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Exploring the moderating role of well-being on the adaptive link between self-assessment practices and learning achievement

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ABSTRACT

Self-assessment practices can positively impact student learning and achievement. However, less is known about psychological moderators that can influence the impact that self-assessment practice may have on achievement. Integrating the dual processing self-regulation model and the self-assessment cycle framework, this study examined the role of students' positive well-being in the link between self-assessment practices and domain-specific achievement scores. Hierarchical multiple regression analyses using data from 765 secondary school students revealed that self-assessment practices positively predicted achievement scores. Results also showed that positive well-being moderated the relationship between seeking internal feedback and self-reflection and achievement scores, in that the positive link between such self-assessment practices and achievement was stronger for students who had low or moderate well-being. These findings reinforce the impact of self-assessment on learning and add to the ecological validity of the dual processing self-regulation model. The discussion focuses on how these findings contribute to our understanding of how well-being could influence the adaptive role of internal and cognitive self-assessment practices in student learning. Limitations and future research directions are also discussed.

1. Introduction

Self-assessment practices (see McDonald & Boud, 2003; Yan, 2020; Yan & Brown, 2017), which involve the agency to determine assessment criteria, seek external and internal feedback, and self-reflection, has been shown to have a positive impact on student learning and achievement (Brown & Harris, 2013; Panadero, Jonsson, & Botella, 2017; Yan, Wang, Boud, & Lao, 2023). Educational research on self-assessment has increased in the past two decades and demonstrated its adaptive role in a wide range of student outcomes (e.g., self-efficacy; self-regulated learning; Kissling & O'Donnell, 2015; Schunk, 2003; Yan & Carless, 2022; Yan et al., 2022). However, despite this expansion in self-assessment research, including both empirical (Leenknecht et al., 2020; McDonald & Boud, 2003; Panadero et al., 2012; Yan, 2020; Yan et al., 2020) and intervention studies (Meusen-Beekman et al., 2016; Yan et al., 2020; Yan et al., 2022), few studies have specifically examined the role of psychological factors, such as well-being, in moderating the relationship between self-assessment practices and learning.

Models of self-regulated learning, such as the dual processing self-regulation model (Boekaerts, 1993; 2006; 2011), can be used to examine how well-being influences the effectiveness of self-assessment for learning. The dual processing self-regulation model acknowledges how internal psychological states like well-being influence learning. According to this model, self-regulated learning initiates a set of dynamic and interacting processes that can influence how learners approach learning tasks (Boekaerts, 2011). Affect and well-being are among these processes that can determine whether or how learners engage in self-regulated learning (see Boekaerts, 1993, 2007). Given the theorizing that psychological factors and processes can influence self-regulated learning, recent reviews on student self-assessment have called for more research to further understand whether or how psychological factors like well-being relate to self-assessment and its implications on student learning (see Andrade, 2019; Lui & Andrade, 2022; Panadero et al., 2016; Shute, 2008). By addressing the scarce research on the psychological factors that influence the impact of self-assessment on achievement, students and educators may further understand how to maximize its impact on learning.

This study aimed to investigate the moderating effect of positive well-being (Keyes, 2002) in the relationship between self-assessment practices and objective achievement scores. Theoreticaly, we integrate

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the dual processing self-regulation model (Boekaerts, 1993; 2006; 2011) and the self-assessment cycle framework (Yan & Brown, 2017) in examining the well-being as a moderators to identify potential conditions where self-assessment practices are most beneficial for improving learning and achievement.

1.1. Self-assessment practice and its implications for learning achievement

Self-assessment is considered a hallmark skill of 21st-century learning (see Dweck, 2009), covering all interrelated evaluative practices and processes of students on their outputs and schoolwork (e.g., self-evaluation, self-appraisal; Taras, 2010). More current theorizing on self-assessment posits that it consists of formative and cyclical practices that demonstrate learners' capacity to appraise the quality of their work, evaluate how well such work adheres to explicitly stated criteria or standards, and make revisions based on feedback sought from multiple sources (see Andrade, 2019; Andrade & Valtcheva, 2009; Boud, 1995; McMillan & Hearn, 2008; Yan & Brown, 2017). Following the self-assessment cycle framework (Yan & Brown, 2017), self-assessment consists of three broad cyclical practices: determining assessment criteria, seeking external and internal feedback, and self-reflection. In the self-assessment process, students first determine the performance criteria for the self-assessment. Subsequently, students take the initiative to seek feedback regarding their learning from external and/or internal sources. External feedback could be obtained via monitoring (i.e., seeking feedback from various sources in the environment) or via inquiry (i.e., seeking feedback from relevant persons). Internal feedback comes from *within the self*, such as feelings, emotions, or sensations (Yan, 2016; Yan & Brown, 2017). It is worth noting that the conceptualization of internal feedback in this study is more specific (i.e., referring to internal states or subjective experiences) compared to the definition in Nicol's (2021), where internal feedback is conceptualized as the process of comparing one's current performance or progress to a reference point. The term "internal feedback" in this study refers to the source of feedback, in contrast with external feedback. However, "internal feedback" in Nicol's work is more about the mechanism by which feedback is generated, i.e., feedback is generated internally by learners themselves through comparing their performance against a reference point. Notably, as Nicol's conceptualization is relatively new, instruments that can evaluate internal feedback based on a reference point may not yet be available.

Based on the collected feedback, externally or internally, students then evaluate and reflect on the quality of their learning processes and outcomes, and identify potential learning needs. Hence, self-assessment entails self-regulated learning strategies and formative assessment practices – an assessment type that continuously elicits indicators of students' schoolwork that can be used to improve current or future learning outcomes (Bennett, 2011; Black & Wiliam, 1998, 2003; Taras, 2010). Accordingly, self-assessment practices are evaluated through the Self-assessment Practices Scale (SaPS; Yan, 2018). The four dimensions of SaPS are seeking external feedback by monitoring (SEFM), seeking external feedback by inquiry (SEFI), seeking internal feedback (SIF), and self-reflection (SR; see Mendoza & Yan, 2021; Yan, 2018).

Several studies have demonstrated the adaptive role of self-assessment practice on school outcomes. Evidence from current interventions, such as randomized control trials and self-assessment diaries/mindmaps, shows that self-assessment practices can boost students' academic performance, self-regulation, and motivation (Meusen-Beekman et al., 2016; Yan et al., 2020; Yan et al., 2022). It has also been identified as a behavioral mechanism that links student motivation to achievement (Mendoza et al., 2022). Research has also demonstrated the impact of self-assessment practice on improving learning and achievement in school (e.g., Andrade, 2019; Cauley & McMillan, 2010; McDonald & Boud, 2003; McMillan & Hearn, 2008; Mendoza et al., 2022; Yan et al., 2020). However, there is a known dearth of studies examining moderators that can examine boundary conditions for the adaptive role of self-assessment on achievement and learning. The exploration of such moderators can shed light on the implications that self-assessment practices hold for learning. Such research can denote whether or not self-assessment practices influence achievement on different levels of psychological moderators (e.g., psychological moderators or well-being).

1.2. The dual processing self-regulated learning model and positive well-being

The Dual Processing Self-Regulated Learning Model suggests that students' moods, affect, and well-being can either facilitate or hinder how they engage in self-regulated learning (Boekaerts, 1993, 2007). According to Boekaerts, (1993, 2007, 2011), self-regulated learning involves a set of dynamic and interrelated processes, such as well-being, that can impact how students approach, appraise, and assess their learning tasks. In her earlier work, Boekaerts (1993) discussed the importance of considering well-being in designing educational interventions and programs.

In terms of how students engage in a learning task, the model posits that students can take either the growth or the well-being pathway (see Fig. 1; Boekaerts, 2007, 2011). When students have positive cognitions and emotions, they are more likely to take the mastery or growth pathway. The growth pathway is considered the ideal self-regulated learning pathway because it allows students to approach their learning tasks with a positive and motivated mindset, which can facilitate their learning and achievement. Students who take the growth pathway are more likely to engage in self-regulatory behaviors such as setting learning goals, monitoring their progress, and seeking feedback, which can support their learning and help them to achieve their goals (see Boekaerts, 2011; Boekaerts & Corno, 2005; Musso et al., 2019; Panadero, 2017). Alternatively, when students have negative thoughts and emotions, this can prompt them to shift to the well-being pathway. The well-being pathway shifts students' goals from their tasks to their well-being, allowing learners to resolve negative emotions and bring the task back into alignment with their learning goals and needs (Boekaerts, 1993, 2007, 2011).

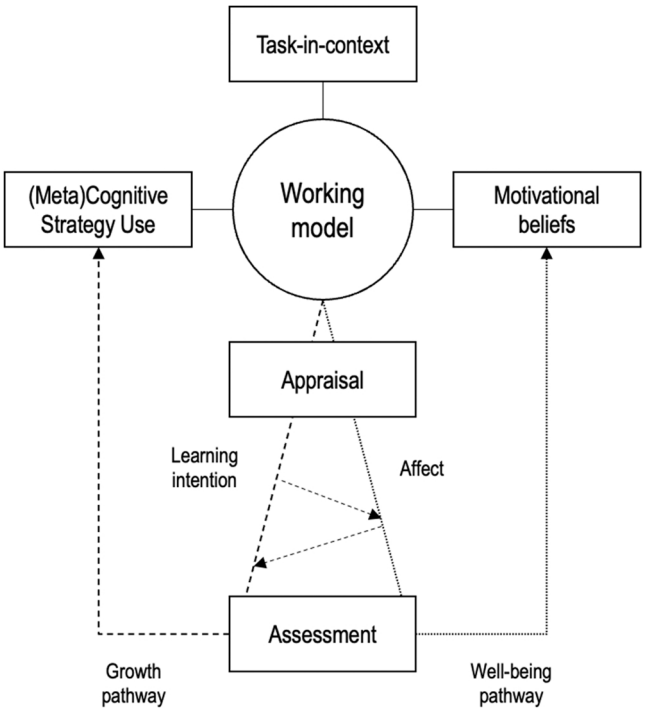


Fig. 1. The dual process self-regulation model (Boekaerts, 2006; 2007).

For example, consider a secondary school student named Ana. According to the dual processing self-regulated learning model, when Ana is feeling positive and motivated, she is more likely to approach her learning tasks effectively, through the growth pathway, and engage in self-regulatory behaviors like setting learning goals, seeking feedback, and monitoring her progress. This can help Ana achieve her learning goals and feel a sense of accomplishment. On the other hand, when Ana is experiencing negative affect or stressed, she may be more likely to take the well-being pathway, which focuses on resolving negative emotions. By focusing on her well-being, Ana may be better able to return to her learning tasks with a more positive and motivated approach, which could facilitate her learning and achievement.

In this example, Ana's well-being plays a key role in determining how she engages in self-regulated learning. This demonstrates the potential of well-being in influencing the relationship between learning behaviors and outcomes. Hence, students' well-being can theoretically influence how they engage in self-regulated learning or self-assessment practice. Given the role that well-being plays in determining students' self-regulated learning and achievement, it is relevant to empirically examine whether or how students' well-being modifies how self-assessment practice and its components impacts learning.

Well-being is conceptualized in this study from the perspective of positive psychology (Keyes, 1998, 2002; Ryff & Keyes, 1995). Keyes (2002) defined positive well-being as indicators of mental health demonstrating positive feelings and functioning, operationalized by measures of subjective well-being (i.e., individuals' perceptions and evaluations of their lives and the quality of their functioning in their lives). It consists of three dimensions: emotional well-being (positive affect), psychological well-being (personal growth or satisfaction), and social well-being (social functioning; Keyes, 2005, 2007; Keyes et al., 2008).

Keyes's (2002, 2007, 2008) conceptualization of positive well-being defines emotional well-being as the presence of positive emotions and the absence of negative emotions, such as happiness, contentment, and satisfaction with life. Psychological well-being, on the other hand, refers to one's sense of purpose, meaning, and fulfillment in life and the ability to manage and cope with stress and adversity. Lastly, social well-being refers to a person's connections and relationships with others, including the quality and quantity of relationships, a sense of belonging and community, and the ability to interact with others meaningfully. Students' positive well-being correlates positively with their learning and achievement (e.g., Antaramian, 2015).

Focusing on the adaptive role of self-assessment practice on learning and the role positive well-being may play between the two, the cyclical self-assessment process (Yan & Brown, 2017) can be integrated into the dual processing model (Boekaerts, 1993, 2007). Particularly, in a specific learning domain (e.g., English language learning), an explicit test of the dual processing model can be implemented by operationalizing self-assessment practice as assessment processes, achievement scores as learning outcomes, and well-being as emotional states (see Fig. 2). This study can reinforce the ecological validity of the dual processing model if students with high positive well-being will benefit more from the adaptive impact of self-assessment practice on English language learning. (Fig. 3).

1.3. The current study

Examining whether well-being could impact the effectiveness of self-assessment practices on improving student learning can provide schools and educators with valuable insights to optimize the use of self-assessment practices. The research area focused on the psychological factors relevant to self-assessment and learning is currently underrepresented (cf. Yang et al., 2023). With the integration of the dual processing self-regulation model (Boekaerts, 2006, 2011) and the self-assessment cycle framework (Yan & Brown, 2017), this study sought to examine the moderating role of positive well-being (Keyes, 2002) in the link between self-assessment practices and achievement scores. Using data from 765 Filipino secondary school students, we applied hierarchical multiple regression to examine the link between self-assessment practice components (i.e., seeking external feedback, seeking internal feedback, and self-reflection) and English learning achievement. We also aimed to test whether well-being components (i.e., emotional, social, and psychological well-being) will moderate the self-assessment to achievement link. The study hypotheses are as follows:

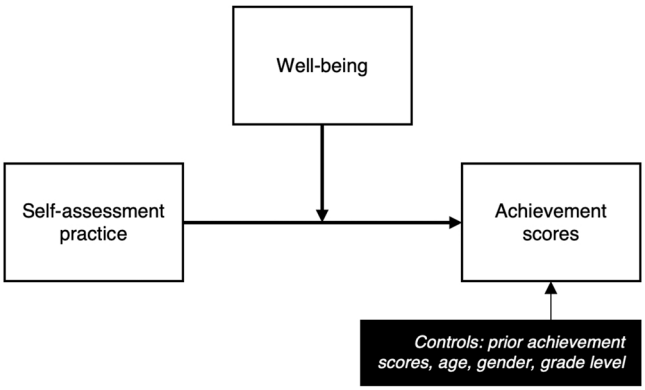


Fig. 2. The conceptual framework of the current study testing the moderating role of well-being on the link between self-assessment practice and achievement scores.

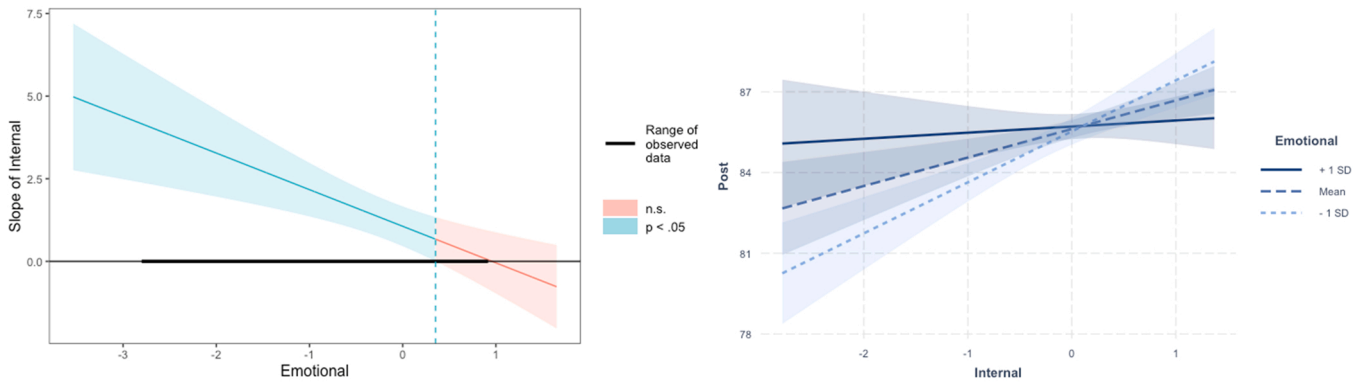
1. The four components of self-assessment practices will have a positive and significant relationship with achievement scores in English language learning while controlling for demographic factors and previous achievement scores. Specifically, we test whether seeking external feedback by monitoring (SEFM; H1.1), seeking external feedback by inquiry (SEFI; H1.2), seeking internal feedback (SIF; H1.3), and self-reflection (SR; H1.4) will have a positive relationship with achievement scores.
2. Well-being will moderate the positive effect of self-assessment components on achievement scores while controlling for demographic factors and previous achievement scores. Specifically, emotional well-being will moderate the SEFM→achievement link (H2.1), the SEFI→achievement link (H2.2), the SIF→achievement link (H2.3), and the SR→achievement link (H2.4).
3. Social well-being will moderate the SEFM→achievement link (H3.1), the SEFI→achievement link (H3.2), the SIF→achievement link (H3.3), and the SR→achievement link (H3.4).
4. Psychological well-being will moderate the SEFM→achievement link (H4.1), the SEFI→achievement link (H4.2), the SIF→achievement link (H4.3), and the SR→achievement link (H4.4).

2. Methods

2.1. Participants and procedures

The data consisted of objective achievement scores in English language learning and self-report data. The prior and current grades correspond to the 3rd and 4th quarter achievement scores, respectively. Seven hundred ninety-six secondary school students participated in the self-report survey conducted in the middle of the final quarter of the school year. After matching the dataset, achievement data for 31 students were incomplete and were excluded from the study, resulting in a final sample size of 765 students. The data consists of 227, 177, 182, and 179 students from Grades 7, 8, 9, and 10, respectively. The students' mean age was 14.13 years old ($SD = 1.51$), with nearly equal numbers of boys and girls ($n = 408$ girls, 53.33 %).

The Human Research Ethics Committee of the authors' affiliated



(a) (b)

Fig. 3. Johnson-Neyman (a) and simple slopes (b) plots for the moderating role of emotional well-being on the link between seeking internal feedback (SIF) on English learning achievement. Notes. Emotional = Emotional well-being; Internal = Seeking internal feedback; Post = T2 English learning achievement.

university approved the methods of the study. Through the Department of Education Divisions Office in the Philippines, the first author approached a public secondary school in a province two hours north of the country's capital to conduct the study. Informed assent forms were requested from the students, which their guardians and teachers also reviewed. The school's principal and English teachers assessed the survey questions beforehand to determine whether they were appropriate for the students' level of English language comprehension. The questionnaires were in English, as English is the language of instruction in the Philippines.

The self-report data were collected through a paper-and-pen method two weeks into the final quarter of the school year. A qualified research assistant administered the questionnaires comprising the instruments described below. The surveys were explained to the students. The English teacher was also present throughout the data collection. Eight weeks later, the school computed and provided the objective achievement scores on English learning, including the students' achievement scores for the previous quarter. Then, the self-report data and achievement scores were matched to the appropriate student's respondent ID.

2.2. Measures

2.2.1. Demographic covariates

The demographic page inquired about the participant's age, gender, and grade level.

2.2.2. Self-assessment practice scale (SaPS)

The SaPS (Yan, 2018) is a 20-item instrument developed from the cyclical model of the self-assessment process (Yan & Brown, 2017). The subject-specific version of the scale (Mendoza & Yan, 2021) was used in this study to measure self-assessment practices in English learning. It consists of four subscales, all with adequate internal reliability in this study: seeking external feedback by monitoring (SEFM; $\alpha = .70$), seeking external feedback by inquiry (SEFI; $\alpha = .74$), seeking internal feedback (SIF; $\alpha = .66$), and self-reflection (SR; $\alpha = .79$). In the current study, the scale's four-factor construct validity had excellent fit to the data SB$\chi^2(164) = 272.859$, CFI = 0.956, TLI = 0.949, RMSEA = 0.038, SRMR = 0.04.

2.2.3. Well-being

We used the Mental Health Continuum-Short Form (MHC-SF; Keyes, 2002; Keyes et al., 2008) to assess positive well-being. This is a 14- item measure of well-being, with items assessing emotional well-being (3 items; e.g., "*satisfied with life*"), social well-being (5 items; e.g., "*that you had something important to contribute to society*"), and psychological well-being (6 items; e.g., "*that your life has a sense of direction or meaning to it*"). Respondents rate the items from 1 (*never*) to 6 (*every day*). In the current study, the scale's three-factor structure had an excellent fit to the data SB$\chi^2(74) = 184.802$, CFI = 0.960, TLI = 0.951, RMSEA = 0.058, SRMR = 0.038. The reliability of the subscales ranged from 0.81 to 0.83 (see Table 1).

2.2.4. Achievement scores in english learning

The K-12 Basic Education Program (Department of Education, 2013, 2016) employs a standard- and competency-based grading system, where grades are determined by the weighted raw score of the students' summative examinations. The basic education system in the Philippines divides the academic year into four quarters, each quarter with a duration of two months (Department of Education, 2013, 2016). For each quarter, achievement scores are calculated. The third and fourth quarter grades in English language learning were used in this study. The average grade of the students in the 3rd and 4th quarters are 82.95 (*SD* = 5.72) and 85.48 (*SD* = 6.05), respectively.

2.3. Data analysis

We used hierarchical multiple regression to examine how self-assessment practices predict achievement scores and whether such a link is moderated by well-being. Before conducting the moderation analyses, Confirmatory Factor Analysis (CFA) using the lavaan package (Rosseel, 2012) was conducted to examine the instruments' factor structure and compute the factor scores for each subscale. We generated factor scores from the CFA to correct for item-level measurement errors that may not be accounted for when using aggregate or sum scores from the scale items. We then computed bivariate correlations.

Considering potential suppression effects or multicollinearity we computed a default model where we controlled for demographic variables (age, gender, grade level) and prior achievement as a preliminary step. A total of 16 regression models were run to test our substantive research questions. Four models (Models 1a to 1d) tested whether the link between seeking external feedback by monitoring (SEFM) as a self-assessment practice and achievement scores was moderated by the three types of well-being (i.e., emotional, psychological, and social). Models 2a to 2d were configured similarly to Models 1a to 1d, but the self-assessment predictor was replaced with seeking external feedback by inquiry (SEFI). Similarly, Models 3a to 3d and Models 4a to 4d had seeking internal feedback (SIF) and self-reflection (SR) as predictors, respectively. All models included age, gender, and grade level as covariates. The autoregressive effect of the previous achievement was also controlled for (see King & Mendoza, 2021; Mendoza & King, 2020, for the relevance of accounting for autoregressor effects). We plotted the models using the Johnson-Neyman technique and the analysis of the

Table 1
Bivariate correlations, descriptive and normality statistics.

Variables	1	2	3	4	5	6	7	8	9
1. SEFM	(.70)								
2. SEFI	.53**	(.74)							
3. SIF	.51**	.41**	(.66)						
4. SR	.66**	.54**	.61**	(.79)					
5. Emotional WB	.26**	.21**	.16**	.28**	(.81)				
6. Social WB	.34**	.33**	.25**	.37**	.61**	(.83)			
7. Psychological WB	.35**	.30**	.27**	.43**	.64**	.72**	(.83)		
8. Previous grades	.21**	.04	.18**	.35**	.12**	.11*	.21**	—	
9. Current grades	.23**	.10*	.21**	.35**	.14**	.10*	.19**	.65**	—
Mean	21.45	17.45	17.45	31.62	14.51	22.28	27.99	82.95	85.48
SD	3.63	3.57	3.03	5.03	3.32	5.08	5.62	5.72	6.05
Skewness	-.41	-.70	-.55	-.73	-1.25	-.69	-.99	-.08	-.28
Kurtosis	3.76	3.52	3.87	4.44	4.14	3.11	3.97	2.20	3.16

Note: Scores shown in parentheses on diagonal are internal consistency reliabilities of the scales (Cronbach's alpha), *. $p < .01$, **. $p < .001$.

simple slopes in R (R Core Team, 2016). The Johnson-Neyman technique determines the value throughout the range of the scores of the moderator at which the influence of the independent variable on the dependent variable changes from statistically significant to not (e.g., Dizon & Mendoza, 2022; Dizon, et al., 2023; see also Hayes, 2013). The simple slopes plot further probed the potential moderating effects. Slopes for low and high well-being were computed as one standard deviation less than the mean (i.e., *mean*-1*SD*) and one standard deviation greater than the mean (i.e., *mean*+1 *SD*), respectively. Average or mean well-being scores represented moderate well-being.

3. Results

3.1. Preliminary analyses

Descriptive statistics, bivariate correlations, and scale internal reliabilities are shown in Table 1. The intercorrelation between the components of self-assessment practices ranged from .41 to .66 (moderate strength), while the intercorrelation between well-being components ranged from .61 to .72 (moderate to high strength). The relationship between self-assessment practice and well-being components ranged from .16 to .43 (low to moderate strength). The association between self-assessment practice to achievement scores was from .10 to .35 (low to moderate strength), while well-being components had correlations to achievement scores ranging from .10 to .21 (low strength), suggesting that multicollinearity is not a concern.

3.2. The direct effects of self-assessment practices and well-being on achievement scores

Examining the direct link between self-assessment practice components to achievement scores in English language learning, the former is regressed to the latter while controlling for age, gender, grade level, and previous achievement scores. As expected, previous achievement scores predicted current achievement scores with moderate strength (see Models 1a, 2a, 3a, and 4a). Still, while controlling for the previous achievement, the four self-assessment components positively predicted achievement scores. Specifically, SEFM ($\beta = .136$; $p < 0.001$), SEFI ($\beta = .105$; $p < 0.001$), SIF ($\beta = .126$; $p < 0.001$), and SR ($\beta = .147$; $p < 0.001$) all positively predicted achievement scores. In terms of effect size, the strengths of the effect of these specific self-assessment practices on achievement scores is considered medium in effect size (Cohen, 1992).

3.3. The moderating role of well-being on the self-assessment and achievement link

The moderating effects of well-being were tested by extending the direct effects models. To do this, we added well-being components as predictor variables, including their corresponding interaction terms with self-assessment practice (e.g., SEFM × emotional well-being). Specifically, Models 1b, 1c, and 1d, tested the moderating effect of emotional, social, and psychological well-being on the link between SEFM and achievement scores (see Table 2). Results show that well-being components did not moderate the relationship between SEFM and achievement scores. Specifically, while SEFM maintained its direct effect on achievement, the interaction term of SEFM and well-being components did not significantly predict achievement scores (see Table 2). Similarly, the link between SEFI and achievement scores was not significantly moderated by the well-being components (see Table 3).

On the other hand, specific well-being components significantly moderated the link between SIF and achievement (see Table 4) and SR and achievement (see Table 5). Specifically, Model 3b (i.e., SIF × emotional well-being) and 3d (i.e., SIF × psychological well-being) respectively demonstrate the moderating effect of emotional ($\beta = .08$; $p < 0.001$) and psychological well-being ($\beta = .05$; $p < 0.001$) on the link between SIF and achievement scores. Both of these effects are considered small in terms of their effect size (Cohen, 1992). Models 3b and 3d highlight that the link between SIF and achievement varies in different levels of well-being. Social well-being did not moderate the SIF-achievement link (see Model 3c). Model 4b (i.e., SR × emotional well-being) demonstrated the significant moderating effect of emotional well-being on the link between SR and achievement ($\beta = .05$; $p < 0.001$; see Table 5). This effect can be categorized as small effect size (Cohen, 1992). Social and psychological well-being did not moderate the SR-achievement link (see Models 4c and 4d).

To probe and illustrate the moderating effects of emotional well-being on the relationship between SIF and achievement (Model 3b) and SR and achievement (Model 4b), and the moderating effect of psychological well-being on the link between SIF and achievement (Model 3d), we used the Johnson-Neyman (JN) technique and plotted the simple slopes analyses. For Model 3b, the JN plots illustrate that the slope of SIF on predicting achievement is statistically significant outside the range of 0.35–2.59 for emotional well-being (see Fig. 5a). Hence, given that the range of observed values of emotional well-being is from − 2.78–0.90, the slope of SIF is statistically significant at values less than 0.36. Simple slopes analysis also uncovers that the positive association between SIF and achievement is only significant for low (estimated $\beta = 1.90$, $t = 5.19$, $p < 0.001$) and moderate emotional well-being (estimated $\beta = 1.06$, $t = 3.44$, $p < 0.001$; see Fig. 5b). Notably, the link between SIF and achievement is non-significant for those with

Table 2
Hierarchical multiple regression models examining how seeking external feedback by monitoring (SEFM) predicts achievement scores, and the moderating role of emotional, social, and psychological well-being.

Models	Model 1		Model 1a		Model 1b		Model 1c		Model 1d	
	β	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)
(Intercept)	-0.050	(−1.216, 0.041, −0.131: 0.031)	-0.050	(−1.240, 0.041, −0.130: 0.029)	-0.038	(−0.906, 0.041, −0.119: 0.044)	-0.040	(−0.960, 0.042, −0.123: 0.042)	-0.040	(−0.962, 0.042, −0.123: 0.042)
Age	-0.076	(−1.627, 0.046, −0.167: 0.016)	-0.073	(−1.591, 0.046, −0.163: 0.017)	-0.081	(−1.764, 0.046, −0.171: 0.009)	-0.076	(−1.651, 0.046, −0.167: 0.014)	-0.080	(−1.727, 0.046, −0.170: 0.011)
Gender	0.094	(1.636, 0.057, −0.019: 0.207)	0.094	(1.669, 0.057, −0.017: 0.206)	0.100	(1.763, 0.057, −0.011: 0.211)	0.091	(1.595, 0.057, −0.021: 0.203)	0.098	(1.710, 0.057, −0.014: 0.210)
Grade level	0.056	(1.189, 0.047, −0.036: 0.148)	0.057	(1.227, 0.046, −0.034: 0.148)	0.063	(1.368, 0.046, −0.028: 0.154)	0.058	(1.241, 0.047, −0.034: 0.149)	0.062	(1.326, 0.046, −0.030: 0.153)
Prior grades	0.627***	(21.450, 0.029, 0.570: 0.684)	0.590***	(19.762, 0.030, 0.531: 0.648)	0.587***	(19.661, 0.030, 0.529: 0.646)	0.591***	(19.722, 0.030, 0.532: 0.650)	0.589***	(19.576, 0.030, 0.530: 0.648)
SEFM	—	—	0.136***	(4.821, 0.028, 0.081: 0.192)	0.122***	(4.076, 0.030, 0.063: 0.181)	0.140***	(4.496, 0.031, 0.079: 0.201)	0.128***	(4.117, 0.031, 0.067: 0.189)
EmoWB	—	—	—	—	0.012	(0.394, 0.031, −0.048: 0.073)	—	—	—	—
SEFM×EmoWB	—	—	—	—	-0.045	(−1.899, 0.024, −0.091: 0.002)	—	—	—	—
SocialWB	—	—	—	—	—	—	-0.020	(−0.630, 0.032, −0.082: 0.042)	—	—
SEFM×SocialWB	—	—	—	—	—	—	-0.020	(−0.853, 0.023, −0.064: 0.025)	—	—
PsychWB	—	—	—	—	—	—	—	—	0.004	(0.118, 0.032, −0.060: 0.067)
SEFM×PsychWB	—	—	—	—	—	—	—	—	-0.027	(−1.189, 0.023, −0.071: 0.017)
F	137.952***		118.240***		85.436***		84.461***		84.660***	
df	(4, 760)		(5, 759)		(7757)		(7757)		(7757)	
R^2	0.421		0.438		0.441		0.439		0.439	
ΔR^2	0.418		0.434		0.436		0.433		0.434	

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$;** $p < 0.01$;* $p < 0.05$.

higher scores of emotional well-being (estimated $\beta = 0.23$, $t = 0.55$, $p = 0.59$).

Similar findings were observed in probing the moderating effects of psychological well-being on the relationship between SIF and achievement (Model 3d). Specifically, the JN plots show that, in the range of observed values of psychological well-being (−3.36 to 1.25), the slope of SIF was significant outside the range of 0.35–2.59 (see Fig. 4a). Simple slopes analysis shows that the positive link between SIF and achievement is only observed to be statically significant for low (estimated $\beta = 1.66$, $t = 4.50$, $p < 0.001$) and moderate psychological well-being (estimated $\beta = 1.12$, $t = 3.53$, $p < 0.001$; see Fig. 4b). The positive correlation between SIF and achievement statistically diminishes as psychological well-being scores increase (estimated $\beta = 0.58$, $t = 1.40$, $p = 0.16$).

Finally, probing the moderating role of emotional well-being on the link between SR and achievement (Model 4b), the slope of SR was significant outside the interval of 0.77–15.51 of emotional well-being. Since the observed values for emotional well-being ranged from − 2.78–0.90, the slope of SR is non-significant for values of emotional well-being greater than 0.77. Results from the simple slopes highlight that the strength of the positive association between SR and achievement weakens as emotional well-being increases such that the SR-achievement link is observed to be statically significant only for low (estimated $\beta = 1.90$, $t = 5.04$, $p < 0.001$) and moderate emotional well-being (estimated $\beta = 1.36$, $t = 4.38$, $p < 0.001$; see Fig. 4b). With high emotional well-being scores, the positive link between SR and achievement is statistically non-significant (estimated $\beta = 0.81$, $t = 2.00$, $p = 0.05$).

4. Discussion

Addressing the scant literature on the psychological factors that influence self-assessment practice can strengthen our understanding of how we can maximize its adaptive impact on students' learning. In this study, we examined whether or how positive well-being could moderate the impact of self-assessment practice on objective achievement scores. We found that all four components of self-assessment practice directly influenced achievement scores (supporting H1.1 to H1.4) while controlling for previous achievement and demographic covariates. We also found that well-being components were statistically significant

Table 3
Hierarchical multiple regression models examining how seeking external feedback by inquiry (SEFI) predicts achievement scores, and the moderating role of emotional, social, and psychological well-being.

Models	Model 2		Model 2a		Model 2b		Model 2c		Model 2d	
	β	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)
(Intercept)	-0.050	(−1.216, 0.041, −0.131: 0.031)	-0.052	(−1.264, 0.041, −0.132: 0.029)	-0.047	(−1.146, 0.041, −0.129: 0.034)	-0.047	(−1.130, 0.042, −0.130: 0.035)	-0.047	(−1.130, 0.042, −0.130: 0.035)
Age	-0.076	(−1.627, 0.046, −0.167: 0.016)	-0.078	(−1.687, 0.046, −0.168: 0.013)	-0.084	(−1.815, 0.046, −0.174: 0.007)	-0.081	(−1.742, 0.046, −0.172: 0.010)	-0.085	(−1.835, 0.046, −0.176: 0.006)
Gender	0.094	(1.636, 0.057, −0.019: 0.207)	0.097	(1.701, 0.057, −0.015: 0.209)	0.106	(1.849, 0.057, −0.007: 0.218)	0.099	(1.717, 0.057, −0.014: 0.212)	0.105	(1.835, 0.057, −0.007: 0.218)
Grade level	0.056	(1.189, 0.047, −0.036: 0.148)	0.064	(1.370, 0.047, −0.028: 0.155)	0.067	(1.448, 0.047, −0.024: 0.159)	0.066	(1.403, 0.047, −0.026: 0.157)	0.069	(1.477, 0.047, −0.023: 0.161)
Prior grades	0.627***	(21.450, 0.029, 0.570: 0.684)	0.612***	(20.932, 0.029, 0.555: 0.669)	0.606***	(20.579, 0.029, 0.548: 0.664)	0.612***	(20.667, 0.030, 0.554: 0.670)	0.607***	(20.390, 0.030, 0.549: 0.666)
SEFI	—	—	0.105***	(3.808, 0.028, 0.051: 0.160)	0.088**	(3.023, 0.029, 0.031: 0.145)	0.101***	(3.328, 0.030, 0.041: 0.160)	0.090**	(2.987, 0.030, 0.031: 0.149)
EmoWB	—	—	—	—	0.035	(1.154, 0.030, −0.024: 0.094)	—	—	—	—
SEFI×EmoWB	—	—	—	—	-0.029	(−1.224, 0.024, −0.075: 0.017)	—	—	—	—
SocialWB	—	—	—	—	—	—	0.000	(0.008, 0.031, −0.061: 0.061)	—	—
SEFI×SocialWB	—	—	—	—	—	—	-0.013	(−0.572, 0.023, −0.059: 0.032)	—	—
PsychWB	—	—	—	—	—	—	—	—	0.025	(0.799, 0.031, −0.036: 0.087)
SEFI×PsychWB	—	—	—	—	—	—	—	—	-0.023	(−0.981, 0.023, −0.068: 0.023)
F	137.952***		115.221***		83.047***		82.171***		82.619***	
df	(4, 760)		(5, 759)		(7757)		(7757)		(7757)	
R^2	0.421		0.432		0.434		0.432		0.433	
ΔR^2	0.418		0.428		0.429		0.427		0.428	

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$;** $p < 0.01$;* $p < 0.05$.

moderators of the link between self-assessment components and achievement.

The results showed that emotional well-being moderated the link between seeking internal feedback (supports H2.3) and self-reflection (supports H2.4) to achievement. Similarly, the findings demonstrated that psychological well-being moderated the link between seeking internal feedback and achievement (supports H4.3). Probing these effects, we found that self-assessment practices such as seeking internal feedback and engaging in self-reflection had a positive impact on student achievement, especially when levels ofemotional and psychological well-being were low. That is, the relationships linking seeking internal feedback and self-reflection on achievement were stronger for students with low and moderate well-being scores, suggesting that these self-assessment practices may be particularly beneficial for students with lower levels of emotional and psychological well-being. These significant moderation effects yielded small effect sizes. Below we interpret these results through the lens of the dual processing self-regulation model (Boekaerts, 2006, 2011) and the self-assessment cycle (Yan & Brown, 2017).

4.1. The adaptive role of self-assessment practice on learning achievement and the moderating role of well-being

This study supports the adaptive role of self-assessment practice on learning achievement. Recent empirical studies on the importance of self-assessment practice as a key behavioral learning strategy provide support for this finding (Leenknecht et al., 2020; McDonald & Boud, 2003; Mendoza et al., 2022; Panadero et al., 2012; Yan et al., 2020; Yan et al., 2022). The behavioral disposition to use available information as feedback to perform optimally and to improve could explain the positive impact of self-assessment practice on learning achievement (Yan, 2020; Yan & Brown, 2017). This is also supported by review studies, which further demonstrate the positive influence of students' self-assessment practice on learning and achievement (see Brown & Harris, 2013; Yan, Wang, Boud, & Lao, 2023). Notably, the results show that all self-assessment components predicted achievement significantly, even after controlling for demographic covariates and previous achievement scores. This suggests that self-assessment practice and its components have a robust, positive, and statistically significant effect on objective achievement scores.

Regarding the role of positive well-being as a moderator, results

Table 4
Hierarchical multiple regression models examining how seeking internal feedback (SIF) predicts achievement scores, and the moderating role of emotional, social, and psychological well-being.

Models	Model 3		Model 3a		Model 3b		Model 3c		Model 3d	
	β	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)
(Intercept)	-0.050	(−1.216, 0.041, −0.131: 0.031)	-0.052	(−1.272, 0.041, −0.132: 0.028)	-0.032	(−0.783, 0.041, −0.113: 0.048)	-0.035	(−0.849, 0.042, −0.117: 0.046)	-0.036	(−0.855, 0.042, −0.117: 0.046)
Age	-0.076	(−1.627, 0.046, −0.167: 0.016)	-0.072	(−1.563, 0.046, −0.162: 0.018)	-0.087	(−1.899, 0.046, −0.177: 0.003)	-0.083	(−1.796, 0.046, −0.174: 0.008)	-0.086	(−1.873, 0.046, −0.177: 0.004)
Gender	0.094	(1.636, 0.057, −0.019: 0.207)	0.097	(1.712, 0.057, −0.014: 0.209)	0.105	(1.857, 0.056, −0.006: 0.216)	0.097	(1.704, 0.057, −0.015: 0.209)	0.104	(1.824, 0.057, −0.008: 0.216)
Grade level	0.056	(1.189, 0.047, −0.036: 0.148)	0.055	(1.181, 0.046, −0.036: 0.146)	0.066	(1.441, 0.046, −0.024: 0.157)	0.062	(1.321, 0.047, −0.030: 0.153)	0.066	(1.419, 0.046, −0.025: 0.157)
Prior grades	0.627***	(21.450, 0.029, 0.570: 0.684)	0.593***	(19.846, 0.030, 0.534: 0.652)	0.588***	(19.741, 0.030, 0.529: 0.646)	0.592***	(19.748, 0.030, 0.533: 0.651)	0.590***	(19.607, 0.030, 0.531: 0.649)
SIF	—	—	0.126***	(4.455, 0.028, 0.071: 0.182)	0.101***	(3.443, 0.029, 0.044: 0.159)	0.119***	(3.913, 0.030, 0.059: 0.179)	0.107***	(3.529, 0.030, 0.048: 0.167)
EmoWB	—	—	—	—	0.015	(0.497, 0.030, −0.043: 0.073)	—	—	—	—
SIF×EmoWB	—	—	—	—	**-0.080****	(−3.466, 0.023, −0.125: −0.035)	—	—	—	—
SocialWB	—	—	—	—	—	—	-0.012	(−0.402, 0.030, −0.072: 0.048)	—	—
SIF×SocialWB	—	—	—	—	—	—	-0.044	(−1.956, 0.023, −0.089: 0.000)	—	—
PsychWB	—	—	—	—	—	—	—	—	0.012	(0.375, 0.031, −0.049: 0.072)
SIF×PsychWB	—	—	—	—	—	—	—	—	**-0.052***	(−2.322, 0.022, −0.095: −0.008)
F	137.952***		117.066***		86.956***		84.366***		84.973***	
df	(4, 760)		(5, 759)		(7757)		(7757)		(7757)	
R^2	0.421		0.435		0.446		0.438		0.440	
ΔR^2	0.418		0.432		0.441		0.433		0.435	

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$;** $p < 0.01$;* $p < 0.05$.

show that emotional and psychological well-being moderated the link between seeking internal feedback (SIF) and achievement, while emotional well-being moderated the link between self-reflection (SR) and achievement. This suggests that the impact of specific self-assessment practices on achievement may vary depending on students' well-being levels. Specifically, the positive impact of seeking internal feedback and self-reflection on achievement was found to be4 statistically significant for students with low and moderate levels of well-being, although the effect sizes were small (see Tables 4 and 5). We discuss these core research findings below.

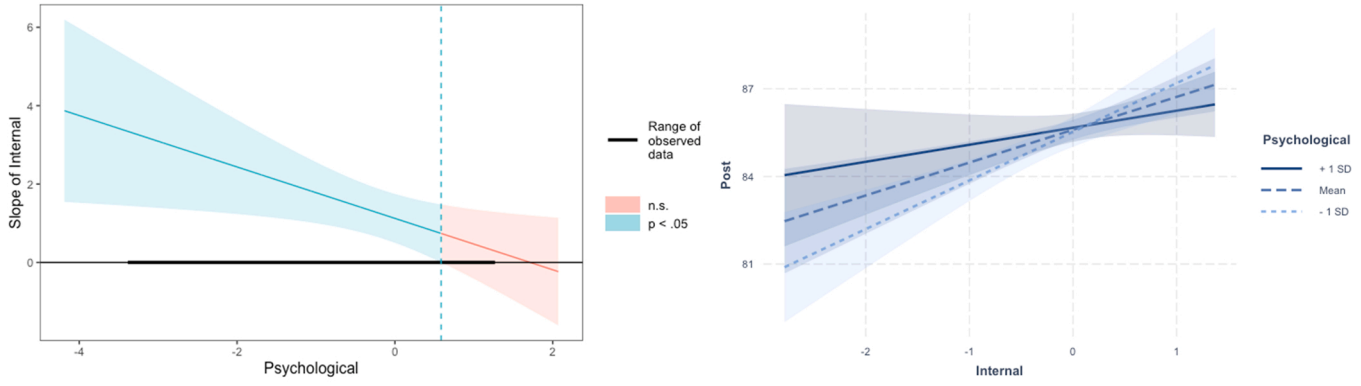
The act of seeking internal feedback involves focusing on personal feelings, emotions, sensations, internal states or subjective experiences (Yan, 2016; Yan & Brown, 2017). This type of feedback-seeking is more accessible than external feedback and can operate automatically and unconsciously, potentially influencing or even overriding external feedback (see Yan & Brown, 2017). The results show that students with low emotional and psychological well-being benefit academically from seeking internal feedback. This finding is supported by the dual processing self-regulated learning model (Boekaerts,1993, 2007, 2011), which suggests that when students experience low levels of positive affect and personal satisfaction, they may be more likely to take the well-being pathway in their learning process. When students with low well-being seek internal feedback, they may be able to consider their well-being and take the well-being pathway (Boekaerts, 2007). To reiterate, the well-being pathway takes into account students' well-being to resolve negative emotions, regain a sense of well-being, and bring the task back into alignment with their learning goals (Boekaerts,2006, 2007, 2011). The well-being pathway facilitates the realignment of students' motivational beliefs about the learning task that helps them reengage and improve (see Boekaerts, 2006, 2011). When students' well-being is high, there could be less internal feedback to the process. And since students with high well-being tend to be more resilient and cope adequately with challenges inside and outside school (Bajaj & Pande, 2016; Masten et al., 1999; Shi et al., 2015), they can focus more on the learning task through the growth pathway (see Boekaerts, 2006). Hence, the moderating role of well-being on the link between seeking internal feedback and achievement supports previous research and theorizing that it is particularly relevant that students seek internal feedback when they experience lower levels of emotional and psychological well-being. By acknowledging and addressing students' well-being, students may be able to resolve negative emotions, improve their well-being, and better align their learning tasks. The process of seeking internal feedback can further enable and enhance these outcomes.

Relatedly, emotional well-being moderated the link between self-reflection and achievement. Specifically, the influence of self-reflection on learning achievement is more pronounced for students with lower levels of emotional well-being. This may be due to the fact that students with low subjective well-being are more prone to ruminate and are more likely to dwell on negative events, which is a repetitive and negative thought process that tends to focus on negative events and can further exacerbate their well-being (see Lyubomirsky, 2001; McLaughlin & Nolen-Hoeksema, 2011). In contrast, self-reflection is a purposeful cognitive process that involves evaluating one's strengths and

Table 5
Hierarchical multiple regression models examining how self-reflection (SR) predicts achievement scores, and the moderating role of emotional, social, and psychological well-being.

Models	Model 4		Model 4a		Model 4b		Model 4c		Model 4d	
	β	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)	*β*	(*t*, *SE*, 95% CI)
(Intercept)	-0.050	(−1.216, 0.041, −0.131: 0.031)	-0.050	(−1.231, 0.041, −0.130: 0.030)	-0.034	(−0.826, 0.041, −0.115: 0.047)	-0.036	(−0.862, 0.042, −0.118: 0.046)	-0.036	(−0.864, 0.042, −0.119: 0.046)
Age	-0.076	(−1.627, 0.046, −0.167: 0.016)	-0.073	(−1.598, 0.046, −0.163: 0.017)	-0.083	(−1.813, 0.046, −0.173: 0.007)	-0.078	(−1.686, 0.046, −0.168: 0.013)	-0.081	(−1.757, 0.046, −0.171: 0.010)
Gender	0.094	(1.636, 0.057, −0.019: 0.207)	0.094	(1.658, 0.056, −0.017: 0.204)	0.099	(1.748, 0.057, −0.012: 0.210)	0.089	(1.554, 0.057, −0.023: 0.201)	0.095	(1.670, 0.057, −0.017: 0.207)
Grade level	0.056	(1.189, 0.047, −0.036: 0.148)	0.054	(1.165, 0.046, −0.037: 0.144)	0.061	(1.332, 0.046, −0.029: 0.152)	0.055	(1.178, 0.046, −0.036: 0.146)	0.059	(1.270, 0.046, −0.032: 0.150)
Prior grades	0.627***	(21.450, 0.029, 0.570: 0.684)	0.582***	(19.364, 0.030, 0.523: 0.641)	0.581***	(19.331, 0.030, 0.522: 0.640)	0.584***	(19.379, 0.030, 0.525: 0.643)	0.583***	(19.275, 0.030, 0.524: 0.642)
SR	—	—	0.147***	(5.161, 0.029, 0.091: 0.203)	0.132***	(4.379, 0.030, 0.073: 0.192)	0.152***	(4.835, 0.031, 0.090: 0.214)	0.140***	(4.431, 0.032, 0.078: 0.202)
EmoWB	—	—	—	—	0.006	(0.198, 0.031, −0.054: 0.066)	—	—	—	—
SR×EmoWB	—	—	—	—	**-0.053***	(−2.250, 0.023, −0.099: −0.007)	—	—	—	—
SocialWB	—	—	—	—	—	—	-0.028	(−0.891, 0.032, −0.091: 0.034)	—	—
SR×SocialWB	—	—	—	—	—	—	-0.026	(−1.150, 0.023, −0.070: 0.018)	—	—
PsychWB	—	—	—	—	—	—	—	—	-0.005	(−0.148, 0.032, −0.068: 0.059)
SR×PsychWB	—	—	—	—	—	—	—	—	-0.033	(−1.465, 0.022, −0.076: 0.011)
F	137.952***		119.412***		86.595***		85.499***		85.641***	
df	(4, 760)		(5, 759)		(7757)		(7757)		(7757)	
R^2	0.421		0.440		0.445		0.442		0.442	
ΔR^2	0.418		0.437		0.440		0.436		0.437	

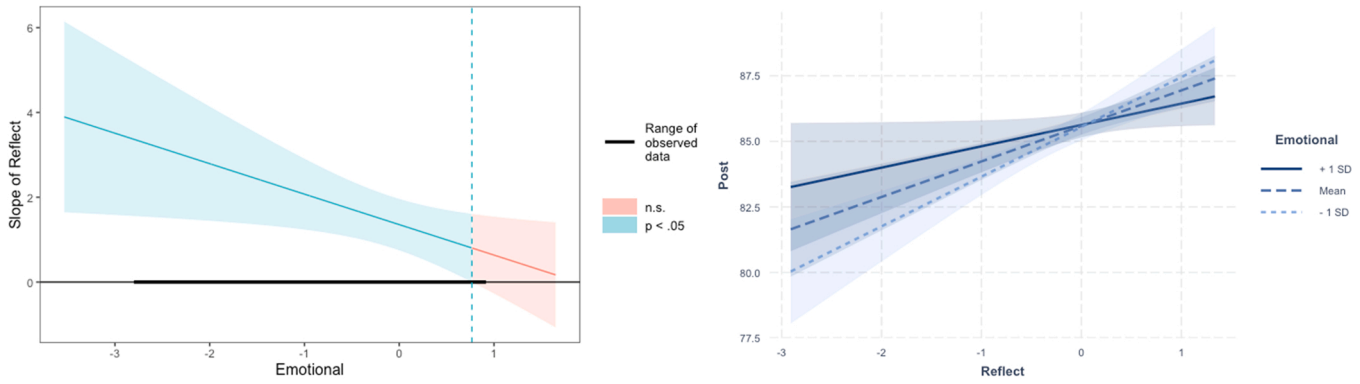
All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$;** $p < 0.01$;* $p < 0.05$.



(a) (b)

Fig. 4. Johnson-Neyman (a) and simple slopes (b) plots for the moderating role of psychological well-being on the link between seeking internal feedback (SIF) on English learning achievement. Notes. Psychological = Psychological well-being; Internal = Seeking internal feedback; Post = T2 English learning achievement.

weaknesses and using that information to improve (Lui & Andrade, 2022; Yan, 2016; Yan & Brown, 2017). Psychological research has shown that self-reflection is a more adaptive and problem-solving-oriented process than rumination (Mendoza et al., 2021; Nolen-Hoeksema et al., 2008). Instead of being hopeless or ruminating on non-productive questions (e.g., "Why am I unhappy?" or "Why is this happening to me?"), self-reflection converts these to more adaptive questions: "What are the parts of the task that I did well?" or "Which parts of the tasks can I further improve?". Therefore, it is likely that students with low emotional well-being may benefit academically from self-reflection as a way to refocus their thoughts more positively and productively. This finding is supported by the dual processing



(a) (b)

Fig. 5. Johnson-Neyman (a) and simple slopes (b) plots for the moderating role of emotional well-being on the link between self-reflection (SR) on English learning achievement. Notes. Emotional = Emotional well-being; Reflect = Self-reflection; Post = T2 English learning achievement.

model's well-being pathway, which allows students to reconcile their negative emotions and bring their learning tasks back into alignment with their learning goals (Boekaerts,1993, 2007, 2011). Students with low emotional well-being can improve through the transformation of their rumination into productive self-reflection. Overall, the internal and cognitive nature of both seeking internal feedback and self-reflection may be particularly beneficial for students with low well-being in terms of improving their learning achievement.

Briefly, we also want to mention our null findings. While external feedback-seeking practices (such as monitoring and inquiry) were related to improved achievement, we did not find that positive well-being significantly moderated this relationship. This finding suggests that internal and cognitive self-assessment practices, such as seeking internal feedback and self-reflection, may be more closely related to subjective well-being, particularly emotional and psychological well-being. In contrast, external feedback-seeking practices may be less dependent on these internal psychological mechanisms as these practices are embedded within students' routine learning practices to improve and achieve better in school (see Yan & Carless, 2022). Overall, seeking external feedback is beneficial for students' learning, regardless of the level of their well-being. While well-being may influence how students respond to and use external feedback, it is not necessarily a determining factor in the benefits students can gain from seeking it. It is worth noting, however, that these findings could be considered exploratory and may not necessarily apply to all contexts and learning situations.

4.2. Study limitations, directions for future research, and practical implications

We note specific study limitations that should be considered in interpreting the findings and future research directions to address these limitations. First, although the moderating effect of well-being was found to be significant in modifying the effects of self-assessment practice on achievement, the effect sizes of these results are rather small. This should be considered when interpreting and generalizing these findings. Second, despite using prospective data (i.e., objective achievement scores from two time points and self-report data), self-report data was not collected at all time points; hence the data may not fulfill assumptions necessary for longitudinal research designs. Hence, due caution should be taken in drawing a causal interpretation of the findings. Longitudinal research designs with data collected at multiple time points and experimental research designs can be implemented in future research to strengthen the rigor of the study design. Third, positive well-being was assessed globally, which inquires on students' positive well-being over the past month and is not specific to English language learning. This means that instead of asking about their well-being in studying English, we sought students' well-being in general. To account for potential well-being variability across specific learning domains, we recommend future research to examine whether it is feasible to evaluate task-specific or subject-specific. An evaluation of task-specific or contextualized self-assessment practice is similarly relevant. This would ensure that the link between self-assessment practices, well-being, and achievement is conceptually coherent and theoretically aligned. Fourth, the psychological factor that we examined is focused on positive well-being. Other forms of internal or psychological states can be further examined and fleshed out in future research. For instance, language learning anxiety, academic stress, or fatigue can be further explored. Expanding the psychological moderators that can influence the effectiveness of self-assessment practices on learning and achievement holds both practical and theoretical implications for research. Relatedly, implementing a mediation analysis to examine the potential mechanisms through which self-assessment practices and well-being might influence achievement scores. This can also include research questions that can further unpack the multifaceted conceptualization of the dual processing model, and examine possible bidirectional or interactive relationships between self-regulated learning outcomes. Finally, the sample in this study consisted of secondary school students; thus, the findings may not necessarily generalize to elementary or college students. Furthermore, the findings are specific to English language learning as a specific learning domain. Replications are needed to extend the generalizability of the findings across academic levels and in different learning domains.

These limitations notwithstanding, the results hold important implications in understanding how well-being can influence the adaptive function of self-assessment practice on student achievement. Specifically, teachers can encourage learners to practice self-assessment to improve their learning outcomes. As a 21st-century skill, self-assessment practices are sustainable learning strategies that have both short- and long-term benefits for learning and achievement (Mendoza, Yan, & King, 2022; Yan, Wang, Boud, & Lao, 2023). Teachers can also pay close attention to learners who could be experiencing relatively lower well-being and support them to acknowledge such emotions and not suppress them. More importantly, learners with suboptimal well-being can be encouraged to practice seeking internal feedback and self-reflection to productively improve and increase their motivation for their learning tasks (Boekaerts, 2006, 2011; Yan, 2016; Yan & Brown, 2017). The theoretical implications of this study relate to the research that unpacks the psychological mechanisms of self-assessment practices (Andrade, 2019; Yang, Yan, Zhang, Boud, & Datu, 2023). Self-assessment research can benefit from exploring and examining internal psychological mechanisms that can strengthen or attenuate the

adaptive role of self-regulated learning strategies (Boekaerts, 1993, 2007).

5. Conclusion

The findings of this study corroborates the positive effect of self-assessment practices on objective student achievement. More so, evidence suggests that positive well-being moderated the relationship between seeking internal feedback and self-reflection on achievement. Specifically, students with low or moderate well-being appeared to benefit more from such self-assessment practices. These findings are consistent with previous research on the adaptive role of self-assessment in a wide range of student outcomes, including learning and achievement (Brown & Harris, 2013; Mendoza, Yan, & King, 2022, 2023; Panadero, Jonsson, & Botella, 2017; Yan, Wang, Boud, & Lao, 2023). The results also align with the dual processing self-regulation model, which asserts the role of well-being in determining how learners engage in self-regulated learning (Boekaerts, 2006, 2011), and in this case, self-assessment practice. The core findings suggest that promoting internal or cognitive self-assessment practices such as seeking internal feedback and self-reflection may boost academic payoffs for students with low or moderate well-being. This study contributes to the theorizing of internal or psychological factors that may influence the self-assessment-and-achievement link. Still, further research is needed to better understand the mechanisms that enable the interaction of self-assessment practices and well-being, as well as the implications both may have on student learning (Andrade, 2019; Lui & Andrade, 2022; Panadero et al., 2016; Shute, 2008).

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