann et al., 2015), suggesting that a changing commitment in teens may involve ruminative thinking about different options and may impair identity formation (Beyers & Luyckx, 2016). These results were replicated in Finish (Mannerström et al., 2017) and Georgian (Skhirtladze et al., 2016) samples. In another

study on Nepali emerging adults (Ozer et al., 2019), the Ruminative Exploration subscale was subdivided into two separate scales related to life achievements and to life direction, implying that the original form of ruminative exploration component was not applicable in native non-Western countries. Hence, the scale's factor structure in different countries needs to be further examined, and up to date, no study evaluating the psychometric properties of DIDS with Iranian adolescents has been conducted.

Previous evidence has indicated that higher levels of commitment aspects (CM and IC), as well as ED and EB, are related to favorable psychological adjustment, such as high self-esteem both in cross-sectional (Beyers & Luyckx, 2016; Mannerström et al., 2017) and longitudinal studies (Luyckx, Klimstra, Duriez, Petegem, et al., 2013); and negatively related to mental maladjustment, such as anxiety (Crocetti et al., 2011; Mastrotheodoros & Motti-Stefanidi, 2017), depression (Skhirtladze et al., 2016), and externalizing problems (Ritchie et al., 2013). In contrast, RE, as a maladaptive dimension, has been associated with a higher level of internalizing (Crocetti et al., 2011; Skhirtladze et al., 2016) and externalizing problems (Ritchie et al., 2013).

Luyckx, Schwartz, et al. (2008) argued that there is a similar pattern of identity formation, irrespective of gender. In contrast, former studies using DIDS have found gender differences. For instance, Skhirtladze et al. (2018) in their study on young Georgian adults found that RE was related to higher depressive symptoms in women, but not men. This link was replicated in the Ritchie et al. (2013) study on 7649 American undergraduate students that showed RE was more likely to increase risky behaviors and externalizing behaviors in men and depression and anxiety in women. However, testing gender differences in identity requires that the measurement tool assesses identity processes in a similar way between girls and boys. That is, valid inferences respecting gender differences in DIDS largely depend on the establishment of gender invariance of this tool. If factor structure was equivalence across girls and boys, this suggests that gender differences in the level of identity dimensions are actual, and not due to the different girls' and boys' perception of items.

One of the deficiencies in this field is that a predominant number of research were conducted in Western countries, and the process of reaching identity commitment in countries with collectivistic cultures, such as Middle-eastern societies, might be different. In collectivistic cultures, conformity is characterized as favorable behavior (Eaton & Louw, 2000) and the individuals define themselves based on their relationships with others in their social context (Grace & Cramer, 2003; Rothbaum & Trommsdorff, 2007), which is reflected in the strong relationship between ethnic identity and wellbeing in Iranian context (Taghizadeh et al., 2014). Therefore, identity exploration and commitment in adolescents emerge through social interactions and under the influence of collectivistic values and expectations (Lewis, 2010). In this context, the autonomous attempts for exploring identity alternatives might be hindered, while commitment to socially accepted

TABLE 1 Studies validating the psychometric properties of the DIDS in different populations.

Author	Country	Participants	Study design	Factor structure	Reliability
Beyers and Luyckx (2016)	Belgium	$n=4289$ (63.7% female) $M\,(SD)_{age}=17\,(2.5)$	C	CFI (6-factor model)=0.95 RMSEA=0.04	–
Crocetti et al. (2011)	Italy	$n=1130$ (69.2% female) $M\,(SD)_{age}=21.65\,(2.28)$	C	CFI (5-factor model)=0.93 RMSEA=0.08	CM=.90 EB=.71 CM=.90 EB=.71 IC=.85 ED=.70
Luyckx, Schwartz, et al. (2008)	Belgium	$n_1=263$ (72.6% female) $M\,(SD)_{age}=19.14\,(0.95)$ $n_2=440$ (57.5% female) $M\,(SD)_{age}=17.84\,(0.52)$	C	CFI_1 (5-factor model)=0.94 $RMSEA_1=0.07$ CFI_2 (5-factor model)=0.94 $RMSEA_2=0.07$	CM $(n_1, n_2)=.86, .86$ EB $(n_1, n_2)=.81, .86$ RE $(n_1, n_2)=.86, .85$ IC $(n_1, n_2)=.86, .83$ ED $(n_1, n_2)=.79, .80$
Luyckx, Klimstra, Duriez, Van Petegem, and Beyers (2013)	Belgium	$n=5834$ (66.2% female) $M\,(SD)_{age}=17.999\,(3.25)$	C	CFI (5-factor model)=0.94 RMSEA=0.06	CM=.83–.93 EB=.76–.87 RE=.80–.89 IC=.79–.89 ED=.75–.83
Mannerström et al. (2017)	Finland	$n=751$ (60.3% female) $M\,(SD)_{age}=24.6\,(3.2)$	C	CFI (6-factor model)=0.85 RMSEA=0.09	CM=.92 EB=.79 RE=.83 IC=.88 ED=.58
Marttinen et al. (2016)	Finland	$n=577$ (55.8% female) age = 23	C	CFI (5-factor model)=0.97 RMSEA=0.05	CM=.89 EB=.74 RE=.82 IC=.89 ED=.89
Mastrotheodoros and Motti-Stefanidi (2017)	Greece	$n=437$ (50.7% female) $M\,(SD)_{age}=15.7\,(0.76)$	L	CFI_1 (6-factor model)=0.93 $RMSEA_1=0.04$ CFI_2 (6-factor model)=0.93 $RMSEA_2=0.04$ CFI_3 (6-factor model)=0.93 $RMSEA_3=0.05$	CM $(T_1, T_2, T_3)=(.91, .93, .94)$ EB $(T_1, T_2, T_3)=(.75, .84, .84)$ RE $(T_1, T_2, T_3)=(.78, .82, .82)$ RC $(T_1, T_2, T_3)=(.64, .68, .68)$ IC $(T_1, T_2, T_3)=(.79, .82, .86)$ ED $(T_1, T_2, T_3)=(.40, .42, .53)$
Morsunbul and Cok (2014)	Turkey	$n=602$ (53.4% female) $M\,(SD)_{age}=19.7\,(1.05)$	C	CFI (5-factor model)=0.92 RMSEA=0.06	CM=.87 EB=.84 RE=.79 IC=.88 ED=.78
Ozer et al. (2018)	Ladakh	$n=487$ (63% female) $M\,(SD)_{age1}=20.47\,(1.67)$ $M\,(SD)_{age2}=21\,(2.61)$	C	EFA=7-factor model with 23 items after removing items 6 and 24=CM (items 1–4), EB (items 7–10), ED (items 21–23 & 25), RE for the current direction in life (items 13–15), RE for the future achievement (items 11 &12), IC (items 16, 17, & 20), F_7 (items 18; dropped due to having one loading item) Factor loadings=0.42 to 0.90 CFI (5-factor model after removing items 1, 6, 15, 18,19, 21–25)=0.96 RMSEA=0.04	

TABLE 1 (Continued)

Author	Country	Participants	Study design	Factor structure	Reliability	
Skhirtladze et al. (2016)	Georgia	$n = 295$ (82.6% female) $M (SD)_{age} = 22.3$ (3.2)	C	CFI (6-factor model) = 0.90 RMSEA = 0.06	CM = .89 EB = .84 RE = .84	IC = .87 ED = .56
Zimmermann et al. (2015)	France and Switzerland	$n_1 = 1088$ (71.7% female) $M (SD)_{age} = 18.99$ (1.32) $n_2 = 687$ (66.5% female) $M (SD)_{age} = 20.5$ (1.99) $n_3 = 464$ (61.8% female) $M (SD)_{age} = 16.84$ (0.87)	C	CFI_1 (5-factor model) = 0.91 CFI_2 (5-factor model) = 0.91 CFI_3 (5-factor model) = 0.88	CM (n_1, n_2, n_3) = .89, .88, .88 EB (n_1, n_2, n_3) = .81, .80, .83 RE (n_1, n_2, n_3) = .84, .85, .87	IC (n_1, n_2, n_3) = .86, .85, .88 ED (n_1, n_2, n_3) = .62, .59, .57

Note: T, waves of longitudinal study; *n*, each sample of study; C, cross-sectional study; L, longitudinal study.

Abbreviations: CFI, comparative fit index; CM, Commitment Making; EB, Exploration in Breadth; F, factor; IC, Identification with Commitment; RC, Reconsideration of Commitment; RE, Ruminative Exploration; RMSEA, root mean square error of approximation.

identity would be encouraged (Cheng & Berman, 2012; Grove, 2015). Concerning these potential cultural differences, it is important to investigate the applicability of DIDS and its correlates in Iran as a country with a dominant collectivistic culture. Furthermore, in recent years in Iran, the growing body of research has drawn attention to the effect of identity on psychopathology, such as personality (Norozpour et al., 2015), and problem behaviors (Fallah Tafti et al., 2016). As an example, Zabihi et al. (2019) in their study on Iranian adolescents revealed that adaptive identity styles had a negative link to substance and alcohol use, smoking, committing suicide, aggression, and the risk of running away from home. The process of identity formation, as a bedrock for future mental health, seems necessary to be appraised in Iran. Being provided with a psychometrically sound tool, we would be able to validly and reliably capture this process and its influence on mental adjustment in this country.

The primary aim of the current study was to evaluate the psychometric features of the DIDS in Iranian adolescents. A Confirmatory Factor Analysis (CFA) was conducted to examine the factor structure of the DIDS and to test alternative models including 5 and 6 factors using six different models. These models included a general factor model, a model comprising five uncorrelated latent factors, a five-factor oblique model, a five-factor oblique model with item-correlated errors, a six-factor oblique model, and a six-factor first-order oblique model with correlated errors. The CFA was used to test the multidimensionality of the identity construct, allowing for a thorough examination of the factor structure of DIDS. The measurement invariance across gender, intercorrelations among subscales, and internal consistency were also examined. The present study also aimed to evaluate external criterion validity by assessing the association between identity dimensions and behavior problems, as well as discriminant validity via variance extracted. The hypotheses were as follows: (1) CM, EB, IC, and ED have negative correlations with behavior problems, and (2) RE is positively associated with behavior problems.

METHOD

Participants

A total of 1453 high school students included 715 boys (49.2%) and 738 girls (50.8%) with an age range of 14–18 years ($M = 15.48$, SD = 0.97) were recruited. The students were included in the study if they: (1) were 14–18 years old and (2) attended high school. The participants were 16% in grade 9, 37.9% in grade 10, 27.6% in grade 11, and 18.6% in grade 12, recruited from 3 boy schools and 3 girl schools, using convenience sampling from the city of Tehran. Regarding parents' education level, 3.5% of the fathers had no official education, 74.7% had a diploma or lower education, and 21.8% had academic education; 4.1% of the mothers had no official education, 77.4% had a diploma

or lower education, and 18.7% academic education. Most fathers (95.7%) were employed and 3.7% were unemployed, and .6% were retired; 15.5% of mothers were employed and 84.4% were unemployed, and 0.1% retired. Regarding family structure, 89.9% of adolescents were living with both parents, 8.7% with their mother or father separately, and 1.4% with others or alone.

Procedure

A bilingual team of professional translators including three mental health experts and a linguist first translated the DIDS scale into the Persian language and after that, translated it back into the English language (Guillemin et al., 1993). An English language expert evaluated the back translation and confirmed the consistency of the translated version with its original. A pilot study was conducted on a group of 30 (15 girls) high school students that volunteered to complete the DIDS scale to test its validity and reliability. These students were also requested to answer the items on a scale ranged between 0 (*not understandable at all*) and 5 (*completely understandable*) to determine if the Persian items are clear and resolve any ambiguities. The results revealed that 97% of the adolescents found the items entirely intelligible, indicating that item revision was not necessary. These students were not included in the main study. After receiving approval from the ethics board of the Iran University of Medical Sciences, data were collected. Students were informed that they were free to participate, and then were provided with the explanation regarding the study aims. Those who volunteered to take part, their parents were provided with the consent forms. Sixteen schools were primarily invited to take part in the study, and six schools agreed to participate (a 37.5% response rate among schools). In these six schools, 1535 students and their parents accepted the invitation out of 1800 students (an 85.28% response rate), and the students were given an online link and completed the DIDS and YSR scales. Finally, 1453 completed all scales (94.7% completion rate). The principle of confidentiality was explained to participants, and they were asked to respond to the questions as honestly as possible.

Instruments

Dimensions of Identity Development Scale

This 25-item instrument was designed by Luyckx, Schwartz, et al. (2008) and comprises five subscales: (1) EB (e.g., *I think about different things I might do in the future*); (2) ED (e.g., *I think about the future plans I already made*); (3) CM (e.g., *I know which direction I am going to follow in my life*); (4) IC (e.g., *I am sure that my plans for the future are the right ones for me*); and (5) RE (e.g., *I keep looking for the direction I want to take in my life*). Each subscale comprised of 5 items; however, a new sixth subscale of RC (the process of reconsidering

or backing out of current unfavorable commitment; e.g., *I think about whether my future plans match with what I really want*) could be calculated from 2 out of 5 items corresponding to ED (Zimmermann et al., 2015). Items were scored on a Likert scale from 1 = "*completely disagree*" to 5 = "*completely agree*." Cronbach's α in this study ranged between .68 and .90.

Youth Self-Report

Youth Self-Report was developed by Achenbach (1991) and measures behavior problems among adolescents. Internalizing scale comprises three subscales designed as (a) anxious/depressed, (b) withdrawal/depressed, and (c) somatic complaints. The externalizing scale comprises (a) rule-breaking behavior and (b) aggressive behavior. On a Likert scale, the questions are rated from 0 (*not true*) to 2 (*very true or often true*). In this study, the Iranian version of YSR (Fadaie et al., 2009) was used. The Cronbach's α were .92 and .91 for internalizing and externalizing problems, respectively.

Academic performance

The participants' personal view of their academic performance was determined based on their evaluation of their overall performance at high school. They were asked to answer the single question of "How do you evaluate your academic performance?" and answers ranged from 1 (*poor performance*) to 5 (*excellent performance*).

Statistical analysis

In this study, data screening was performed using IBM SPSS Statistics (Version 28). The DIDS items were found to be homogeneous with no missing data, as indicated in Table 2, due to the online data gathering format that required users to submit responses to all items (*N* = 1453). To test the confirmatory factor structure of the DIDS, maximum likelihood with robust standard errors (MLR) estimation method was applied using Mplus version 8.8 (Muthén & Muthén, 1998–2020). This type of analysis is less biased and produces more accurate results for ordinal Likert-type scales. Normality assumptions were tested, and the results revealed a mostly negative but nonsubstantial skewness in all items, as depicted in Table 2 (Gravetter et al., 2020).

Statistical strategies were as follows: First, the CFA was conducted to test the DIDS's factor structure considering six models. Model 1 (M_1) examined a general factor, in which the total 25 items loaded on a single common factor of identity to test the unidimensional model of assumed latent factor and included random measurement error and indicator-specific variance (Gustafsson & Åberg-Bengtsson, 2010). If the general factor model fitted the data well, it meant that the assumption of the

TABLE 2 Items mean, standard deviation, skewness, kurtosis, corrected item-total correlations, and reliability of DIDS.

Subscale	Item No.	M	SD	r^{cs}	SK	KU	CAID	α	TCID	Theta	Omega	Total M (SD)	Male M (SD)	Female M (SD)	Ave.VAR	CR
CM	1. I have decided on the direction I am going to follow in …	4.10	.98	.57	−1.14	1.04	.90	.89	.93	.93	.90	20.02 (4.16)	19.98 (0.15)	20.05 (4.17)	.64	.90
	2. I have plans for what I am going to do in the future.	4.01	.99	.76	−1.04	.83	.86		.90							
	3. I know which direction I am going to follow in my life.	3.99	.98	.80	−.94	.62	.85		.90							
	4. I have an image about what I am going to do in the future.	3.91	1.03	.78	−.83	.19	.86		.90							
	5. I have made a choice on what I am going to do with my life.	3.98	.97	.75	−.98	.76	.87		.90							
EB	6. I think actively about different directions I might take …	3.88	.97	.64	−.73	.24	.84	.86	.88	.90	.81	19.68 (3.73)	19.70 (3.73)	19.66 (3.73)	.52	.79
	7. I think about different things I might do in the future.	4.05	.90	.67	−.97	.89	.83		.87							
	8. I am considering a number of different lifestyles that …	3.75	.98	.69	−.59	.08	.83		.87							
	9. I think about different goals that I might pursue.	4.08	.83	.67	−1.02	1.41	.83		.87							
	10. I am thinking about different lifestyles that might be …	3.90	.95	.69	−.79	.49	.82		.87							

TABLE 2 (Continued)

Subscale	Item No.	M	SD	r^{cs}	SK	KU	CAID	α	TCID	Theta	Omega	Total M (SD)	Male M (SD)	Female M (SD)	Ave.VAR	CR
RE	11. I am doubtful about what I really want to achieve in life.	2.89	1.18	.57	.01	−.86	.56	.65	.55	.68	.76	14.40 (3.86)	14.22 (3.87)	14.58 (3.85)	.47	.74
	12. I worry about what I want to do with my future.	3.18	1.3	.65	−.27	−1.07	.51		.51							
	13. I keep looking for the direction I want to take in my life.	2.10	.89	.11	−.58	.27	.73		.75							
	14. I keep wondering which direction my life has to take.	2.89	1.26	.66	.07	−1.05	.51		.50							
	15. It is hard for me to stop thinking about the direction I …	3.32	1.16	.20	−.32	−.69	.72		.74							
IC	16. My plans for the future match with my true interests…	3.97	.97	.63	−.87	.42	.90	.90	.93	.93	.90	20.03 (3.97)	19.89 (3.91)	20.16 (4.02)	.65	.90
	17. My future plans give me self-confidence.	4.12	.92	.78	−1.009	.77	.87		.91							
	18. Because of my future plans, I feel certain about myself.	3.94	.94	.78	−.79	.43	.87		.91							
	19. I sense that the direction I want to take in my life …	4.02	.91	.79	−.82	.52	.877		.91							
	20. I am sure that my plans for the future are the right ones…	3.96	.92	.75	−.64	.004	.88		.91							
ED	21. I think about the future plans I already made.	3.67	.96	.44	−.41	−.18	.24	.44	.36	.53	.45	7.20 (1.69)	7.29 (1.64)	7.12 (1.74)	.30	.45
	22. I talk with other people about my plans for the future.	3.53	1.14	.49	−.65	−.37	.34		.36							

TABLE 2 (Continued)

Subscale	Item No.	M	SD	r^{cs}	SK	KU	CAID	α	TCID	Theta	Omega	Total M (SD)	Male M (SD)	Female M (SD)	Ave.VAR	CR
RC	23. I think about whether the aims I already have for life…	3.73	.92	.55	−.63	.43	.47	.66	.54	.72	.66	11.05 (2.27)	11.14 (2.26)	10.97 (2.28)	.38	.63
	24. I try to find out what other people think about the specific…	3.46	1.11	.51	−.59	−.30	.69		.75							
	25. I think about whether my future plans match with what I…	3.85	.91	.48	−.70	.56	.50		.57							

Abbreviations: AVE.VAR, average variance extracted (AVE) for discriminant validity; CAID, Cronbach's alpha if item deleted; CM, Commitment Making; CR, composite reliability; EB, Exploration in Breadth; ED, Exploration in Depth; IC, Identification with Commitment; KU, kurtosis; M, mean; RC, Reconsideration of Commitment; RE, Ruminative Exploration; SD, standard deviation; SK, skewness; TCID, theta coefficient if item deleted.

multidimensionality of the measurement tool was violated. In other words, it could be interpreted as a lack of discriminant validity for subscales of psychological instruments. Model 2 (M_2) consisted of a model comprising five uncorrelated latent factors, suggesting that the five subscales measure five distinct dimensions of identity. Model 3 (M_3) examined a five-factor oblique model, resembling the exploratory factor analysis conducted by Luyckx et al. (2006). Model $M_{3.1}$–$M_{3.3}$ tested a five-factor oblique and item-correlated errors model. Model 4 (M_4) evaluated a six-factor oblique model (Zimmermann et al., 2015). Finally, Models $M_{4.1}$–$M_{4.3}$ evaluated a six-factor first-order oblique and correlated errors model.

In order to evaluate the adequacy of fit, first, we utilized various statistical indices and tests with suggested acceptable values. These included the chi-square (χ^2), for which a nonsignificant value is desirable ($p > .05$), and the comparative fit index (CFI) and Tucker-Lewis index (TLI), for which values >0.90 are preferred. Additionally, the normalized chi-square (χ^2/df) should be <3, and the root mean square error of approximation (RMSEA) and its 90% confidence interval should be below 0.06. We referred to established literature to determine these acceptable values (Bentler & Bonett, 1980; Loehlin, 2004; MacCallum et al., 1996; Maruyama, 1997; Miles & Shevlin, 2007). The standardized root mean square residual (SRMR) was also examined, with values <0.05 being considered acceptable. If the chi-square was not significant, then the exact fit was deemed acceptable, regardless of the SRMR value. In the case of a significant chi-square, the approximate fit was considered acceptable if SRMR was less than or equal to 0.08. Poor fit was concluded when the chi-square was significant and SRMR was greater than 0.08. The Bayesian information criterion (BIC) was also employed to compare the fit of competing models, with a lower BIC value indicating a better fit.

In the second step, measurement invariance was examined across genders after the selection of the model. This involved testing the invariance of the factorial pattern, weak, strong, and strict invariances. The RMSEA values and their confidence intervals (CIs) of the nested models were compared to evaluate the invariance. For example, if the RMSEA values of the configural and metric invariance models fell within each other's CIs, metric invariance would be supported. Furthermore, variations in the CFI, RMSEA, and SRMR of nested models were analyzed. To support measurement invariance, two of the following indices needed to be satisfied: (1) ΔCFI ≤ 0.01, ΔRMSEA ≤ 0.015, and ΔSRMR ≤ 0.03 for factor loading invariance and (2) ΔCFI ≤ 0.01, ΔRMSEA ≤ 0.015, and ΔSRMR ≤ 0.01 for intercept and residual invariance (Chen, 2007; Cheung & Rensvold, 1999, 2002; Sass et al., 2014).

Third, in line with the recommended practice for Likert-type scales, the internal consistency of the measurement tool was assessed. To this end, mean interitem correlations and Cronbach's alpha were computed, as well as Theta and Omega Reliability Coefficients using the semTools and psych Packages (Revelle, 2015) in R version 4.1.2 (Revelle, 2017), based on the polychoric correlation matrix, as an alternative to the Pearson correlation matrix (Gadermann et al., 2012;

TABLE 3 Invariance analysis for CFA of the DIDS across gender in the six-factor oblique correlated errors model.

Model	χ^2(df)	Scaling	χ^2/df	AIC	BIC	CFI	TLI	RMSEA	SRMR	Negative res. Var	Base model	$\Delta\chi^2$	ΔCFI	ΔTLI	ΔRMSEA
M1	3943.621 (275)	1.3627	14.34	88,088.038	88,484.142	0.742	0.718	0.096 (0.093–0.98)	0.085	No	–	–			
M2	4554.440 (275)	1.3455	16.56	88,842.141	89,238.245	0.698	0.671	0.103 (0.101–0.106)	0.306	No	M_1	610.82***			
M3	1967.279 (265)	1.3458	7.42	85,381.672	85,830.590	0.880	0.864	0.066 (0.064–0.069)	0.103	No	M_1	1505.84***			
M3.1	1500.282 (242)	1.3463	6.20	81,679.228	82,112.302	0.908	0.895	0.060 (0.057–0.063)	0.066	No	M_3	469.04***			
M3.2	1255.280 (241)	1.3425	5.21	81,346.189	81,784.544	0.926	0.915	0.054 (0.051–0.057)	0.064	No	$M_{3.1}$	699.14***			
M3.3	1012.523 (240)	1.3399	4.22	81,019.706	81,463.342	0.944	0.935	0.047 (0.044–0.050)	0.059	No	$M_{3.2}$	922.13***			
M4	1868.983 (260)	1.3449	7.19	85,257.672	85,732.997	0.887	0.869	0.065 (0.062–0.068)	0.100	No	M_1	1976.34***			
M4.1	1401.770 (237)	1.3453	5.91	81,554.816	82,014.296	0.92	0.90	0.058 (0.055–0.061)	0.062	No	M_4	468.23***			
M4.2	1157.045 (236)	1.3415	4.90	81,223.191	81,687.953	0.93	0.92	0.052 (0.049–0.055)	0.058	No	$M_{4.1}$	697.52***			
M4.3	884.846 (235)	1.3394	3.76	80,810.125	81,153.415	0.953	0.944	0.050 (0.047–0.054)	0.056	No	$M_{4.2}$	951.19***			
M5	1135.225 (470)	1.3095	2.42	80,849.230	81,789.316	0.952	0.944	0.044 (0.041–0.047)	0.056	No	–				
M6	1146.742 (488)	1.3087	2.35	80,827.378	81,672.399	0.953	0.947	0.043 (0.040–0.046)	0.058	No	M_5	10.989	0.001	0.003	0.001
M7	1190.602 (506)	1.2981	2.35	80,835.691	81,585.648	0.951	0.947	0.043 (0.040–0.046)	0.059	No	M_6	18.930	0.002	0.000	0.000
M8	1200.643 (528)	1.3321	2.35	80,845.817	81,479.583	0.952	0.950	0.042 (0.039–0.045)	0.059	No	M_7	25.54	0.001	0.003	0.001

Note: M_1, general one-factor for 25 items; M_2, five-factor orthogonal model; M_3, five-factor oblique model; $M_{3.1}$, the model with oblique five factors, item 13 is removed because it cross-loads with the other four no-related latent factors (factors: 1, 2, 4, and 5); $M_{3.2}$, the model $M_{3.2}$ is similar to model $M_{3.1}$ but adds correlated errors (items number: 8–10); $M_{3.3}$, the model $M_{3.3}$ and $M_{3.2}$ are similar, but adds correlated errors (items number: 22–24); M_4, six-factor first-order model; $M_{4.1}$, the model with oblique six factors, item 13 is removed because it cross-loads with the other four no-related latent factors (factors: 1, 2, 4, and 5); $M_{4.2}$, the model $M_{4.2}$ is similar to model $M_{4.1}$, but adds correlated errors (items number: 8–10); $M_{4.3}$, the model $M_{4.3}$ and $M_{4.2}$ are similar, but adds correlated errors (items number: 22–24); $\Delta\chi^2$, difference between minus twice log likelihoods between the current model and the general one-factor (M_1); p, p-value; Negative res. var, negative residual variances; ADJBIC, sample-size adjusted BIC; M_5, configural invariance across gender; M_6, metric invariance across gender; M_7, scalar invariance across gender; M_8, strict invariance across gender.

Abbreviations: AIC, Akaike's information criterion; BIC, Bayesian information criterion; CFI, comparative fit index; df, degrees of freedom; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index; χ^2, chi-square.

Zumbo et al., 2007). The internal consistency was evaluated by following Cicchetti's (1994) suggestion that a correlation coefficient of .70 or higher indicates acceptable internal consistency among the items.

Fourth, criterion validity was assessed by utilizing the point-biserial correlation and Kendall's coefficient of rank correlation (τ_b) to measure the relationship between the different dimensions of identity development and various factors such as behavior problems, gender, grade, and academic performance. Since the data indicated non-normality, these measures were deemed suitable for analysis. The strength of the correlation effect sizes was interpreted using Cohen's (1988) categorization, where effect sizes were considered small ($r = .10$), medium ($r = .30$), large ($r = .50$), or very large ($r = .70$).

RESULTS

Factor structure

As indicated in Table 3, the five-factor oblique model (M_3) failed to meet most of the fit criteria. As part of the next step, the modifications in the five-factor oblique model ($M_{3.1}$–$M_{3.3}$) and the six-factor oblique model ($M_{4.1}$–$M_{4.3}$) were performed in three steps. First, item 13 was removed from modified models for the following reasons: (1) a corrected item-subscale correlation indicated a low coefficient (ruminative exploration), (2) being considered for deletion to improve the Cronbach's alpha, and (3) its high cross-loading with all other latent factors. Additionally, due to the similarity in the content of some items (8 with 10 and 22 with 24), the diagonal error covariances of these items were set to be estimated freely (more details are given in Table 2). As a result of the modification, a five-factor oblique item-correlated errors model ($M_{3.3}$) showed a better fit (χ^2/df = 4.22; CFI = 0.94; TLI = 0.93; and RMSEA = 0.047; 90% CI = 0.044–0.050).

Model selection

In addition to CFA, we conducted an Exploratory Factor Analysis (EFA) considering items with factor loadings greater than 0.4. Items with loadings greater than 0.4 on more than one factor were considered cross-loaded. Generaly, the results of EFA supported a 6-factor solution. Further details on factor loading and the number of factors can be found in the supplementary online document. In the EFA for the 6-factor solution, items 13 and 21 were not loaded on the corresponding latent factors. Items 1 to 7 were loaded on Commitment Making and items 6 and 7 showed insufficient loadings on the corresponding latent factor (Exploration in Breadth) and instead, loaded on Commitment Making. Results in Table 3 showed the six-factor oblique correlated errors model ($M_{4.3}$) approximately fitted the data (χ^2/df = 3.76, RMSEA = 0.052), with those of the M_1 as the baseline/null model (M_1; $\Delta\chi^2 = 2793.30$, Δdf = 40, $p < .001$) and the five-factor oblique item-correlated errors model ($M_{3.3}$; $\Delta\chi^2 = 125.81$, Δdf = 5,

$p < .001$). Then, the principle of parsimony (Bollen, 1989) was used to compare the fit indices of the competitive models. In conclusion, the six-factor correlated errors model ($M_{4.3}$) was the optimal/parsimonious model.

Furthermore, standardized factor loadings of the modified six-factor oblique model ranged between 0.39 and 0.86, and an adequate factor loading on the related factor was yielded for all items [with the exception of two items of Ruminative Exploration subscale: item 13 ($\lambda = .27$): "I keep looking for the direction I want to take in my life" and item 15 ($\lambda = .26$): "It is hard for me to stop thinking about the direction I want to follow in my life"].

Measurement invariance across gender

As indicated in Table 3, the hypothesized measurement invariances of DIDS (i.e., the six-factor oblique and correlated errors model) fitted the data well, showing that the same construct was being measured across gender. In other words, results indicated that among males and females, there were equivalent forms, factor loadings, item intercepts, and residual variances. Finally, according to the Table 3, it could be concluded that the six-factor oblique model with correlated errors was the parsimonious model across gender.

Internal reliability

Table 2 summarizes the descriptive statistics, along with Cronbach's α, theta (ordinal alpha), and omega reliability coefficients for the subscales of DIDS. Almost all the items within each subscale had a moderate positive relationship with each other—with values ranging from .44 to .80 (based on the corrected item-total correlation for the subscale's items), except for items 13 and 15 on the RE subscale, which showed corrected correlation coefficients of .11 and .20, respectively. Using Cronbach's alpha, omega, and ordinal theta (Table 2), we examined the reliability of the RE subscale by removing items 13 and 15 and found that reliability could be improved up to a critical point derived from the literature (.70; Taber, 2018). Finally, the means of interitem correlation were .63, .50, .21, .65, and .36 for CM, EB, RE, IC, and ED subscales, respectively. Furthermore, the ED and RC subscales also showed low levels of reliability, when the six-factor oblique and item-correlated errors model was considered as an optimal model: .45 and .66, respectively.

Criterion and discriminant validity

Table 4 represents the results of the intercorrelation between the DIDS subscales, as the internal criterion validity based on the six-factor modified model (Table 3; $M_{4.3}$). Almost all subscales of DIDS had a significant association with each other, with correlation coefficients ranging from −.52 (for RE and CM) to .85 (for ED and EB).

TABLE 4 Correlations between the DIDS, demographic variables, and behavior problems ($n = 1453$).

Construct	Subscales	1	2	3	4	5	6
Identity development	1. CM	1					
	2. EB	.83**	1				
	3. RE	−.52**	−.30**	1			
	4. IC	.84**	.75**	−.48**	1		
	5. ED	.75**	.85**	−.31**	.82**	1	
	6. RC	.49**	.65**	−.06	.57**	.81**	1
Demographic variables	7. Gender	.009	−.005	.04	.03	−.05	−.03
	8. Grade	−.07	−.06	.11	−.02	−.08	−.04
	9. Academic performance	.37*	.28*	−.29*	.37*	.24*	.21*
Behavior problems	10. Anxious/depressed	−.28*	−.15*	.45*	−.27*	−.19*	−.14*
	11. Withdrawal/depressed	−.31*	−.18*	.42*	−.32*	−.27*	−.22*
	12. Somatic complaints	−.26*	−.14*	.35*	−.25*	−.20*	−.18*
	13. Internalizing problems	−.32*	−.18*	.46*	−.32*	−.25*	−.20*
	14. Rule-breaking behavior	−.26*	−.20*	.20*	−.28*	−.16*	−.22*
	15. Aggressive behavior	−.31*	−.19*	.32*	−.28*	−.17*	−.21*
	16. Externalizing problems	−.32*	−.21*	.30*	−.30*	−.18*	−.24*
	17. Behavior Problems-Total	−.35	−.21	.43	−.34	−.24	−.24

Abbreviations: CM, Commitment Making; EB, Exploration in Breadth; ED, Exploration in Depth; IC, Identification with Commitment; RC, Reconsideration of Commitment; RE, Ruminative Exploration.

$^*p > .01$; $^{**}p > .05$.

Table 4 presents the external criterion validity. Behavior problems were negatively associated with CM, IC, EB, ED, and RC and were positively correlated with RE. The correlation coefficients for internalizing problems were between −.32 (with CM) and .46 (with RE) and for externalizing problems were between −.32 (with CM) and .30 (with RE). The relations between demographic variables (gender and grade) and academic performance with dimensions of identity development were examined by point-biserial correlation and Kendall's coefficient of rank correlation (τ_b). As Table 4 shows, no significant relations were found between gender and grade with the dimensions of identity development. Academic performance was also negatively associated with RE and positively related to the other five dimensions.

Discriminant validity of identity subscales through variance extracted (Table 2; Factor Analysis) was also acceptable, except for RE (.47), ED (.30), and RC (.38). According to the literature, the minimum AVE of .5 is recommended, while the AVE < .5 is considered "questionable" because it implies that the variance due to measurement error exceeds the variance captured by the construct, and the discriminant validity of the individual indicators, as well as the construct, appears to be in question (Fornell & Larcker, 1981; Henseler et al., 2015). When compared with the composite reliability, AVE is also a strict measure of convergent validity. When composite reliability is considered alone, the convergent validity of the construct is sufficient, even if more than 50% of the variance can be explained by error (Kock, 2019; Voorhees et al., 2016).

DISCUSSION

The present study sought to evaluate the psychometric characteristics and test the factor structure of the DIDS (Luyckx, Schwartz, et al., 2008) in a sample of Iranian adolescents. Overall, the results indicated that the empirically derived identity dimensions did not fit the data, but rather, the six-factor model had the best fit and can be applied in Iran. The overall pattern of the correlations of identity dimensions with psychological maladaptive behaviors was consistent with what the identity development model has suggested (Luyckx, Schwartz, et al., 2008).

The CFA results indicated that the six-factor oblique and correlated errors model had the best fit. In general, the standardized factor loadings were adequate; however, items 13 (*I keep looking for the direction I want to take in my life*) and 15 (*It is hard for me to stop thinking about the direction I want to follow in my life*) of the RE subscale showed the lowest factor loadings. This may be due to linguistic and cultural reasons. In the Persian language, "keep looking for future directions" is perceived as a positive concept, unlike questions 11, 12, and 14, which have negative meanings. In Iranian parenting culture, "non-stop thinking about the future direction" and "keep looking for future directions" in adolescents may be considered as being serious about their identity task and are encouraged by society and parents. The six dimensions of the scale were supported in the Iranian sample, which is in line with Zimmermann et al. (2015) proposition of dividing Exploration in depth into ED and RC, as

well as with previous studies (Mannerström et al., 2017; Mastrotheodoros & Motti-Stefanidi, 2017). Hence, ED was conceptualized in Luyckx et al. (2006) model as a re-evaluation of present commitments to consolidate identification with commitment was supported, and at the same time, it was distinguished from RC—defined as changing or abandoning current commitments—in this study. This six-factor model was found in both Western (e.g., Switzerland; Zimmermann et al., 2015) and nonwestern societies (e.g., Georgia; Skhirtladze et al., 2016), suggesting that global characteristics have led to the similarity in identity formation model in several countries. On the one hand, identity formation is profoundly affected by the economic necessities. In Iran, like many other developing countries, the job opportunities for adolescents are limited, with a 23.7% rate of youth unemployment (Statistical Center of Iran, 2022a, 2022b). Due to the current economic crisis in Iran (Noravesh et al., 2007), adolescents are not able to make long-term future plans, have to stay dependent on parents' financial support for a longer time, and change their career several times. Such socioeconomic factors may result in a sense of indecisiveness and instability. On the other hand, in the era of globalization and mass communication, Iranian people have rapidly shifted from extremely collectivistic to relatively individualistic values during the last decades (Aghajanian & Thompson, 2013; Asghari, 2020; Askari et al., 2020). In this context, the western values of flexibility, openness, self-awareness, and self-exploration (Cote & Levine, 2014; Gergen, 2014; Mannerström et al., 2017; Sennett, 1998) are more encouraged in Iran, both by the family and the society (e.g., school and the job market), the phenomenon that is called "prolonged identity" and refers to having unclear direction toward the future plans or changing the life choices multiple times without commitment till 30s (Arnett, 2000; Côté, 2006). For example, the age of marriage in Iran has increased by an average of 4 years from 1957 to 2016 (Statistical Center of Iran, 2022a, 2022b). Hence, the person has more time and opportunity to work through and reconsider their chosen identity (Arnett, 2000).

To the best of our knowledge, our research is among the first that examined the measurement invariance of the best-fitting model across gender for DIDS. Results indicated equalities in the item-to-item correlation matrices, as well as metric, configural, scalar, and strict invariance (Brown, 2006; Byrne, 2001; Cheung & Rensvold, 2002; Meredith & Teresi, 2006; Vandenberg & Lance, 2000). In other words, both genders perceived the identity-related situations similarly, which suggested that any gender differences found in the Iranian context are unbiased and due to actual gender differences.

Cronbach's alpha, theta, and omega coefficients, after removing items 13 and 15, ranged from .65 (for RE) to .93 (for CM), which according to George and Mallery (2003) suggested acceptable to excellent internal consistency. Sufficient

reliability of the scale has been observed in previous research (Beyers & Luyckx, 2016; Luyckx, Klimstra, Duriez, Petegem, et al., 2013). For example, Luyckx, Klimstra, Duriez, Petegem, et al. (2013) reported Cronbach's alphas for identity dimensions between .77 and .91. However, when ED was divided into ED and RC, they showed weaker reliabilities of .45 and .66, respectively. This pattern also emerged in our results, where the alphas fell to .44 and .66 for the ED and the RC.

Regarding the internal criterion validity of DIDS, the subscales' intercorrelations indicated moderate to high positive relations among all dimensions, except for RE, which had a negative relation with the other dimensions. These results mesh with the hypothesized model of identity formation (Luyckx, Schwartz, et al., 2008). Of note, in line with Zimmermann et al. (2015), RC had a nonsignificant negative but weak correlation with RE, which shows they both refer to uncertainty about future life choices, but at the same time, have a distinct role in identity formation. While RE hampers any formation of commitment, RC prompts teens to review and actively reconsider any commitment they have made. Additionally, three out of six subscales (i.e., CM, EB, and IC) had an average variance extracted (AVE) higher than .5, which showed an acceptable discriminant validity.

The DIDS external criterion validity was also demonstrated by significant correlations of identity dimensions to behavior problems. In parallel with the existing literature (Beyers & Luyckx, 2016; Crocetti et al., 2011; Mastrotheodoros & Motti-Stefanidi, 2017), the five dimensions of CM, IC, ED, RC, and EB were negatively correlated with behavior problems, while, as expected, RE was correlated positively with both internalizing and externalizing problems. Luyckx et al. (2006) argued that after a period of exploring various alternatives to life aspects and making a commitment, adolescents re-examine their choices in-depth with their values and standards. If the committed identity is consistent with their values, they would experience a sense of identity consolidation and integration. Although all five steps in identity processing are healthy developmental tasks, our finding showed a slightly stronger negative correlation between commitment dimensions and behavior problems, compared to EB, ED, and RC. In addition, some adolescents develop RE, which stems from uncertainty about decisions toward identity and leaves one prone to mental pressure and distress (Luyckx, Schwartz, et al., 2008). These results added to the evidence showing that while RE seems to be the maladaptive form of exploration and detrimental to psychological adjustment, the other five identity dimensions are the predictors of positive functioning. Also, since RC is usually considered as an instability factor and therefore negative for adaptation (Mastrotheodoros & Motti-Stefanidi, 2017), our result of the negative association between RC and behavior problems contradicted the previous research. This negative link may imply that RC is positive and functional in today's world

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that embraces the ideas of flexibility and exploring various new identities without being limited to the existing commitment (Arnett, 2000). However, to speculate or justify the mechanism that might explain this result, we need to acquire more empirical evidence to ensure the stability and reliability of our results. It should be noted that given all these correlation coefficients were weak to moderate, they should be interpreted cautiously.

Concerning the demographic characteristics, identity dimensions depicted nonsignificant correlations with gender and grade, suggesting that their effects were not meaningful. Additionally, the results showed that academic performance had a negative link with RE and a positive link with the other five dimensions. This is totally consistent with previous research (Beyers & Luyckx, 2016) and suggests that adolescents who have developed identity consolidation, resulting from adaptive identity dimensions (after excluding RE), are more likely to show better academic performance (Klimstra et al., 2012; Schwartz et al., 2015).

Limitations

The current study had several limitations. First, our sample only included students in late adolescence. This may prevent the generalizability of the findings to early and middle adolescents and individuals in emerging adulthood, as well as those adolescents who were not in school. Second, participants were selected using convenience sampling and may not be fully representative of all adolescents. Third, the cross-sectional design of our study did not permit us to capture identity formation processes. It limits our knowledge about the paths through which identity dimensions develop and, more importantly, about the associations between identity status and psychological adjustment. Longitudinal studies are needed to evaluate the development of identity from early adolescence to emerging adulthood. For instance, it might be beneficial to assess whether RE is stable or transforms from adolescence to adulthood.

Research and clinical implications

The present piece of research offers three main implications for research and practice. Primarily, when evaluating the age in which identity synthesis should be achieved in Iranian adolescents, researchers and practitioners should take into consideration the prolonged identity phenomenon, caused by economic circumstances and globalization. Our findings showed that although reconsideration of made commitment may suspend the achievement of identity, it does not necessarily lead to psychological and behavioral maladjustment. Rather, even the process of healthy identity exploration was positively associated with academic performance. It implies that instead of imposing commitment achievement in adolescence, the focus should be on

the adaptive process of identity formation—irrespective of the time it takes. Second, efforts should be made to assist teenagers in not getting engaged in the vicious circle of ruminative exploration. This is particularly crucial due to the positive link of this dimension with behavior problems. An in-depth investigation of the roots of ruminative exploration (e.g., maladaptive perfectionism; Luyckx, Soenens, et al., 2008) enables clinical psychologists to work on these psychological predisposing factors. Finally, based on our results, school counselors can improve academic performance by facilitating adaptive identity processes. It may include offering school programs that target healthy and unhealthy identity processes.

CONCLUSION

DIDS is a well-established scale, developed to evaluate identity formation processes in late adolescence and emerging adulthood (Morsunbul & Cok, 2014). Our findings, in line with previous studies, suggest that this self-report scale is a powerful tool with satisfactory construct and discriminant validity as well as sufficient internal consistency in a nonwestern context. Similar measurement precision for assessing identity was supported for both genders. Further, identity dimensions were associated with behavior problems and academic performance. Given the highly salient role of identity formation in adolescents' mental adjustment and development, reliable identity assessment tools are needed. Therefore, DIDS can be applied in clinical and educational settings in Iran.

CONFLICT OF INTEREST
We have no known conflict of interest to disclose.

ORCID
Pardis Salehi Yegaei https://orcid.org/0000-0002-0773-650X
Thomas M. Achenbach https://orcid.org/0000-0003-3515-4619
Elizabeth Trejos-Castillo https://orcid.org/0000-0002-3301-8042
Stefanos Mastrotheodoros https://orcid.org/0000-0002-0936-6143
Balal Izanloo https://orcid.org/0000-0002-6839-3598
Mojtaba Habibi Asgarabad https://orcid.org/0000-0002-5011-2823

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