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Motivated strategies for learning questionnaire part B revisited: New subscales for an adult distance education setting

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ABSTRACT

In the current study, the underlying factor structure of the learning strategies part of the Motivated Strategies for Learning Questionnaire (MSLQ), originally designed for traditional college students, was explored and a best-fit-solution for subscales was proposed for students in adult distance education (DE). Factor analyses revealed five factors (management of time and effort; complex cognitive strategy use; simple cognitive strategy use; contacts with others; academic thinking), including fewer items, which resulted in a shorter list than the original learning strategies part of the MSLQ. Cognitive strategies and management of time and effort were used most by adult DE students, contacts with others were used least. Compared to traditional college students, the findings in adult DE may be explained by a differential interpretation of items based on differences between educational systems, living and study circumstances, and age and experiences. The newly developed subscales may be considered for future research on learning strategies of students within adult DE in which the students can determine their own time, place, and pace of study.

1. 1 Introduction

Strategies are actions that can be undertaken to reach a certain goal (Burger, Uittenhove, Lemaire, & Taconnat, 2017; Lemaire & Reder, 1999), such as finishing a course or even a total curriculum. Learning strategies that can be used during studying are cognitive information processing strategies, active study strategies, support strategies, and metacognitive strategies, and reflect actions learners undertake to make their learning more effective and to facilitate their knowledge acquisition and comprehension (Weinstein & Underwood, 1985). This places students as active and constructive participants in their own learning process (Schunk, 2005).

Information on student learning strategy use can be useful for achieving several goals. Firstly, educators can develop interventions to stimulate students' use of beneficial learning strategies based upon such information (Artino & Stephens, 2009). Secondly, students can use the information to become more aware of their general learning approaches and make learning more effective by informing students of the most useful learning strategies (Credé & Phillips, 2011). Finally, education can be evaluated, e.g., by adjusting levels of instructional control, co-operative learning, and the use of educational technology (Duncan & McKeachie, 2005), and by making use of the best fitting online teaching strategies (Artino & Stephens, 2009). Researching the learning strategies that are used by students is imperative to design optimal education especially for internet based education with online instructions (Duncan & McKeachie, 2005), such as distance education (DE).

1.1. Distance education

There is an increase in adult students enrolled in DE, especially since there is a growing emphasis on lifelong learning and continuous professional development (Eurostat, 2016; Eurydice, 2011; Latanich, Nonis, & Hudson, 2001). Adult distance students are referred to as non-traditional students (Jacobson & Harris, 2008) because they are often older than traditional college students. Next to that, they have jobs, families and other responsibilities. These characteristics make it difficult to attend traditional education, which explains their preferences for a flexible system in which their study can be tailored towards their

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living circumstances and facilities (Clayton, Blumberg, & Auld, 2010).

In line with Simonson (2003), we position DE as 'institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors' (Simonson, 2003, p. 1). Features of the traditional educational system are that students study at the same time and pace and attend meetings in which they interact, mostly face-to-face, in groups (Pintrich, 2004). This is in contrast with DE students, who study at their own chosen time, pace and location, and are free to contact others or not (Eurostat, 2016; Eurydice, 2011; Latanich et al., 2001). In DE, students and professors are in different physical locations, education is facilitated via digital technology and can be synchronous or asynchronous (Auld, Blumberg, & Clayton, 2010). Next to that, adult students often have jobs, families and other responsibilities (Brand-Gruwel, Camp, & Timmermans, 2016), which also differentiates adult students from traditional college students, who's core focus is, in general, studying. Learning strategy use is context bound (Duncan & McKeachie, 2005; Feiz, Hooman, & Kooshki, 2013) and therefore, differences based on institutional aspects and home environment can be expected. Age is another aspect that differentiates non-traditional from traditional students and with increasing age, life experiences increase and these experiences have been related to learning strategy use (Justice & Dornan, 2001). Jacobson and Harris (2008) note that the ability to use prior experiences and wisdom is related to strategy use. They even state that non-traditional education -of which DE and online learning are elements- might facilitate self-regulated learning. Self-regulation is an important factor for academic performance, for instance in time and effort planning (Schunk, 2005). Next to that, older students seem to prefer more self-directed modes of studying (Bernt & Bugbee, 1993). Effeney, Carroll, and Bahr (2013) have argued that self-regulation and executive functions are related and that some aspect might even be fully developed during early adolescence. Additionally, although based on memory research, strategy use might become less efficient with increasing age because of less available cognitive resources, which might (negatively) affect the strategies that will be used (Burger et al., 2017). Outcomes of research on learning strategies used by non-traditional students (i.e., older students) studying in an online environment can be beneficial for both adult DE students and institutions (Jacobson & Harris, 2008), as studying in such an environment requires more self-regulation than in traditional education (Artino & Stephens, 2009). Therefore, it is imperative to study whether scales that inquire learning strategy use that were developed for traditional college students apply to adult DE students as well.

1.2. MSLQ

A widely used instrument to determine the learning strategies students use is the Motivated Strategies for Learning Questionnaire (MSLQ) developed by the National Center for Research to Improve Postsecondary Teaching and Learning and the School of Education at the University of Michigan (Duncan & McKeachie, 2005; Pintrich, Smith, García, & McKeachie, 1991, 1993). The MSLQ integrates knowledge of diverse domains of research such as instructional psychology, classroom based educational research, and cognitive psychology (McClendon, 1996). Its items were constructed based on information processing models that assumed to enhance learning outcomes in secondary education (McClendon, 1996) where the student is considered an active information processor who mediates instructional input (Duncan & McKeachie, 2005; Pintrich et al., 1993). The final version of the MSLQ includes 81 items, consisting of two major parts: a motivational part (31 items) and a learning strategy part (50 items; Duncan & McKeachie, 2005; McClendon, 1996; Pintrich et al., 1991, 1993).

The MSLQ comprises two parts: a motivational part (MSLQ-A) and a learning strategy part (MSLQ-B). Motivation is one of the most important factors in academic success (Schunk, 2005). Adults have different motivations to study as compared to traditional college students, such as personal interests, employment requirements and job improvement (Jacobson & Harris, 2008), which may result in high intrinsic motivation to complete the study (for more information see: Neroni, Meijs, Leontjevas, Kirschner, & de Groot, 2018). The current study focused on the learning strategy part (MSLQ-B) because this part specifically focuses on the learning strategies students might use during studying. Pintrich et al. (1993) administered the MSLQ to traditional college students and conducted confirmatory factor analyses to confirm the subscales. These subscales were constructed based on a theoretical model that specified which items should belong to a specific subscale. The found factor structure of the MSLQ-B fits 9 subscales and these subscales show Cronbach's α coefficients around 0.70, ranging from 0.52 to 0.80 (Pintrich et al., 1993). The nine subscales are allotted to three general scales: cognitive, metacognitive self-regulation, and resource management (Duncan & McKeachie, 2005; Pintrich et al., 1993). The cognitive subscale refers to strategies to process information (e.g., educational) and comprises four subscales: rehearsal (e.g., repetition), elaboration (e.g., summarization), organization (e.g., outlining), and critical thinking (e.g., connecting new knowledge to existing knowledge, applying previous knowledge to new situations, and critical evaluating the learned information). The metacognitive self-regulation scale is one large scale that comprises planning, monitoring, and regulation. Resource management strategies form the third general subscale and consists of four subscales: time and study environment management (i.e., whether students use their study time appropriately and whether they have a proper study location), effort regulation (i.e., whether students can regulate their effort or persistence), peer learning (i.e., whether students study in groups), and help-seeking (i.e., whether students seek help from others if they do not succeed). These last two subscales refer to making use of others during learning (Duncan & McKeachie, 2005; Pintrich et al., 1993). All subscales can be used separately. To the best of our knowledge, no reference scores are available since populations differ (Duncan & McKeachie, 2005). This final point, namely that populations differ, raises theoretical issues for the interpretation of the items (Harris, Edmundson, & Jacobson, 2006), if it is applied to other populations than traditional college students. It has been described before that social, instructional, and contextual factors might affect self-regulation (Schunk, 2005), an important aspect in learning strategy use. More specifically, differences between the traditional college educational system and the DE system, in living circumstances and backgrounds of students might evoke other strategies to be used, differential interpretation of learning strategies and differential importance of learning strategy use (Bernt & Bugbee, 1993), which might lead to a differential factor structure underlying the MSLQ-B for adult DE student as compared to traditional college students.

1.3. Statistical considerations

From a statistical point of view, there are also indications for concerns regarding the originally reported MSLQ-B factor structure. Duncan and McKeachie (2005) reported studies that administered the MSLQ-B to various populations, and found slightly different factor structures in different populations (i.e., high school and traditional college students) and suggested future research to study possible influences of increasing age/experiences on learning strategy use. A related statistical issue is overlap between subscales. Dugan and Andrade (2011) noted strong correlations between subscales and low Cronbach's α coefficients in traditional college students. Strong correlations between subscales, more specific rehearsal, elaboration, and organization, were also found by Kikas and Jõgi (2016). They combined these subscales into one scale in their study including children with a mean age of approximately 13 years of age. Credé and Phillips (2011) found that the subscales rehearsal, elaboration, organization, metacognitive self-regulation, time and study management and effort regulation together

loaded on one factor and that the subscales critical thinking, peer learning and help seeking together loaded on a second factor in traditional college students. Feiz et al. (2013) conducted an exploratory factor analyses on the MSLQ within a population of Iranian high school students and reported 3 factors within the learning strategy part of the MSLQ: organization, self-regulation and rehearsal. This all is in contrast with Duncan and McKeachie (2005), who found that metacognitive self-regulation was a separate factor consisting of the aspects planning, monitoring, and regulation. They suggested that students score similarly on the three aspects because it reflects the same latent construct. Even though Credé and Phillips (2011) concluded that the MSLQ-B is a 'reasonably reliable measure of constructs' (p. 342), they remarked that there was non-trivial redundancy between subscales because there were close to one correlations between subscales. They recommended rewriting items or combining subscales. McClendon (1996) also reported less factors: The cognitive scale produced three factors corresponding to (1) organization, elaboration, planning and regulating; (2) surface processing; and (3) monitoring. The resource management scale produced four factors corresponding to: (1) time, study, and effort management; (2) help seeking; (3) attendance and (4) practice. He concluded that this leads to problems with the construct validity of these scales. However, he studied the factor structure of an older version of the MSLQ-B in a population of preservice teachers enrolled in an open admission university. This older version included 105 items; 8 cognitive subscales and 5 resource management subscales. Though this study made use of an older version, it is discussed here because this is one of the few studies that included students with similar living circumstances to adult DE students. In the study of McClendon (1996), most of the students were employed and structured their study according to their working schedule, which is comparable to what is the case for adult DE students. Eventual differences in factor structure with the subscales based on studies with traditional college students might specifically be explained by these differences.

The statistical issues described above in a diverse range of populations imply that more studies into factor structure of the MSLQ-B are necessary in general. In the current study, we focused on adult DE students because the number of studies that targeted this population is scarce even though there is a growth of this specific population (Eurostat, 2016; Eurydice, 2011; Latanich et al., 2001). Next to that, the MSLQ-B comprises 50 items, with subscales of different sizes ranging from 3 up to 12 items. This implies a reasonably long scale with not proportioned subscales. A shorter, more proportioned scale is more efficient for use in DE settings.

1.4. Current study

The aim of the current study was to explore the underlying structure of the MSLQ-B scale in adult DE students and to suggest a best-fit-solution for grouping items into subscales, with evenly proportioned scales. In this process, a factor analysis was performed with the original scales and correlations between the original subscales of the MSLQ-B in adult DE students were studied to support the rationale of the eventual combination of subscales (see statistical issues reported above). Lastly, the mean scores on the newly developed subscales for adult DE were calculated to explore what learning strategies were used by adult DE students.

2. Methods

2.1. Design, participants and procedure

The sample for the present cross-sectional study was drawn from a larger study, the ALOUD study. Originally, in this study the biological and psychological determinants of learning in adult DE were investigated (for more information regarding ALOUD, see: Neroni, Gijselaers, Kirschner, & de Groot, 2015). All new students of the Open University of the Netherlands (OU-NL) registered in the period of August 2012 to August 2013 (N = 4945) were approached to participate in ALOUD. Students at the OU-NL studied at their own time, pace and chosen location. A course has a total duration of 14 months and the average number of courses that students finish within that timeframe is 2.8 (for more information, see: Gijselaers, Meijs, Neroni, Kirschner, & De Groot, 2017). ALOUD entailed a baseline measure including a questionnaire and cognitive tests and a follow-up measurement at 14 months using only a questionnaire. At baseline, 57.5% of those approached responded (n = 2842) and 41.3% completely filled out the questionnaire and the cognitive tests (n = 2040). The characteristics of these participants were comparable to the general population of students who study at OU-NL (Moerkerke, 2014) with respect to employment and living circumstances (i.e., single, with a partner, with or without children). Included in the current study were students who, along with the baseline, also participated in the follow-up measurement and completed the MSLQ-B on both measurements (n = 1196). Some students made remarks at the end of the questionnaire of which could be inferred that they were no active students. These students were excluded (n = 42), leading to a sample of 1154 students (mean age 38.85 (SD = 11.35); 714 (62%) females, 440 males). ALOUD was approved by the ethics commission of the OU-NL.

2.2. Materials: MSLQ-B

The MSLQ-B consists of 50 items to assess 9 learning strategy subscales, namely rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation, time- and study environment, effort regulation, peer learning, and help seeking. All items were scored on a 7-point Likert scale, ranging from 1 (totally disagree) to 7 (totally agree). The MSLQ has been reported to have a relatively good reliability in terms of internal consistency (for more information, see: Pintrich et al., 1993). A translate-retranslate procedure was used for the translation from English into Dutch. When necessary, the items were adjusted for a DE population (for instance 'course' used instead of 'class'; see Appendix A), which has also been done before in other studies (for an example, see: Auld et al., 2010). MSLQ-B data gathered at the follow-up measurement were used to determine learning strategy use. These data were preferred over data collected at baseline. If students have study experience (a course has a duration of 14 months and students on average finish 2.8 courses within that timeframe; for more information, see: Gijselaers et al., 2017) and can base their learning strategy report on the obtained grade, they can better assess their learning strategy use (Credé & Phillips, 2011). Therefore, these data were interpreted as more valid than baseline data on learning strategy use. Average scores summed per scale were used in the current study to explore what learning strategies were used by adult DE students.

2.3. Analyses

Confirmatory factor analyses (CFA) were analyzed using the LAVAAN package (Rosseel, 2012) in the statistical environment R (R_Core_Team, 2015) and the other analyses were performed using SPSS 22.0.0 (Chicago, IL, USA). First, a CFA was performed with the original subscales, on the total sample. The following fit-indices were used to determine the models' fit: the Non-Normed Fit Index (NNFI; 0.96 or higher), Standardized Root Mean Square Residual (SRMR; 0.09 or lower), Root Mean Square Error of Approximation (RMSEA; 0.06 or lower), and the Comparative Fit Index (CFI; 0.96 or higher; Hooper, Coughlan, & Mullen, 2008). Additionally, to study whether there was overlap between the original subscales in the data gathered in adult DE students (see statistical issues described above), correlation analyses were performed (non-parametric, Spearman, correlation analyses). Correlations (r_s) between the mean scores of the subscales of ≤ 0.1 were classified as negligible, between 0.1 and 0.3 as small, between 0.3 and 0.5 as medium, and ≥ 0.5 as high (for more information, see: Cohen,

Table 1
Correlations (r_s) between the original subscales of the MSLQ-B in adult DE students.

		1	2	3	4	5	6	7	8
1	Rehearsal								
2	Elaboration	0.352[a]							
3	Organization	0.498[a]	0.541[a]						
4	Critical thinking	0.118[a]	0.507[a]	0.266[a]					
5	Metacognitive self-regulation	0.385[a]	0.570[a]	0.499[a]	0.447[a]				
6	Time and study environment management	0.206[a]	0.295[a]	0.257[a]	0.122[a]	0.464[a]			
7	Effort regulation	0.200[a]	0.299[a]	0.248[a]	0.129[a]	0.499[a]	0.629[a]		
8	Peer learning	0.225[a]	0.164[a]	0.187[a]	0.120[a]	0.121[a]	0.109[a]	−0.018	
9	Help seeking	0.165[a]	0.159[a]	0.143[a]	0.037	0.077[a]	0.138[a]	−0.002	0.637[a]

[a] Correlation is significant at the 0.01 level (2-tailed).

1992; Field, 2009). To compare these correlations with the correlations between the new subscales, we calculated the mean correlation coefficient.

Second, exploratory factor analyses (EFA) were performed, on half of the data (subsample A), by means of principal axis factoring, oblique rotation (in line with Credé & Phillips, 2011), promax rotation, to explore the underlying factor structure of the MSLQ-B in DE students. Factor loadings of 0.4 and higher were considered meaningful (Comrey & Lee, 1992) while items with meaningful loadings on more than one factor were considered for omitting from the scale (Field, 2009). The multiple criteria that were used to base the interpretation of the number of factors on were: inspection of the inflexion point of the Scree plot, eigenvalues of 1 and higher; the Kaiser-Meyer-Olkin statistic (KMO) to inspect whether the analyses yielded distinct and reliable factors; KMO values between 0.5 and 0.7 was considered as mediocre, between 0.7 and 0.8 was considered as good, 0.8 and higher as very good; KMO values for individual items with the acceptable limit of 0.5; Bartlett's test of sphericity, which is an indicator of whether the correlations between the items are [overall] significantly different from 0; the communalities after extraction, to check whether the right number of factors has been extracted and how much of the variance was explained by the factors; the number of non-redundant residuals, to check the percentage of residuals that has an absolute value larger than 0.05, 50% is the maximum; and the determinant, to check whether there are items that might cause problems, should be higher than 0.00001 (for more information, see: Field, 2009).

Next, a cross-validation was performed on the other half of the data (subsample B) by CFA. Firstly, to confirm the found factor structure and, secondly, to propose a well-fitted model with proportionally-sized subscales (of about the same length). In the iterative process for choosing a well-fitted model we used likelihood ratio tests for comparing different models, and modification indices for considering specific items for omission from a subscale. We did not use specific boundaries for modification indices but considered items for omission in the order from the best to the worst model improvement. While accounting for the number of items in subscales, we omitted an item from a larger subscale if two or more items showed considerable overlaps in content and showed equal modification indices. The iterative process was repeated until all fit indices were acceptable. In line with Pintrich et al. (1993), Cronbach's α coefficients were calculated to study the internal consistency of the adult DE subscales to explore their reliability. Lastly, fit indices for the well-fit model in subsample B were reported for subsample A, and the total sample (Hu & Li, 2015).

Additionally, to study whether the overlap between the new subscales was lower than between the original subscales, correlation analyses were performed (non-parametric, Spearman, correlation analyses). Correlations (r_s) between the mean scores of the subscales of ≤0.1 were classified as negligible, between 0.1 and 0.3 as small, between 0.3 and 0.5 as medium, and ≥0.5 as high (for more information, see Cohen, 1992; Field, 2009). To compare these correlations with the correlations between the original subscales, we calculated the mean correlation coefficient.

Finally, to explore what learning strategies were used by adult DE students, the means scores and standard deviations of the newly developed subscales for adult DE students were calculated.

3. Results

3.1. Original subscales CFA

The CFA on the total sample revealed that the original factor structure did not fit. The fit indices of this model were: NNFI of 0.696, SRMR of 0.087, RMSEA of 0.068, and CFI of 0.717 ($\chi^2(1139.000) = 7507.111$, $p < .000$).

3.2. Correlation analyses original subscales

Correlations between the mean scores of the original subscales in adult DE students can be seen in Table 1 showing that there were correlations, and possibly overlap, between the subscales. Significant correlations were found for almost all subscales. The exceptions were: critical thinking and help seeking; effort regulation and help seeking; and effort regulation and peer learning. Some patterns of correlation emerge (Spearman rho (r_s) rounded to discrete numbers).

a) Metacognitive self-regulation correlated strongly with most subscales except rehearsal (medium to strong) and peer learning and help seeking (both weak; see point b).
b) Peer learning and help seeking correlated weakly with most subscales except for with each other (strong) and rehearsal (weak to medium).
c) Time and study environment and effort regulation correlated strongly. Both correlated medium to weakly with the cognitive learning strategies.
d) Within the cognitive strategies, the pattern was not as straightforward. Elaboration and organization both had 2 strong and 1 medium correlations with the other subscales whereas rehearsal and critical thinking both had 1 strong, 2 medium and 1 weak correlations with the others. Rehearsal showed a differential pattern of correlations based on points a and b.

The mean correlation between the subscales was $r_s = 0.273$.

3.3. EFA

Correlation analyses between the items revealed relations between most items of the MSLQ-B. Therefore, an oblique rotation was used, promax procedure, because it lead to larger factor loadings. Based on inspection of the Scree plot and the indicators of the EFA described above, the best fitting model was a 5-factor model (see Table 2 for the factors and the loadings above 0.4). Of this final model, the Kaiser-Meyer-Olkin statistic (KMO) was 0.860, which can be classified as very

Table 2
Factors of the EFA.

Item nr	Factor				
	1	2	3	4	5
52	0.823				
77	0.722				
37	0.665				
70	−0.613				
43	−0.592				
73	−0.586				
80	0.538				
33	0.517				
74	−0.487				
57	0.477				
60	0.437				
48	−0.422				
64		0.817			
66		0.684			
76		0.600			
62		0.559			
81		0.510			
61		0.463			
59		0.448			
67			0.802		
72			0.762		
63			0.728		
32			0.609		
46			0.403		
75				0.838	
45				0.834	
50				0.817	
58				0.438	
38					0.652
47					0.646
71					0.601
51					0.491
36					0.423

good. All KMO values for individual items were above 0.763, which is well above the limit of 0.5. Bartlett's test of sphericity was significant ($\chi^2(528) = 7212.233$, $p < .001$) which is an indicator that the correlation matrix was different from the identity matrix and, therefore, factorable. The mean of the communalities after extraction was slightly below 0.500 (namely 0.433) but the amount of non-redundant residuals was 11.0% (which is below the maximum of 50%). Even though the determinant was 3.662E-6, which is rather low, we remained this model because excluding more items based on statistical and/or theoretical grounds would only marginally enhance the determinant. The items that were excluded in the EFA ($n = 17$) and the rationale behind it are presented in 3.

3.4. CFA

CFA indicated that the 5-factor model of the EFA suited the adult DE population more than the 9-factor model. Even though the fit of the 5-factor model was better than the fit of the 9-factor model, the fit indices for the 5-factor structure from the EFA were not satisfactory and some theoretical issues (i.e., ambiguity in interpretation) with items remained. Therefore, 8 more items were excluded (see Table 3) to improve the fit indices and the theoretical framework. The fit indices of the final model in subsample B were: NNFI of 0.887, SRMR of 0.068, RMSEA of 0.057, and CFI of 0.900 ($\chi^2(265.000) = 744.991, p < .000$). The indices NNFI and CFI were not sufficient, however SMRS and RMSEA were reached which has been argued to be a sufficient fit (for more information, see: Hooper et al., 2008). The CFA on subsample A revealed that the factor structure also fitted. The fit indices of this model were: NNFI of 0.886, SRMR of 0.064, RMSEA of 0.054, and CFI of 0.900 ($\chi^2(265.000) = 723.852, p < .000$). The CFA on the complete dataset revealed that the factor structure also fitted. The fit indices of this model were slightly better than for subsamples A and B: NNFI of 0.891, SRMR of 0.061, RMSEA of 0.054, and CFI of 0.904 ($\chi^2(265.000) = 1158.435, p < .000$).

Table 3
Overview of the excluded items during EFA and CFA.

Stage	Excluded items	Rationale
Inspection of correlations	68, 78	Possible multi-collinearity noticed in correlation matrix
First round EFA	34, 35, 40, 41, 42, 44, 49, 53, 55, 56, 65, 69, 79	Factor loadings < 0.4
Second round EFA	39, 54	Factor loadings < 0.4 and theoretical framework
CFA	33, 37, 48, 52, 57, 62, 66, 77	Enhanced fit indices and theoretical framework

3.5. Newly constructed subscales: adult DE subscales

The five newly constructed subscales were categorized as: management of time and effort (e.g., I make good use of my study time for this course); complex cognitive strategy use (e.g., When reading for this class, I try to relate the material to what I already know); simple cognitive strategy use (e.g., When I study the readings for this course, I outline the material to help me organize my thoughts); contacts with others (e.g., I try to work with other students from this course to complete the course assignments); and academic thinking (e.g., When a theory, interpretation, or conclusion is presented in the course or in the readings, I try to decide if there is good supporting evidence; see Appendix B).

3.6. Reliability of the adult DE subscales

The Cronbach's α coefficients of the adult DE subscales range from 0.70 to 0.80 (see Table 4). The adult DE subscale management of time and effort was a combination of a few items of the original subscales time and study environment (Cronbach's α coefficient = 0.80) and effort regulation (Cronbach's α coefficient = 0.69) and had a Cronbach's α coefficient of 0.80. The adult DE subscale contacts with others was a combination of a few items of the original subscales peer learning (Cronbach's α coefficient = 0.68) and help seeking (Cronbach's α coefficient = 0.69) and had a Cronbach's α coefficient of 0.80. The adult DE subscale academic thinking had a Cronbach's α coefficient of 0.74, whereas the original subscale critical thinking had a Cronbach's α coefficient of 0.76. Both the adult DE cognitive learning strategy subscales were combinations of parts of original subscales and could therefore not be compared.

3.7. Correlation analyses adult DE subscales

Correlations between the mean scores of the new subscales in adult DE students can be seen in Table 5 showing that there were correlations, and possibly overlap, between the subscales. Significant correlations were found for all subscales. Two correlations were negligible, four correlations were weak to negligible, and four correlations were medium. Some patterns of correlations emerge (Spearman rho (r_s) rounded to discrete numbers), namely that contacts with others showed the weakest correlations and complex cognitive strategy use the (relatively) strongest correlations with the other adult DE subscales. The mean correlation between the subscales was $r_s = 0.212$.

3.8. Exploration of what learning strategies were used by adult DE students

The means, standard deviations, and the interpretation of the means in labels of the 7 point Likert scale of the subscales can be seen in

Table 4
Items in the adult DE subscales, origin in the original subscales, Cronbach's α coefficients, mean scores and standard deviations and labels with regard to the 7 point Likert scale of the adult DE subscales.

Factor	Items	DE subscales	Items from the original subscales	α	*M*(SD)	Rounded labels
1	43, 60, 70, 73, 74, 80	Management of time, place and effort	Time and study environment/Effort regulation	0.80	4.86(1.11)	'Tend to agree'
2	59, 61, 64, 76, 81	Complex cognitive strategy use	elaboration, metacognitive self-regulation, rehearsal	0.70	5.21(0.82)	'Tend to agree'
3	32, 46, 63, 67, 72	Simple cognitive strategy use	Rehearsal, organization, elaboration	0.79	4.94(1.18)	'Tend to agree'
4	45, 50, 58, 75	Contacts with others	Peer learning/Help seeking	0.80	2.58(1.23)	Between 'Tend to disagree' and 'disagree'
5	36, 38, 47, 51, 71	Academic thinking	Critical thinking/metacognitive self-regulation	0.74	4.21(1.10)	'Neither disagree, nor agree'

Table 5
Correlations (r_s) between the new subscales of the MSLQ-B in adult DE students.

		1	2	3	4
1	Management of time and effort				
2	Complex cognitive strategy use	0.391[a]			
3	Simple cognitive strategy use	0.290[a]	0.363[a]		
4	Contacts with others	0.100[a]	0.078[a]	0.143[a]	
5	Academic thinking	0.095[a]	0.399[a]	0.145[a]	0.114[a]

[a] Correlation is significant at the 0.01 level (2-tailed).

Table 4. Management of time and effort, complex and simple cognitive strategy use were tended to agree that they were used, academic thinking was neither agreed, nor disagreed that it was used, and contacts with others was (tended to) disagreed to be used.

4. Discussion

Knowing what learning strategies are used by students is imperative for the students as well as the educational institute. The MSLQ-B is a questionnaire for measuring the use of learning strategies that was developed for traditional college students. There are both theoretical and statistical grounds to explore the underlying factor structure of the MSLQ-B in adult DE students. The current study explored the underlying factor structure in adult DE students and showed that, as expected, that the original subscales of the MSLQ did not fit for adult DE students. This is the first study on the MSLQ-B in adult DE students that accounted for theoretical and statistical grounds when selecting items for subscales. A shorter scale with evenly proportioned subscales is proposed, which can be useful for determining learning strategy use in adult DE students. Additionally, these adult DE scales were used to explore what learning strategies were used by adult DE students.

4.1. Content of the adult DE subscales

The analyses revealed a five-factor structure that reflected five adult DE subscales. The first adult DE subscale, labelled management of time and effort, comprised 6 items that were part of the original subscales time and study environment management ($n = 4$) and effort regulation ($n = 2$). Whereas these items loaded on separate factors in traditional college students, for adult DE students, these items combined into one factor. This was to be expected because management of time and place as well as effort are needed to be able to combine employment and social life with study (Eurydice, 2011; Latanich et al., 2001; Pintrich, 2004). It was also in line with studies reporting that items requiring time and study environment management and effort regulation loaded on one factor in university students who also had jobs (McClendon, 1996) and even in some studies with traditional college students (Pintrich, 2004). Moreover, Credé and Phillips (2011) reported a strong correlation between time and study environment management and effort regulation ($r_s = 0.95$) within a population of traditional college students and suggested that subscales with high construct overlap might better be combined. In the current study, these original subscales correlated also strongly in adult DE students.

The second adult DE subscale, labelled complex cognitive strategy use, comprised items from several original subscales: rehearsal ($n = 1$), elaboration ($n = 2$), and metacognitive self-regulation ($n = 2$). It was surprising that an item from the original subscale rehearsal (i.e., 'I memorize key words to remind me of important concepts in this course'), which was assumed to suggest simple strategy use in the original subscales, was part of a more complex subscale in adult DE students. However, inspection of the nature of the items in the second adult DE subscale revealed that the interpretation of that particular item might differ between traditional college students and adult DE students. Whereas traditional college students might have focused on the aspect of the memorization (i.e., rehearsal), it is speculated that adult DE students might have focused on the content of the course, concepts, and on attempts to formulate suitable keywords. If this item was interpreted in that manner, the definition that rehearsal is a strategy in which the information is not transformed or moved beyond what is being taught (Kikas & Jõgi, 2016, p. 580), was no longer valid for this particular item and therefore it is plausible that this item reflected more complex strategy use instead of more superficial strategy use (Pintrich, 2004). With this suggestion in mind, the combination of the items in this subscale became clearer. Within this subscale, the items originally from the subscales elaboration and metacognitive self-regulation, which also focused on the content, concepts and idea's in the course, were combined. The combination of the items in this subscale was theoretically in line with studies that distinguished between surface and deep strategies (Diseth & Kobbeltvedt, 2010). According to Diseth and Kobbeltvedt (2010), relating ideas (or here, material/concepts in the courses) to other information to seek meaning is classified as a deep learning strategy. Several items in the subscale referred to these activities such as relating new information to previously known information and applying ideas on other educational activities.

The third adult DE subscale, labelled simple cognitive strategy use, comprised items from the original subscales: rehearsal ($n = 2$), elaboration ($n = 1$), and organization ($n = 2$). In the original subscales, these items were assumed to suggest both simple and complex cognitive strategy use. Inspection of the nature of the items showed that these items are all related to actions undertaken to handle the course content. The focus was on 'doing with' and, in contrast to the second DE subscale, less on 'thinking about'. Kikas and Jõgi (2016) described that in the most basic strategy, information is not transformed and it is not actively handled to move beyond what is actually being taught (Kikas & Jõgi, 2016, p. 580). The items represented ways that the course material can be managed to be able to learn in more efficient manner without reflecting on its meaning. These strategies are comparable to the surface strategies described by Diseth and Kobbeltvedt (2010) in which the newly learned information is interpreted as unrelated to other parts of (already existing) information, such as previous knowledge. The comparison was not in line with Pintrich (2004), who described rehearsal as a surface strategy, and the other cognitive strategies as deep strategies. However, as described above, if we focused on

the content of the items rather than the label of the original subscales, these strategies could be interpreted as simple.

Credé and Phillips (2011) reported strong correlations between the original subscales rehearsal and elaboration (r_s = 0.80), rehearsal and organization (r_s = 0.80), elaboration and organization (r_s = 0.82), and elaboration and metacognitive self-regulation (r_s = 0.78) in traditional college students. They suggested that these subscales might better be combined, which was the case for several subscales in adult DE students. Even though the current study revealed correlations between the original subscales in adult DE students that were lower than the reported correlations by Credé and Phillips (2011), the adult DE subscales complex and simple cognitive strategy use were both combinations of parts of the original subscales rehearsal, organization, elaboration and metacognitive self-regulation. The newly formed adult DE subscale complex cognitive strategy also correlated with management of time and effort (including items of the original subscale metacognitive self-regulation), simple cognitive strategy use (including items of the original subscales rehearsal, organization, and elaboration), and academic thinking (including items from the original subscale metacognitive self-regulation) but these correlations were lower than the correlations between the original subscales, however within the same pattern (see section 4.2). McClendon (1996) also described that some subscales probably combine to one subscale and explained that organization, elaboration, planning and regulation might not be as distinct as Pintrich et al. (1993) stated.

The fourth adult DE subscale, labelled contacts with others, comprised items from the original subscales peer learning (n = 2) and help seeking (n = 2). Credé and Phillips (2011) reported for traditional college students strong correlations between the original subscales peer learning and help seeking (r_s = 0.92) and suggested to combine these subscales into one subscale. In adult DE students, these scales were correlated also. In contrast to traditional college education (Pintrich, 2004), DE courses are mostly designed to be studied independently. Making contact with others, whether they are fellow students or teachers, means undertaking extra actions in reaching out. For peer learning as well as help seeking, DE students needed to actively seek contact with others in a similar way. Another difference between traditional college students and adult (DE) students is that the age gap between students and teachers was smaller or even reversed in adult DE. This might explain why in traditional college, contacting peers might be different from contacting instructors or teachers, whereas for adult DE students this difference was less relevant. Thus, the interpretation of the items might be different in traditional college students depending on whom they contact whereas in adult DE students the focus is not on whom they contacted but on the action they had to undertake to contact others (regardless of which person is contacted). Therefore, combining these items into one subscale for adult DE students was justifiable.

The fifth adult DE subscale, labelled academic thinking, comprised items from the original subscale critical thinking (n = 4) with one metacognitive self-regulation item (i.e., 'when reading for this course, I make up questions to help focus my reading') added. The items focused on having a critical attitude regarding the course material and on the use of the material as a starting point for interweaving the information with previous and common knowledge. The metacognitive self-regulation item could be interpreted in this sense as well. Older students (such as DE students) have been reported to make more use of critical thinking (Artino & Stephens, 2009). One of these aspects concerns making critical evaluations of new ideas. Therefore, perhaps, adult DE students interpreted asking questions (the metacognitive self-regulation item) as critical questions, whereas traditional college students (who are younger) might have interpreted the item as intended, as learning strategy to enhance performance and to focus.

Noteworthy was that the original subscale metacognitive self-regulation was not found in adult DE students, but that some of the items of this original subscale were divided over other subscales. The fact that this original subscale correlated strongly with most of the other original subscales in adult DE students was also indicative for the division of metacognitive self-regulation items over other subscales. This is in contrast with what Duncan and McKeachie (2005) reported, who consistently found that metacognitive self-regulation was one large factor in traditional college students. This might suggest that in adult DE students the metacognitive aspects planning, monitoring and regulation are separate aspects and that these are not based on a similar latent construct, as they are for traditional college students.

4.2. Reliability of and correlations between the adult DE subscales

The Cronbach's α coefficients of the adult DE subscales could be classified as good, which indicates that the factors consistently reflect the construct that is measured (Field, 2009). The subscales management of time and effort and contacts with others, were both combinations of two original subscales and had higher Cronbach's α coefficients than the average of the separate original subscales, for contacts with others even substantial higher. Additionally, the adult DE subscales management of time and effort, contacts with others, and academic thinking included fewer items than the original subscales. With the rationale in mind that fewer items often lead to lower Cronbach's α coefficients, it can be concluded that the adult DE subscales were more reliable for adult DE students than de original subscales. Both the cognitive learning strategy subscales were combinations of parts of original subscales and could therefore not be compared. Based on these findings it can be concluded that the adult DE subscales are more reliable for learning strategy use in adult DE students than the original subscales, designed for college students.

Even though there were correlations between the adult DE subscales, these were lower than the correlations between the original scales. This was concluded based on the mean correlations between the subscales and on the absolute values of the correlations. A pattern that emerged at both the original and the adult DE subscales was that peer learning and help seeking (original subscales) and contact with others (consisted items from peer learning and help seeking from the original subscales in the adult DE subscales) showed the lowest correlations with the other scales. Complex cognitive strategy use from the adult DE subscales correlated highest with the other scales (except for contacts with others). This is in line with the correlations that the original metacognitive self-regulation subscale and the cognitive subscales had with the other original subscales. Thus, the pattern of relations is similar in the original and adult DE subscales but the correlations are lower for the adult DE subscales than for the original subscales. Low-to-moderate correlations between subscales of learning strategy use is not uncommon, since more scales show some inter-correlations between the subscales (e.g., Bernt & Bugbee, 1993) and people tend to use multiple strategies (Lemaire & Reder, 1999). Also, a study that compared learning strategy use between students that preferred traditional versus non-traditional learning environments showed that the correlations between learning strategy subscales were higher in students with a preference for a traditional learning environment (Auld et al., 2010; Clayton et al., 2010). This also supports the finding that the original subscales did not fit for adult DE students since the correlations were higher.

4.3. What learning strategies were used by adult DE students

Adult DE students tended to agree that they used management of time and effort as a strategy. This score above midpoint suggest a positive use of this learning strategy (Clayton et al., 2010). This was expected because adult DE students need to balance employment, family and spare time to study (Eurydice, 2011; Latanich et al., 2001; Pintrich, 2004). Management of time and effort is part of behavior control, which is necessary in the academic learning domain (Pintrich, 2004). Students need to make schedules for studying, arrange a proper study

location in which there is little or no distraction and decide whether they put effort in beneficial situations but to restrain from non-beneficial ones. Non-traditional students make less use of effort regulation than traditional students (Jacobson & Harris, 2008) and students that prefer non-traditonal learning environments invest less effort (Clayton et al., 2010) and this might therefore be one of the factors that differentiates students attending adult DE from traditional college students.

Adult DE students tended to agree that they used complex cognitive learning strategies. Here also, this score above midpoint suggest a positive use of this learning strategy (Clayton et al., 2010). It was expected that these strategies would be used because we assume that university students have the capacities to use complex strategies and that they are aware of the benefits of their use. In addition, older students (which most adult DE students are) were expected to make use of those strategies based on (1) life- and academic experiences that increase with increasing age (Justice & Dornan, 2001) and (2) the finding that non-traditional students made more use of organization and elaboration than traditional students (Jacobson & Harris, 2008). On the other hand, complex cognitive strategy use might require cognitive resources, which might decline with age (Burger et al., 2017) but that is not the current study indicated. Perhaps, the adult DE population has enough cognitive resources, they are able to study, to be able to make use of cognitive demanding learning strategies.

Adult DE students also tended to agree that they used simple cognitive strategies, which is also above midpoint (Clayton et al., 2010). Simple cognitive strategies are actions that can be undertaken to make the course material easier and more efficient to study such as taking notes and/or making summaries and lists. These are more surface-level learning strategies. It was expected that this strategy would be used by adult DE students (Justice & Dornan, 2001) but not to such high degree as by younger students. While it is indeed necessary to organize the course material during studying, it was expected that adult DE students would make less use of this strategy than, for instance, they would of academic thinking. However, Diseth and Kobbeltvedt (2010) described that if there is an overload on the students, they will choose to use more short-term effective strategies such as the more simple, surface strategies and they will put just enough effort in studying to pass which might explain why this strategy was used more than expected.

Adult DE students made few (i.e., between tended to disagree and disagree) contacts with others during their learning. This score is below midpoint and shows a negative attitude towards the use of this strategy (Clayton et al., 2010). Seeking help has been reported to be a behavioral strategy because it involves the student's own behavior, but also the involvement of the context (Pintrich, 2004), namely the cooperation and availability of other students. The DE courses at the OU-NL were designed for independent study. This is quite different from traditional college education where student contact is greater and working in groups is common (Pintrich, 2004) and teachers as well as peer students are in close proximity of the student. Thus, contacts with others, whether peers or teachers, might be less imperative and within a different context for adult DE students as compared to (college) students in traditional education. This finding is in line with the expectations that this strategy would be used less and it indicates that adult DE students indeed mostly worked alone. Based on the assumption that adult DE students are good at self-regulation, it is possible that they are selective in their contacts with others and only contact helpful sources if necessary (Schunk, 2005). Additionally, the age gap between students and teachers in adult DE is smaller and both teachers and students are employees, which makes the difference between students and teachers smaller, and as a result, also the choice for contacting a student or a teacher more similar. It indicates once more the differences in the importance of contacts with others during studying between traditional college education and adult DE (Jacobson & Harris, 2008; Pintrich et al., 1993). Even though, adult DE students have less contacts with others, this might be something that they would prefer based on the study of Clayton et al. (2010) that showed that even students that preferred non-traditional education (including online education) would like direct interaction with professors and students and have relations with the faculty and students. The choice for online education might therefore more a factor of necessity to fit to their life styles than based on a preference for this form of education (Auld et al., 2010). A remarkable finding was that contacts with others was less related to the other strategies. Thus, it is clearly distinguishable from the other more cognitive factors.

Adult DE students were neutral (i.e., neither disagreed nor agreed) towards academic thinking, in which a critical stance with regard to course material is taken and the learned information is integrated with and set off against existing information. This is score around midpoint which neither indicated a positive or a negative point of view regarding this learning strategy (Clayton et al., 2010). We expected that this strategy would be used because (1) this is advocated in university education (Brand-Gruwel et al., 2016), (2) older students would do this based on their life experiences and wisdom (Jacobson & Harris, 2008), and (3) studies reported that older students make more use of critical thinking than younger students (Artino & Stephens, 2009). Academic thinking is needed to work and think scientifically. Thus, that students were rather neutral might not be a good sign. However, the MSLQ-B was administered after only 14 months of studying. OU-NL students finish approximately one or two courses within that given timeframe. Thus, their study careers at a university were at a starting point. Since learning experiences may account for an increase in critical thinking (Artino & Stephens, 2009), this might explain the somewhat lower reports than expected. Repetition of the MSLQ-B adult DE subscales at a later point in their study careers would show whether students develop this stance during the educational program.

5. Limitations and future research

There are some limitations in the current study. The MSLQ is a self-report measure and social desirability is of concern (Dugan & Andrade, 2011). Even though that Duncan and McKeachie (2005) mentioned that the MSLQ indicates at a global level if learning strategies were used and social desirability would not be a concern, this remains a point of critique. Dugan and Andrade (2011) reported that self-report questionnaires are the preferred method for assessing academic self-regulation (Dugan & Andrade, 2011, p. 46), of which learning strategies are part of. However, other studies indicated that reports on learning strategy use are not as reliable as actual measures of strategy use (Pintrich, 2004). For instance, even though the study performed by Kikas and Jõgi (2016) included children, objective measures of strategy use (i.e., during a memorization task) were related to school performance whereas the subjective measures (i.e., subscales of the MSLQ) were not (Kikas & Jõgi, 2016). This might indicate that self-report measures are not the preferred method, but probably the most suitable method with regard to applicability for the current study within an adult DE population. In addition, strategy use is probably more a dynamic state than a stable trait and might, thus, fluctuate per course, per teacher, per situation, over time (Duncan & McKeachie, 2005) and even within courses, if there are different types of exams (i.e., writing a paper versus a multiple choice exam) strategies are apt to change (Credé & Phillips, 2011). However, Rotgans and Schmidt (2009) studied whether the MSLQ was course-related and concluded that this was not the case. Additionally, studies with the adult DE subscales, both in traditional student populations and in adult DE students, should be carried out to confirm the validity of the adult DE subscales. Our sample was not large enough to provide a third subsample for confirming the final model. Lastly, further studies should focus on the relation between learning strategy use based on the adult DE subscales and study performance. With this information, recommendations can be given to students on what strategies fit best their educational system and their personal circumstances, and which learning strategies can better not be used (and hence where effort can be spared).

6. Conclusions and recommendations

The most used subscales of the MSLQ-B are subscales whose validation is based on research with traditional college students. In the current study, the suggestion was made that these original subscales were less suitable for adult DE in which the students can determine their own time, place and pace of study. Therefore, new subscales were constructed (i.e., management of time and effort; complex cognitive strategy use; simple cognitive strategy use; contacts with others; and academic thinking). Most adult DE subscales were combinations of original subscales, but with fewer items. A benefit of the adult DE subscales is that fewer items of the MSLQ-B have to be used, which makes it less effortful for the students to complete. Additionally, the newly formed adult DE subscales were more evenly proportionated regarding the number of items per subscale and revealed that adult DE students tended to use management of time and effort and complex and simple strategy use, were neutral to academic thinking and made few contacts with others during learning. Based on the content of the subscales and the interpretation of the items, the adult DE subscales differentiate adult DE students from traditional college students, based on the features of the educational system, living and study circumstances, and age/experience. For instance, contacts with others – whether with teachers or peers – might have a different interpretation for adult DE students than for traditional college students. Based on these findings, it is recommended to check the fit of the factors in other datasets and if the fit is good, to use these new reported subscales for studies that are performed with populations of students that study within educational systems comparable to the DE population studied: students within online distance education in which the students can determine their own time, place, and pace of study and in which the students are adults in contrast to traditional aged students.

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Appendix A. MSLQ-B original subscales administered in the current study

Item nr	Item text
Rehearsal	
39	When I study for this course, I practice saying the material to myself over and over.
46	When studying for this course, I read my course notes and the course readings over and over again.
59	I memorize key words to remind me of important concepts in this course.
72	I make lists of important items for this course and memorize the lists.
Elaboration	
53	When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions.
62	I try to relate ideas in this subject to those in other courses whenever possible.
64	When reading for this course, I try to relate the material to what I already know.
67	When I study for this course, I write brief summaries of the main ideas from the readings and my course notes.
69	I try to understand the material in this course by making connections between the readings and the concepts from the lectures.
81	I try to apply ideas from course readings in other course activities such as lecture and discussion.
Organization	
32	When I study the readings for this course, I outline the material to help me organize my thoughts.
42	When I study for this course, I go through the readings and my course notes and try to find the most important ideas.
49	I make simple charts, diagrams, or tables to help me organize course material.
63	When I study for this course, I go over my course notes and make an outline of important concepts.
Critical thinking	
38	I often find myself questioning things I hear or read in this course to decide if I find them convincing.
47	When a theory, interpretation, or conclusion is presented in course or in the readings, I try to decide if there is good supporting evidence.
51	I treat the coursematerial as a starting point and try to develop my own ideas about it.
66	I try to play around with ideas of my own related to what I am learning in this course.
71	Whenever I read or hear an assertion or conclusion in this course, I think about possible alternatives.
Metacognitive self-regulation	
33	During course time I often miss important points because I'm thinking of other things. (REVERSED)
36	When reading for this course, I make up questions to help focus my reading.
41	When I become confused about something I'm reading for this course, I go back and try to figure it out.
44	If course readings are difficult to understand, I change the way I read the material.
54	Before I study new course material thoroughly, I often skim it to see how it is organized.
55	I ask myself questions to make sure I understand the material I have been studying in this course.
56	I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
57	I often find that I have been reading for this course but don't know what it was all about. (REVERSED)
61	I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
76	When studying for this course I try to determine which concepts I don't understand well.
78	When I study for this course, I set goals for myself in order to direct my activities in each study period.
79	If I get confused taking notes in course, I make sure I sort it out afterwards.
Time and study environment	

35	I usually study in a place where I can concentrate on my course work.
43	I make good use of my study time for this course.
52	I find it hard to stick to a study schedule. (REVERSED)
65	I have a regular place set aside for studying.
70	I make sure that I keep up with the weekly readings and assignments for this course.
73	I attend this course regularly.
77	I often find that I don't spend very much time on this course because of other activities. (REVERSED)
80	I rarely find time to review my notes or readings before an exam. (REVERSED)
Effort management	
37	I often feel so lazy or bored when I study for this course that I quit before I finish what I planned to do. (REVERSED)
48	I work hard to do well in this course even if I don't like what we are doing.
60	When course work is difficult, I either give up or only study the easy parts. (REVERSED)
74	Even when course materials are dull and uninteresting, I manage to keep working until I finish.
Peer learning	
34	When studying for this course, I often try to explain the material to a coursemate or friend.
45	I try to work with other students from this course to complete the course assignments.
50	When studying for this course, I often set aside time to discuss course material with a group of students from the course.
Help seeking	
40	Even if I have trouble learning the material in this course, I try to do the work on my own, without help from anyone. (REVERSED)
58	I ask the instructor to clarify concepts I don't understand well.
68	When I can't understand the material in this course, I ask another student in this course for help.
75	I try to identify students in this course whom I can ask for help if necessary.

Appendix B. MSLQ-B DE subscales

Item nr	Item text
Management of time and effort	
43	I make good use of my study time for this course.
60	When course work is difficult, I either give up or only study the easy parts. (REVERSED)
70	I make sure that I keep up with the weekly readings and assignments for this course.
73	I attend this course regularly.
74	Even when course materials are dull and uninteresting, I manage to keep working until I finish.
80	I rarely find time to review my notes or readings before an exam. (REVERSED)
Complex cognitive strategy use	
59	I memorize key words to remind me of important concepts in this course.
61	I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
64	When reading for this course, I try to relate the material to what I already know.
76	When studying for this course I try to determine which concepts I don't understand well.
81	I try to apply ideas from course readings in other course activities such as lecture and discussion.
Simple cognitive strategy use	
32	When I study the readings for this course, I outline the material to help me organize my thoughts.
46	When studying for this course, I read my course notes and the course readings over and over again.
63	When I study for this course, I go over my course notes and make an outline of important concepts.
67	When I study for this course, I write brief summaries of the main ideas from the readings and my course notes.
72	I make lists of important items for this course and memorize the lists.
Contacts with others	
45	I try to work with other students from this course to complete the course assignments.
50	When studying for this course, I often set aside time to discuss course material with a group of students from the course.
58	I ask the instructor to clarify concepts I don't understand well.
75	I try to identify students in this course whom I can ask for help if necessary.
Academic thinking	
36	When reading for this course, I make up questions to help focus my reading.
38	I often find myself questioning things I hear or read in this course to decide if I find them convincing.
47	When a theory, interpretation, or conclusion is presented in course or in the readings, I try to decide if there is good supporting evidence.
51	I treat the course material as a starting point and try to develop my own ideas about it.
71	Whenever I read or hear an assertion or conclusion in this course, I think about possible alternatives.

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