

Individuelle Einflussfaktoren auf Motivationsregulation:
Wer reguliert wann und wie die eigene Lernmotivation?

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Zusammenfassung

Besonders im Hochschulkontext stellt die Selbstregulation kognitiver, metakognitiver, umweltbezogener, aber auch motivationaler Aspekte des Lernens eine wichtige Voraussetzung für den Studienerfolg dar (Dresel et al., 2015; Robbins et al., 2004). Während sich viele Belege für die positiven Effekte von Motivationsregulation auf Anstrengungsbereitschaft, Leistung, Wohlbefinden, verminderte Prokrastination und Studienabbruchstendenzen finden, ist der Einfluss individueller, personenbezogener Faktoren auf Motivationsregulation weniger gut untersucht, geprägt von inkonsistenten oder kleinen Zusammenhängen eher allgemeiner und vergleichsweise stabiler Einflussfaktoren (wie kognitiven Fähigkeiten und Persönlichkeitseigenschaften) und unklaren Mechanismen, wie und an welcher Stelle des Motivationsregulationsprozesses sie Einfluss nehmen. Die vorliegende Dissertation befasst sich daher mit den Fragen, 1) ob für den Motivationsregulationsprozess spezifische und veränderbare individuelle Dispositionen über allgemeinere individuelle Dispositionen hinaus mit Motivationsregulation zusammenhängen (Manuskripte 1 & 2), 2) durch welche Mechanismen sie mit Motivationsregulation und Anstrengungsbereitschaft zusammenhängen, und 3) wie für den Motivationsregulationsprozess spezifische und veränderbare individuelle Dispositionen sowie Variablen des Motivationsregulationsprozesses valide in Selbstberichten erfasst werden können (Manuskripte 1, 2 & 3). Manuskripte 1 und 2 fanden in fünf Studierendenstichproben, dass Selbstwirksamkeitserwartungen für Motivationsregulation und implizite Veränderbarkeitstheorien über Motivation als für Motivationsregulation spezifischere individuelle Dispositionen über allgemeine Dispositionen hinaus mit dem Einsatz von Motivationsregulationsstrategien und Anstrengungsbereitschaft zusammenhängen. Bezüglich möglicher Wirkmechanismen zeigte sich, dass Selbstwirksamkeit für Motivationsregulation mit einem häufigeren Einsatz von Motivationsregulationsstrategien und Anstrengungsbereitschaft zusammenhängt, nicht aber mit einem effektiveren Strategieeinsatz. Implizite Veränderbarkeitstheorien über extrinsische Motivation hängen, vermittelt über

Selbstwirksamkeit für Motivationsregulation, ebenfalls mit einem häufigeren Strategieeinsatz und Anstrengungsbereitschaft zusammen. Studie 3 zeigte, dass verschiedene theoretisch nah verwandte Konstrukte des Motivationsregulationsprozesses durch Selbstberichtsfragebögen unter bestimmten Bedingungen valide erfassbar sind (wenn beispielsweise für methodische Artefakte kontrolliert wird), ihr Einsatz aber auch Nachteile birgt. Implikationen dieser Befunde bezüglich der zukünftigen Erfassung des Motivationsregulationsprozesses, der Erweiterung bisheriger Modelle zur Beschreibung dieses Prozesses und zur praktischen Förderung von Motivationsregulation in Trainings werden diskutiert.

Abstract

Especially in higher education, the self-regulation of cognitive, metacognitive, environmental, but also motivational aspects of learning is an important prerequisite for academic success (Dresel et al., 2015; Robbins et al., 2004). While there is much evidence for the positive effects of motivational regulation on effort expenditure, performance, well-being, reduced procrastination and dropout tendencies, the influence of individual, person-related dispositions on the process of motivational regulation is less well understood, characterised by inconsistent or small associations between motivational regulation and rather general and comparatively stable individual factors examined (such as cognitive abilities and personality traits), and lack of clarity to which aspects of the motivational regulation process these dispositions are related. This dissertation therefore addresses the questions 1) whether stable, but malleable individual dispositions that are more specific to the motivational regulation process are related to motivational regulation beyond general individual dispositions (manuscripts 1 & 2), 2) by which mechanisms they are related to motivational regulation and willingness to exert effort, and 3) how such specific individual dispositions and different aspects of the motivational regulation process can be validly assessed in self-reports (Manuscripts 1, 2 & 3). Manuscripts 1 and 2 found in five student samples that self-efficacy for motivational regulation and implicit theories about motivation as individual dispositions more specific to motivational regulation were related to the use of motivational regulation strategies and effort expenditure beyond respective general dispositions. Regarding possible mechanisms, self-efficacy for motivational regulation was associated with a more frequent use of motivational regulation strategies and effort expenditure, but not with a more effective strategy use. Implicit theories about extrinsic motivation were also related to more frequent strategy use and effort expenditure via self-efficacy for motivational regulation. Study 3 showed that various constructs of the motivational regulation process, which are closely related in terms of content and theory, can be validly assessed via self-report questionnaires under certain conditions (for

example, if methodological artefacts are controlled for), but that their use also bears disadvantages. Implications of these findings for future assessment of the motivational regulation process, the expansion of existing models describing motivational regulation and the practical promotion of motivational regulation in training are discussed.

Einleitung

Selbstreguliertes Lernen bedeutet, eigene Lernaktivitäten selbst zu steuern, also sich selbstständig Ziele zu setzen, den Prozess der Zielerreichung zu beobachten und adaptive Strategien einsetzen zu können, um diese Ziele zu erreichen (Weinert, 1982; Zimmerman, 2000a). Dies ist eine wichtige Voraussetzung für Lern- und Studienerfolg (Dent & Koenka, 2016; Robbins et al., 2004; Sitzman & Ely, 2011). Aufgrund der Bedeutsamkeit selbstregulierten Lernens sowohl innerhalb als auch außerhalb formeller Bildungskontexte ist es als Förderziel sowohl in Beschlüsse der Kultusministerkonferenz zur Weiterbildung als auch den „Deutschen Qualifikationsrahmen für lebenslanges Lernen“ eingegangen (Arbeitskreis deutscher Qualifikationsrahmen (AK-DQR), 2011; Ständige Kultusministerkonferenz der Länder (KMK), 2000, 2012).

Ein wichtiger Teilaspekt im Rahmen des selbstregulierten Lernens ist die Selbstregulation der eigenen Lern- und Leistungsmotivation (Pintrich, 2004). Motivationsregulation beschreibt den aktiven Einsatz von Handlungen und Gedanken zu dem Zweck, die eigene Lernmotivation aufzubauen oder aufrechtzuerhalten (Wolters, 2003). Um sich selbst zu motivieren, setzen Lernende eine Vielzahl unterschiedlicher Strategien ein (Engelschalk et al., 2016; Schwinger et al., 2007; Wolters, 1998). Die positiven Effekte des Einsatzes dieser Strategien auf vermehrte Motivation und Anstrengungsbereitschaft (Schwinger & Otterpohl, 2017), dadurch bessere Leistungen (Eckerlein et al., 2019; Kryshko et al., 2020; Schwinger et al., 2009; Schwinger & Stiensmeier-Pelster, 2012), Freude und positiven Affekt beim Lernen (Grunschel et al., 2016; Smit et al., 2017), sowie vermindertes Prokrastinationsverhalten und Studienabbruchtendenzen (Bäulke et al., 2018, 2021; Grunschel et al., 2016; Kryshko et al., 2020) sind gut belegt. Weniger Klarheit besteht allerdings darüber, welche individuellen Dispositionen (z.B. Überzeugungen, Einstellungen, Persönlichkeitseigenschaften) von Lernenden den Prozess der Motivationsregulation wie genau beeinflussen – welche Lernenden wie genau ihre Motivation regulieren.

Bisherige Studien zu dieser Frage haben je nach untersuchter Disposition oft kleine, keine, oder inkonsistente Zusammenhänge gefunden (z.B. Ljubin-Golub et al., 2019; Schwinger et al., 2009). Dafür lassen sich drei Hauptursachen ausmachen: Erstens wurden meist stabile und relativ schwer veränderbare Dispositionen wie Persönlichkeitseigenschaften oder Intelligenz untersucht (z.B. Diamond, 2013; Dweck, 2017; Roberts & DelVecchio, 2000; Roberts et al., 2006; Takacs & Kassai, 2019), die zweitens wenig spezifisch waren für Motivationsregulation als konkretes Verhalten (Baranik et al., 2010). Drittens wurden mögliche Mechanismen, wie genau die jeweiligen Dispositionen den Prozess der Motivationsregulation und den Einsatz von Strategien beeinflussen, selten explizit untersucht und verglichen.

Gleichzeitig haben sich in verwandten Bereichen der Selbstregulation wie etwa der Emotionsregulation für den jeweiligen Bereich spezifischere und im Rahmen von Interventionen modifizierbare Prädiktoren als nützlich erwiesen, beispielsweise Selbstwirksamkeitserwartungen (z.B. für Emotionsregulation oder selbstreguliertes Lernen, Tamir et al., 2007; Zimmerman et al., 1992) oder implizite Veränderbarkeitstheorien (z.B. über die Veränderbarkeit eigener Fähigkeiten oder Emotionen, Burnette et al., 2013; Ford & Gross, 2019). Es stellt sich daher die Frage, ob diese individuellen Überzeugungen, angepasst an den Kontext der Selbstregulation der eigenen Lern- und Leistungsmotivation, relevant und nützlich sind zur Vorhersage, ob und wie erfolgreich Lernende ihre Motivation regulieren. Da für diese spezifischeren Dispositionen im Bereich der Selbstregulation von Lern- und Leistungsmotivation noch keine Instrumente zur Erfassung existieren, müssen diese entwickelt und mit Blick auf mögliche theoretisch-konzeptuelle und methodische Überschneidungen in Selbstberichtsinstrumenten hinsichtlich ihrer Validität geprüft werden (Wolters & Won, 2018).

Die vorliegende Dissertation geht daher in drei Manuskripten den Fragen nach,

- 1) wie für den Motivationsregulationsprozess spezifischere und veränderbarere individuelle Dispositionen und Aspekte der Motivationsregulation (z.B. der Einsatz

von Strategien zur Regulation, Bewertungen ihres Erfolges) valide in Selbstberichten erfasst werden können (Manuskripte 1, 2 und 3);

- 2) ob und in welchem Maß für den Motivationsregulationsprozess spezifische und veränderbare individuelle Dispositionen den Prozess besser vorhersagen als allgemeine individuelle Dispositionen (Manuskripte 1 und 2); und
- 3) wie genau, d.h. an welchen Stellen diese individuellen Dispositionen mit dem Prozess der Motivationsregulation zusammenhängen (Manuskripte 1 und 2).

Ein besseres Verständnis darüber, ob und welche spezifischen individuellen und veränderbaren Dispositionen Motivationsregulation und ihren Erfolg durch welchen psychologischen Mechanismus beeinflussen, ist wichtig, um theoretische Erklärungsansätze zu Motivationsregulation zu explizieren. Beispielsweise schlägt das Prozessmodell der Motivationsregulation bisher nur heuristisch vor, dass unterschiedliche individuelle Dispositionen an unterschiedlichen Stellen im Prozess Einfluss nehmen können (Schwinger & Stiensmeier-Pelster, 2012). Außerdem können diese Erkenntnisse in der Förderung von Motivationsregulation genutzt werden, indem sie beispielsweise im Rahmen von Interventionen gezielt gefördert werden oder Trainingsmaßnahmen speziell für Personengruppen mit bestimmten Dispositionen konzipiert werden im Sinne einer aptitude-treatment-interaction (Snow, 1991).

Motivation im Lern- und Leistungskontext

Motivation bezeichnet die „aktivierende Ausrichtung des momentanen Lebensvollzuges auf einen positiv bewerteten Zielzustand“ (Rheinberg, 2008, S. 15) im Sinne einer allgemeinen Bereitschaft, Anstrengung und Ausdauer für eine Aktivität zu zeigen (Wolters, 2003). Dieser breiten Definition von Motivation und motiviertem Verhalten liegt kein einheitliches Konstrukt, sondern eine Vielzahl unterschiedlicher Erlebensweisen und psychologischer Prozesse zugrunde und wird daher aus Perspektive vieler unterschiedlicher Theorien beschrieben. Dazu zählen beispielsweise Selbstwirksamkeitserwartungen aus der sozial-

kognitiven Theorie (Bandura, 1997), das Erleben intrinsischer und extrinsischer Formen von Motivation (Ryan & Deci, 2020), situationales Interesse und dispositionelle Interessen (Sansone & Thoman, 2005), Kausalattributionen (Weiner, 1972), sowie Erfolgserwartungen und der subjektive Aufgabenwert (Wigfield & Eccles, 2020), die alle jeweils einen Beitrag zur Erklärung motivierten Verhaltens leisten.

Motivation ist in Lern- und Leistungskontexten über kognitive Fähigkeiten und Vorwissen hinaus ein wichtiger Prädiktor für akademischen Erfolg (Robbins et al., 2004; Schneider & Preckel, 2017; Steinmayr et al., 2019), sowie für höheres Wohlbefinden und Studienzufriedenheit (Kryshko et al., 2022; Ryan & Deci, 2000; Smit et al., 2017; Wach et al., 2016). Motivationsprobleme hingegen treten im universitären Kontext häufig auf: Über den Studienverlauf lässt sich eine Abnahme verschiedener Aspekte von Lern- und Leistungsmotivation beobachten (Dresel & Grassinger, 2013). Prokrastination, also das Aufschieben von aversiven (z.B. langweiligen oder schwierigen) Aufgaben trotz Wissen um daraus entstehende negative Konsequenzen, ist hoch prävalent unter Studierenden (Grunschel et al., 2016; Klingsieck, 2013). Auch bei Studienabbrüchen sind Motivationsprobleme ein häufig genannter Grund (Heublein et al., 2010), wobei die Quote der Studienabbrüche mit 27% der Studienanfänger:innen im Jahrgang 2014/15 als hoch einzuschätzen ist (Heublein et al., 2020).

Um Motivationsprobleme zu beheben können einerseits Lernumwelten durch Lehrpersonen modifiziert und motivational anregender gestaltet werden (z.B. Lazowski & Hulleman, 2016). Andererseits werden besonders in Lernumgebungen mit vergleichsweise geringer von außen vorgegebener Struktur wie z.B. in einem Hochschulstudium (Dresel et al., 2015; Steuer et al., 2015) hohe Anforderungen an die Selbstregulation gestellt – u.a. auch an die Selbstregulation der eigenen Motivation. Das bedeutet, dass Lernende aktiv Gedanken oder Handlungen einsetzen müssen mit dem Ziel, ihre Motivation und Anstrengungsbereitschaft zum Beginnen oder Vollenden einer Aufgabe aufzubringen oder aufrechtzuerhalten (Wolters,

2003). Diese Handlungen und Gedanken modifizieren somit Prozesse, die der Lern- und Leistungsmotivation zugrunde liegen, wie beispielsweise Attributionen (Weiner, 1972), Zielorientierungen (Dweck & Leggett, 1988), Erfolgserwartungen und Aufgabenwert (Wigfield & Eccles, 2020). Dabei liegt die Hauptdifferenzierung zwischen Motivation und Selbstregulation von Motivation in der aktiven Kontrolle und Veränderung dieser Prozesse (Wolters, 2003).

Motivationsregulation ist mit höherer Anstrengungsbereitschaft und Leistung (Eckerlein et al., 2019; Kryshko et al., 2020; Schwinger et al., 2009; Schwinger & Stiensmeier-Pelster, 2012), mehr Freude an Lernaktivitäten und positivem Affekt beim Lernen (z.B. Grunschel et al.; 2016; Smit et al., 2017), verminderter Prokrastination (z.B. Bülke et al., 2018; Grunschel et al., 2016) und geringeren Studienabbruchstendenzen (Bülke et al., 2018; Kryshko et al., 2020) assoziiert. Folglich scheint die Selbstregulation der eigenen Lern- und Leistungsmotivation ein wichtiger Ansatzpunkt, um Motivationsproblemen und deren Konsequenzen in Lern- und Leistungskontexten vorzubeugen (vgl. Eckerlein, 2020; Leutner et al., 2001). Ein möglichst genaues Verständnis darüber, wie Motivationsregulation funktioniert, ist daher hilfreich, um sie besser fördern zu können.

Der Motivationsregulationsprozess

Motivationsregulation kann als Prozess beschrieben werden, der mit der Wahrnehmung eines Motivationsproblems beginnt (motivationales Monitoring, Abbildung 1, Schwinger & Stiensmeier-Pelster, 2012; Miele & Scholer, 2018). Anschließend stellen Lernende einen Grund für ihr Motivationsproblem fest (z.B. eine zu hohe Aufgabenschwierigkeit verbunden mit geringen Erfolgserwartungen oder eine langweilige, sinnlos scheinende Aufgabe verbunden mit einem geringen Aufgabenwert, vgl. Engelschalk et al., 2015; Wigfield & Eccles, 2020). Darauf aufbauend wenden sie Strategien zur Motivationsregulation an (motivationale Kontrolle), wobei verschiedene Strategien zum Einsatz kommen können, die unterschiedliche zugrundeliegende Aspekte der Motivation beeinflussen (Engelschalk et al., 2015; Schwinger et

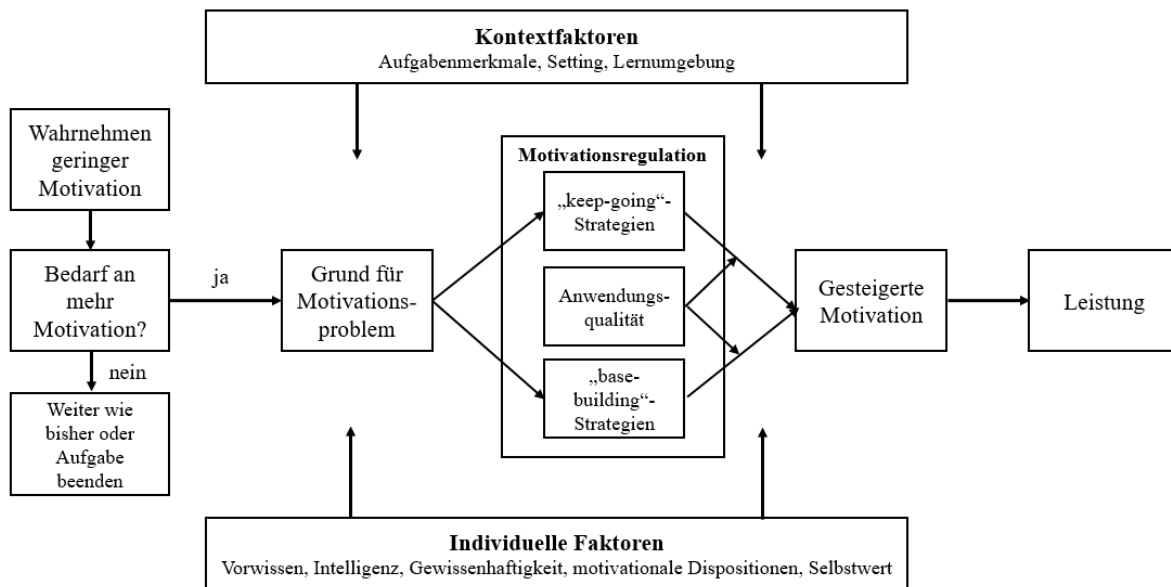
al., 2007; Wolters, 1998). Zielbasierte Strategien betonen dabei das entsprechende Lern- oder Leistungsziel: Durch *lernzielorientierte Selbstinstruktion* erinnern sich Lernende daran, so viel wie möglich für ihren persönlichen Kompetenzgewinn zu lernen; durch *leistungszielbezogene Selbstinstruktion* stellen sie das Ziel in den Vordergrund, bestmögliche Leistungen zu zeigen und besser als Andere abzuschneiden (*Annäherungs-leistungszielbezogene Selbstinstruktion*) oder sich nicht durch schlechte Leistungen vor Anderen zu blamieren (*Vermeidungs-leistungszielbezogene Selbstinstruktion*). Um das Interesse an einer Aufgabe zu steigern, verwenden Lernende die Strategien *Steigerung des situationalen Interesses* (z.B. Aufgaben in ein Spiel zu verwandeln) und *Steigerung der persönlichen Bedeutsamkeit* (das Hervorheben von Gründen, warum die Aufgabe für sie wichtig und relevant ist). Das *Setzen kleinerer und erreichbarer Teilziele* als Strategie wird häufig in Kombination mit *Selbstbelohnungen* eingesetzt, also sich selbst für das Erreichen eines Ziels eine Belohnung zu versprechen. Im Rahmen der Strategie *Umweltkontrolle* wählen und gestalten Lernende ihre Lernumwelt motivationsförderlich, z.B. durch die Wahl ablenkungsfreier Lernorte oder bestimmter Zeitpunkte, zu denen sie gut arbeiten können. Weiterhin stellen *fähigkeitsbezogene Selbstinstruktion*, z.B. sich selbst an vergangene Erfolgserlebnisse zu erinnern, und *soziale Unterstützung*, z.B. durch gemeinsames Lernen mit Anderen, Strategien dar, um sich selbst zum Lernen zu motivieren.

Während manche dieser Strategien explizit auf intrinsische Aspekte von Motivation abzielen (z.B. Steigerung des situationalen Interesses zur Förderung des Interesses und der Freude an einer Tätigkeit), fokussieren andere explizit auf extrinsische Aspekte (z.B. Selbstbelohnung). Zur erfolgreichen Motivationsregulation spielt sowohl die Häufigkeit als auch die Qualität des Einsatzes von Motivationsregulationsstrategien eine Rolle (Eckerlein et al., 2019; Engelschalk et al., 2017). Eine erfolgreiche Strategieranwendung führt zu gesteigerter Motivation, welche häufig breit operationalisiert wird als erhöhte Anstrengungsbereitschaft für eine Aufgabe (Wolters, 2003). Vermittelt durch Anstrengungsbereitschaft wirkt sich

Motivationsregulation auf bessere Leistungen aus (Schwinger et al., 2009; Schwinger & Stiensmeier-Pelster, 2012). Des Weiteren ist Motivationsregulation auch mit spezifischen motivationalen Outcomes assoziiert wie Erfolgserwartungen, Aufgabenwert und motivationalen Kosten (Kryshko et al., 2020), positivem Affekt und Freude (Grunschel et al., 2016; Smit et al., 2017) oder behavioralen Outcomes wie Prokrastination und Abbruchtendenzen (Bäulke et al., 2021; Kryshko et al., 2020). Auch der subjektive Regulationserfolg, definiert als erfolgreiches Überwinden von Motivationsproblemen und das Aufrechterhalten von Motivation beim Lernen, wird mit erfolgreicher Strategieverwendung in Verbindung gebracht (Engelschalk et al., 2016, 2017).

Abbildung 1

Das Prozessmodell der Motivationsregulation nach Schwinger & Stiensmeier-Pelster (2012)



Einflussfaktoren auf Motivationsregulation

Motivationsregulation geschieht in Interaktion zwischen Individuum und Umwelt (Schwinger & Stiensmeier-Pelster, 2012; Wolters, 1998, 2003). Zum einen beeinflussen Kontextmerkmale den Prozess, z.B. durch die Merkmale einer Aufgabe oder eines

Studienfaches. Zum anderen beeinflussen individuelle Dispositionen den Motivationsregulationsprozess (Schwinger & Stiensmeier-Pelster, 2012), zu denen sowohl stabile Eigenschaften wie Intelligenz und Persönlichkeitseigenschaften wie Gewissenhaftigkeit, als auch individuelle Überzeugungen und motivationale Dispositionen gehören. Bezüglich des genauen Wirkmechanismus ist das Modell jedoch heuristisch; es wird ein möglicher Einfluss an verschiedenen Stellen im Modell postuliert, besonders dahingehend, „how often and how effectively particular motivational strategies are used“ (Schwinger & Stiensmeier-Pelster, 2012, S. 39).

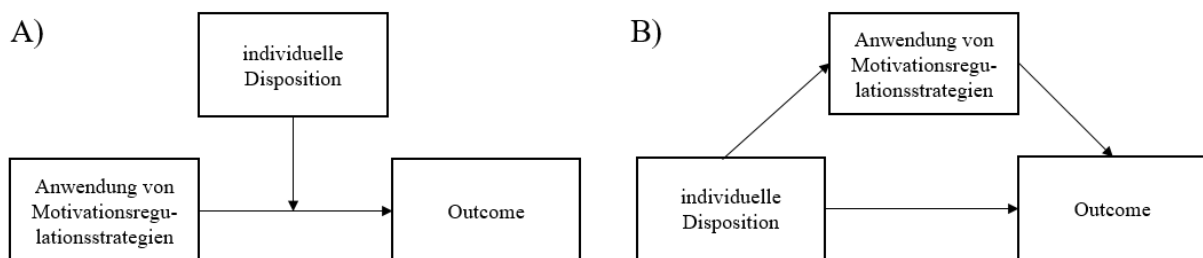
Intelligenz und Persönlichkeitseigenschaften als Prädiktoren für Motivationsregulation

Intelligenz als allgemeine kognitive Fähigkeit zum Problemlösen wird als Aspekt von Selbstregulation gesehen (z.B. Grigorenko & Sternberg, 2001). Im selben Sinn wird eine Überlappung zwischen Intelligenz und exekutiven Funktionen als grundlegende kognitive selbstregulative Fertigkeiten diskutiert (Diamond, 2013). Ein Einfluss dieser basalen selbstregulativen Fähigkeit auf komplexere Formen der Selbstregulation ist daher anzunehmen (Diamond, 2013; Nigg, 2017). Schwinger et al. (2009) unterteilten acht Motivationsregulationsstrategien in zielbasierte Strategien (lernzielbezogene, annäherungsleistungszielbezogene und vermeidungs-leistungszielbezogene Selbstinstruktion) und sonstige Strategien (Steigerung des situationalen Interesses und persönlicher Bedeutsamkeit, Teilziele setzen, Selbstbelohnung und Umweltkontrolle). Sie fanden, dass kognitive Leistungsfähigkeit den Zusammenhang zwischen dem Einsatz von zielbasierten Motivationsregulationsstrategien und Anstrengungsbereitschaft nicht moderierte, wohl aber den Zusammenhang der sonstigen Strategien mit Anstrengungsbereitschaft (vgl. Abbildung 2A). Dies wurde dahingehend interpretiert, dass kognitiv leistungsfähigere Lernende diese (im Vergleich zu einfachen zielbasierten Strategien) komplexeren Strategien qualitativ besser und dadurch effektiver anwenden können. Die Autor:innen argumentierten, dass weitere Wirkmechanismen von Intelligenz auf den Motivationsregulationsprozess denkbar sind. Beispielsweise könnten

intelligenterer Lernende über ein größeres und damit adaptiveres, flexibler einsetzbares Strategierepertoire zur Motivationsregulation verfügen. Diese Annahme wurde allerdings nicht empirisch getestet.

Abbildung 2

Mögliche Wirkmechanismen individueller Dispositionen auf den Motivationsregulationsprozess



Anmerkung. A) Moderationshypothese – die Effektivität des Einsatzes von Motivationsregulationsstrategien auf Outcomes, z.B. Anstrengungsbereitschaft, hängt von der Ausprägung bestimmter individueller Dispositionen ab. B) Mediationshypothese – individuelle Dispositionen beeinflussen die Häufigkeit des Einsatzes von Motivationsregulationsstrategien und dadurch indirekt Outcomes wie Anstrengungsbereitschaft.

Neben Intelligenz wurde der Einfluss von Persönlichkeitseigenschaften auf Motivationsregulation betrachtet. Schwinger und Otterpohl (2017) untersuchten, ob gewissenhaftere Personen, ähnlich dem zuvor beschriebenen Einfluss von Intelligenz auf den Motivationsregulationsprozess, Motivationsregulationsstrategien effektiver einsetzen, da gewissenhaftere Personen sich ambitionierte Ziele setzen und diese verfolgen (vgl. Abbildung 2A). Dieser moderierende Einfluss zeigte sich allerdings nicht. Auch Sansone et al. (1999) fanden, dass Gewissenhaftigkeit keinen Einfluss auf den Zusammenhang zwischen Interessenssteigerung als Motivationsregulationsstrategie und Persistenz bei Aufgaben hatte. Im Gegensatz zur Moderationshypothese nahmen Ljubin-Golub et al. (2019) und Bäumle et al. (2019) im Sinne einer Mediationshypothese an, dass gewissenhaftere Personen häufiger

Motivationsregulationsstrategien einsetzen würden und dadurch weniger Prokrastination zeigen würden (vgl. Abbildung 2B). Ljubin-Golub et al. (2019) fanden diesen Zusammenhang für alle Big Five Persönlichkeitseigenschaften: Je gewissenhafter, verträglicher, offener, extravertierter und emotional stabiler Lernende waren, desto häufiger setzten sie Motivationsregulationsstrategien ein. Diese Zusammenhänge waren klein bis moderat und auf Ebene einzelner Strategien war nicht jede Persönlichkeitseigenschaft mit jeder Strategie assoziiert. Bäumle et al. (2019) fanden im Gegensatz dazu, dass nur Gewissenhaftigkeit mit einem häufigeren Einsatz von Motivationsregulation assoziiert war, nicht aber Neurotizismus. Motivationsregulation wurde hier allerdings nicht auf Strategieebene erfasst, sondern als allgemeine Tendenz, Motivationsregulation (erfolgreich) zu betreiben. Die Autor:innen diskutieren einen möglichen Einfluss von Persönlichkeitseigenschaften auf die Effektivität und Qualität der Strategieranwendung; dieser wurde jedoch nicht empirisch untersucht.

Motivationsbezogene Überzeugungen und Motivationsregulation

Ein dritter großer und vergleichsweise intensiv untersuchter Bereich individueller Dispositionen als Einflussfaktoren auf den Motivationsregulationsprozess sind motivationale Überzeugungen, was zwar relativ stabile, aber i.d.R. veränderbare Glaubenssätze umfasst, die die eigene Lern- und Leistungsmotivation betreffen (z.B. Bandura, 1997; Schunk & Zimmerman, 2007; Yeager et al., 2019; Yeager & Walton, 2011). Darunter fallen Zielorientierungen als die situationsübergreifende Disposition, Annäherungs- oder Vermeidungs-Lern- oder -Leistungsziele beim Bearbeiten von Aufgaben zu verfolgen (Dweck & Leggett, 1988), aber auch akademische Selbstwirksamkeitserwartungen als die subjektive Einschätzung darüber, inwieweit eigene (akademische) Fähigkeiten ausreichen, um intendierte Lern- und Leistungsergebnisse zu erzielen (Bandura, 1977; Zimmerman, 2000b), und Aufgabenwert als subjektiv empfundener Wert einer Aufgabe für ein Individuum (bestehend aus intrinsischem Wert, persönlicher Bedeutsamkeit und Nützlichkeit; Wigfield & Eccles, 2020). Auch für motivationale Dispositionen wird zumeist angenommen, dass sie einen

Einfluss auf die Häufigkeit des Strategieeinsatzes haben (vgl. Abbildung 2B). Diesen Zusammenhängen liegen zwei Annahmen zugrunde: Zum einen sollten Motivationsregulationsstrategien zu bestehenden motivationalen Überzeugungen passen, d.h. je stärker lernzielorientiert Personen sind, desto häufiger sollten sie lernzielbezogene Selbstinstruktion verwenden (Wolters & Rosenthal, 2000). Zum anderen wird angemerkt, dass bereits hoch lernzielorientierte Personen keine Notwendigkeit sehen sollten, ihre Motivation weiter in diese Richtung zu steigern, da diese nicht ihrem motivationalen Problem entspricht (Wolters, 2003).

Vor dem Hintergrund dieser heterogenen Erklärungsansätze erscheinen die gefundenen Zusammenhänge zwischen motivationsbezogenen Überzeugungen und dem Einsatz von Motivationsregulationsstrategien umso überraschender: Lernzielorientierungen hängen moderat bis stark positiv mit dem Einsatz von Motivationsregulationsstrategien zusammen; Annäherungs-Leistungszielorientierungen zeigen kleine bis moderate Zusammenhänge mit Motivationsregulationsstrategien, die nicht immer und nicht für alle Strategien signifikant sind (Schwinger et al., 2007; Wang et al., 2017; Wolters & Benzon, 2013; Wolters & Rosenthal, 2000). Vermeidungs-Leistungszielorientierungen weisen kleine, nicht signifikante bis hohe Zusammenhänge mit Motivationsregulationsstrategien auf, wobei diese hauptsächlich mit zielbasierten Strategien bestanden (Annäherungs- und Vermeidungs-leistungszielbezogene Selbstinstruktion; Schwinger et al., 2007) oder mit diesen besonders ausgeprägt waren (Wang et al., 2017). Die einzige Studie, die ebenfalls im Sinne einer Passung zwischen motivationaler Überzeugung und Regulationsstrategie einen moderierenden Einfluss von Zielorientierungen auf den Effekt von Strategieverwendung auf Anstrengungsbereitschaft untersuchte, fand keinen solchen Einfluss in zwei Stichproben (Schwinger & Otterpohl, 2017).

Neben Zielorientierungen weisen allgemeine akademische Selbstwirksamkeitserwartungen als individuelle motivationale Disposition kleine, nicht signifikante bis moderate Zusammenhänge mit dem Einsatz von

Motivationsregulationsstrategien auf (Wolters & Rosenthal, 2000; Wolters & Benzon, 2013). Der subjektive Aufgabenwert hängt ebenfalls positiv mit dem Einsatz von Motivationsregulationsstrategien zusammen, wobei entsprechende Korrelationen in ihrer Größe von klein und nicht signifikant bis groß schwanken und zwischen Studien nicht gänzlich konsistent sind (Wolters & Rosenthal, 2000; Wolters & Benzon, 2013). Obwohl im Motivationsregulationsmodell von Schwinger & Stiensmeier-Pelster (2012) als individueller Einflussfaktor genannt, fanden Lohbeck und Moschner (2021) kaum Korrelationen zwischen akademischem Selbstkonzept, definiert als die kognitive Repräsentation eigener Fähigkeiten in verschiedenen Fächern, und Motivationsregulation.

Zusammenfassend lässt sich festhalten, dass Motivationsregulation nicht für alle Lernenden gleichermaßen funktioniert, sondern in einer Interaktion aus Umwelt und Person stattfindet – Lernende bringen individuell ausgeprägte persönliche Eigenschaften und Überzeugungen mit, die den Prozess der Motivationsregulation beeinflussen (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012). Die bisher untersuchten Variablen und Zusammenhänge implizieren, dass verschiedene Faktoren auf verschiedene Weisen den Prozess der Motivationsregulation beeinflussen können, z.B. durch eine Steigerung der Häufigkeit oder der Effektivität der Anwendung von Motivationsregulationsstrategien. Die gefundenen Zusammenhänge sind allerdings nicht ganz konsistent zwischen Studien, oftmals klein und nicht immer in Einklang mit theoretischen Erwartungen. Dabei lassen sich vier Probleme bisheriger Studien zum Einfluss individueller Dispositionen auf den Motivationsregulationsprozess festhalten, die zu dieser Befundlage beigetragen haben können:

1. Bisher wurden verschiedene Wirkmechanismen der jeweiligen individuellen Dispositionen, z.B. ein Zusammenhang mit der Häufigkeit des Strategieeinsatzes oder eine effektivere Anwendung von Motivationsregulationsstrategien, diskutiert. Diese wurden jedoch selten empirisch gegenübergestellt. Gleichermäßen fehlt es an expliziten theoretischen Ausführungen und entsprechenden, über querschnittlich-

korrelative Designs hinausgehenden, Studien zu kausalen, reziproken und temporalen Dynamiken des Zusammenspiels individueller Dispositionen und verschiedenen Aspekten des Motivationsregulationsprozesses.

2. Die untersuchten Faktoren sind (mit einigen Ausnahmen) wenig spezifisch für Motivationsregulation. Allgemeine Persönlichkeitsmerkmale wie Gewissenhaftigkeit oder allgemeine kognitive Leistungsfähigkeit, aber auch allgemeine akademische Selbstwirksamkeitserwartungen haben für sich genommen einen hohen Wert zur Vorhersage akademischer Leistung (Kuncel et al., 2004; Honicke & Broadbent, 2016; Ohtani & Hisasaki, 2018; Robbins et al., 2004; Sitzman & Ely, 2011; Vedel, 2014). Gleichzeitig ist fraglich, ob diese allgemeinen Eigenschaften und Überzeugungen ein spezifisches Verhalten wie Motivationsregulation im Sinne einer Passung der Spezifitätsebene zwischen Prädiktor und Kriterium effektiv und präzise vorhersagen können (Baranik et al., 2010).
3. Einige der untersuchten Faktoren wie Intelligenz und Persönlichkeit sind vergleichsweise stabil und schwer modifizierbar (Diamond, 2013; Dweck, 2017; Takacs & Kassai, 2019). Für Trainings und Interventionen zur Förderung von Motivationsregulation ist das Wissen um ihren Einfluss auf den Motivationsregulationsprozess zwar einerseits informativ, um Trainingsmaßnahmen im Sinne einer Treatment-Aptitude-Passung an Teilnehmende anzupassen (beispielsweise die Anzahl und Komplexität der vermittelten Strategien nach der kognitiven Leistungsfähigkeit der Teilnehmenden zu richten; Snow, 1991). Andererseits sind diese Dispositionen im Rahmen von Trainings nur schwer veränderbar und Trainings solch allgemeiner Eigenschaften scheinen nicht unbedingt auf spezifisches Verhalten außerhalb der Trainingssituationen zu generalisieren (Diamond, 2013; Takacs & Kassai, 2019).

Als Trainingsinhalt erscheinen diese allgemeinen Dispositionen daher weniger geeignet.

In verwandten Bereichen der Selbstregulation, beispielsweise der eigenen Emotionen (Ford & Gross, 2019; Tamir et al., 2007) und des selbstregulierten Lernens (Dweck, 1999), werden spezifischere individuelle Dispositionen als Einflussgrößen bereits in den Blick genommen, die deutlich konsistentere Zusammenhänge mit dem Einsatz von Selbstregulationsstrategien aufweisen. Zwei Faktoren stechen dabei besonders hervor: Selbstwirksamkeitserwartungen (Bandura, 1997; Zimmerman et al., 1992) und implizite Theorien (Dweck, 1999; Molden & Dweck, 2006; Tamir et al., 2007).

Spezifische und veränderbare Einflussfaktoren auf Motivationsregulation

Selbstwirksamkeitserwartungen und Selbstregulation

Eine vielfach untersuchte individuelle Disposition für akademischen Erfolg und selbstreguliertes Lernen sind Selbstwirksamkeitserwartungen (Honicke & Broadbent, 2016; Usher & Pajares, 2006; Zimmerman et al., 1992). Selbstwirksamkeitserwartungen beschreiben die individuelle Einschätzung eigener Fähigkeiten, bestimmte Verhaltensweisen auszuführen, um erwünschte Ergebnisse und Effekte zu erzielen (Bandura, 1977, 1997). Da Verhalten und gewünschte Effekte sehr vielfältig sind, lassen sich Selbstwirksamkeitserwartungen kaum global erfassen, sondern jeweils domänenspezifisch mit Bezug zu einem konkreten Verhalten und seinen Effekten (Bandura, 1997, 2006). Selbstwirksamkeitserwartungen speisen sich laut Banduras (1997) sozial-kognitiver Theorie aus vier Quellen, nämlich (subjektiv empfundenen) Erfolgserlebnissen, indirekten Erfahrungen von Erfolgserlebnissen bei Rollenmodellen und Vorbildern, sozialer Überzeugung (z.B. durch Informationen von Anderen) und der Interpretation eigener emotionaler und physiologischer Zustände. Durch diese Zugänge sind Selbstwirksamkeitserwartungen explizit trainier- und veränderbar (z.B. Schunk & Zimmerman, 2007; Zinken et al., 2008).

Bisherige domänenspezifische Konzeptualisierungen von Selbstwirksamkeitserwartungen im akademischen Kontext haben gezeigt, dass Lernende mit höheren allgemeinen akademischen Selbstwirksamkeitserwartungen bessere Leistungen zeigen (Honicke & Broadbent, 2016). Selbstwirksamkeitserwartungen spezifisch für selbstreguliertes Lernen beschreiben die subjektive Einschätzung, verschiedene Strategien zum Organisieren und Planen von Lernaktivitäten, Beseitigen von Ablenkungen und zur Steigerung der eigenen Motivation zum erfolgreichen Lernen einsetzen zu können (Zimmerman et al., 1992). Diese sind ebenfalls mit einer Reihe positiver Outcomes in Verbindung gebracht worden wie akademischer Leistung (Bandura et al., 1996; Caprara et al., 2008), vermindertem Problemverhalten (Bandura et al., 1996), geringerer Wahrscheinlichkeit zum Schulabbruch (Caprara et al., 2008) und verminderter Prokrastination (z.B. Klassen et al., 2008). Selbstwirksamkeitserwartungen für selbstreguliertes Lernen sagen Leistung über Intelligenz und Persönlichkeitseigenschaften hinaus vorher (Zuffianó et al., 2013). Diese Befunde weisen darauf hin, dass Selbstwirksamkeitserwartungen für selbstreguliertes Lernen positiv mit verschiedenen lern- und leistungsrelevanten Outcomes, adaptiverer Selbstregulation und Wohlbefinden zusammenhängen.

Obwohl selbstreguliertes Lernen als multidimensionales und Selbstwirksamkeitserwartungen als domänenspezifisches Konstrukt definiert sind, sind bisherige Erfassungen von Selbstwirksamkeit für selbstreguliertes Lernen eindimensional geblieben und damit nicht getrennt für Motivationsregulation von kognitiven, metakognitiven und umweltbezogenen Subdimension selbstregulierten Lernens erfolgt (Pintrich, 2004; Zimmerman et al., 1992). Im Sinne der Domänenspezifität von Selbstwirksamkeitserwartungen (Bandura, 2006) und Prädiktor-Kriteriums-Passung (vgl. Baranik et al., 2010) scheint es daher angebracht, die Effekte von Selbstwirksamkeitserwartungen speziell für die Subdimension der Motivationsregulation zu untersuchen.

Bezüglich der Frage, wie Selbstwirksamkeitserwartungen mit erfolgreicher Selbstregulation zusammenhängen, können zwei Mechanismen aus der Forschung zum Einfluss allgemeiner Dispositionen abgeleitet werden. Zum einen sollten höhere Selbstwirksamkeitserwartungen Verhalten wie den Einsatz von Selbstregulationsstrategien, wahrscheinlicher machen und dadurch im Sinne der oben beschriebenen Mediationshypothese positive Outcomes bewirken (Abbildung 2B, Bandura, 1997; Bandura et al., 1996; Caprara et al., 2008). Gleichzeitig ist denkbar, dass Lernende mit höheren Selbstwirksamkeitserwartungen Strategien nicht unbedingt häufiger, sondern qualitativ besser einsetzen, was der oben benannten Moderationshypothese entsprechend zu positiven Outcomes führen kann (Abbildung 2A, Bandura, 1977; Engelschalk et al., 2017).

Implizite Theorien und Selbstregulation

Im breiten Kontext der Selbstregulation, beispielsweise im Umgang mit akademischen Misserfolgen (Burnette et al., 2013; Dweck, 1999), aber auch der Regulation eigener Emotionen (Tamir et al., 2007), dem selbstregulierten Lernen (Hertel & Karlen, 2020) oder der eigenen Willenskraft (Job et al., 2010), spielen implizite Theorien über die (Un)Veränderbarkeit persönlicher Merkmale und Eigenschaften eine wichtige Rolle (vgl. Molden & Dweck, 2006). Implizite Theorien beschreiben individuelle Glaubenssätze, ob persönliche Eigenschaften und Erlebnisse (z.B. Fähigkeiten, Willenskraft, aber auch fluidere Zustände wie Emotionen) durch persönliche Anstrengung veränderbar (inkrementelle Theorien) oder unveränderbar (Entitätstheorien) sind. Die beiden Ausprägungen sind dabei als Pole eines Kontinuums zu betrachten (Dweck, 1999). Implizite Theorien stellen grundlegende, übergeordnete Überzeugung über sich selbst, die Welt und andere dar, welche weitere Bewertungen, z.B. Selbstwirksamkeitserwartungen, beeinflussen (Ford et al., 2018; Molden & Dweck, 2006). Im Gegensatz zu Selbstwirksamkeitserwartungen beschreiben sie ein allgemeines Potential für Veränderbarkeit von Fähigkeiten, Eigenschaften und Zuständen, wohingegen Selbstwirksamkeitserwartungen sich konkreter auf aktuelle und zukünftige

Handlungsfähigkeiten und –erfolge beziehen (vgl. de Castella & Byrne, 2015; Zimmerman, 2000b). Theorien über die Veränderbarkeit von Eigenschaften und Zuständen bilden sich meist in Kindheit und Jugend heraus und sind relativ stabil (Robins & Pals, 2002), sind aber durch Interventionen veränderbar (Dweck, 1999; Yeager et al., 2019). Während implizite Theorien meist auf Ebene allgemeiner Theorien zur Veränderbarkeit einer bestimmten Eigenschaft bei Menschen im Allgemeinen (z.B. „Man kann nichts daran ändern, wie intelligent man ist“) erfasst werden, werden sie auch als persönliche Überzeugung bezogen auf die Veränderbarkeit der persönlichen Eigenschaft durch eigene Anstrengung aufgefasst (z.B. „Ich kann nichts daran ändern, wie intelligent ich bin“, vgl. de Castella & Byrne, 2015; de Castella et al., 2013; Spinath, 1998). Der persönlichen impliziten Theorie wird eine höhere Vorhersagekraft für Verhalten zugeschrieben, da sie relevanter für individuelle Entscheidungen sei (de Castella & Byrne, 2015).

Auch im Kontext verschiedener Aspekte der Lern- und Leistungsmotivation wurden domänenspezifische implizite Theorien untersucht. Beispielsweise fanden O’Keefe et al. (2018), dass Personen, die eher an eine Unveränderbarkeit ihrer *dispositionellen Interessen* glaubten, eher erwarteten, dass sich ihre Motivation in diesen Bereichen von allein einstelle. Diese Personen verloren umso mehr Interesse, wenn sie motivationale Schwierigkeiten in ihrem Interessensbereich erlebten. Thoman et al. (2020) fanden, dass stärker von der Veränderbarkeit ihres *situationalen Interesses* überzeugte Lernende häufiger Strategien zur Steigerung ihres situationalen Interesses verwendeten. Bezüglich möglicher Wirkmechanismen lässt sich also annehmen, dass implizite Theorien eher einen Einfluss darauf haben, ob Lernende überzeugt sind, sich überhaupt erfolgreich regulieren zu können und damit, ob überhaupt Strategien eingesetzt werden (vgl. Abbildung 2B). Darüber hinaus gehen implizite Theorien mit höheren Selbstwirksamkeitserwartungen einher, was wiederum mit positiven (selbstregulativen) Outcomes assoziiert ist. Beispielsweise fanden Tamir et al. (2007), dass College-Studierende mit stärkeren Veränderbarkeitsüberzeugungen über ihre Emotionen höhere

Selbstwirksamkeitserwartungen für Emotionsregulation berichteten und häufiger adaptive Strategien zu diesem Zweck einsetzten als Personen mit geringeren Veränderbarkeitsüberzeugungen. Taberero & Wood (1999) fanden ebenfalls, dass Veränderbarkeitstheorien zu höheren Selbstwirksamkeitserwartungen führten, was wiederum mit adaptiverer Zielsetzung und besseren Leistungen einherging.

Lern- und Leistungsmotivation lässt sich nicht ausschließlich über dispositionelle und situative Interessen abbilden, da sie mit verschiedenen qualitativ unterschiedlichen Formen des Erlebens einhergeht. Eine prominente Unterscheidung dieser Erlebensweisen findet sich in der Selbstbestimmungstheorie von Ryan & Deci (2017), speziell in der organismischen Integrationstheorie (Ryan & Deci, 2000). Motiviertes Verhalten wird definiert als ein Kontinuum von Amotivation über verschiedene Formen extrinsischer Motivation bis hin zu intrinsischer Motivation. Intrinsisch bedeutet hier, dass eine Tätigkeit ausgeführt wird um ihrer selbst willen und der Freude an der Ausführung wegen. Extrinsische Formen von Motivation entstehen hingegen durch äußere Anreize (das Beenden der Tätigkeit, Belohnungen und Bestrafungen), die z.T. in das Selbstbild integriert werden können. Der Prozess der Integration extrinsischer Tätigkeitsanreize in das Selbstbild wird als „Regulation“ bezeichnet und geht mit qualitativ unterschiedlichen Erlebensweisen einher, je nachdem, wie kontrollier- und selbstbestimmt veränderbar sie die relevanten Ursachen für ihre Motivation wahrnehmen (Ryan & Deci, 2000). Es ist daher anzunehmen, dass Lernende unterschiedliche Vorstellungen über die Veränderbarkeit ihrer intrinsischen vs. extrinsischen Motivation haben, die über unterschiedliche Prozesse (gesteigerte Selbstwirksamkeitserwartungen und/oder den Einsatz von Selbstregulationsstrategien) zu positiven Outcomes führen.

Erfassung des Motivationsregulationsprozesses

Da zur Erfassung von Selbstwirksamkeitserwartungen speziell für Motivationsregulation und impliziten Theorien über intrinsische und extrinsische Motivation noch keine Instrumente vorliegen, müssen diese zunächst entwickelt werden. Sowohl zur

Erfassung verschiedener Variablen des Motivationsregulationsprozesses (z.B. Strategieranwendung, subjektiver Regulationserfolg, Anstrengungsbereitschaft) als auch individueller Dispositionen (z.B. motivationale Dispositionen) sind Selbstberichtsfragebögen eine beliebte und gute Möglichkeit. Dies geht darauf zurück, dass sie a) mit am validesten Auskunft über innerhalb der Person ablaufende Prozesse wie Selbstregulation oder persönliche Überzeugungen geben können, b) ökonomisch einsetzbar sind und c) besonders in heterogenen und freien Lernumgebungen, in denen selbstreguliertes Lernen häufig erforscht wird, gut interpretierbar sind (Roth et al., 2016; Spörer & Brunstein, 2006; Wolters & Won, 2018).

Methodische Voraussetzungen zur Erfassung individueller Dispositionen

Neben ihrer Objektivität und Reliabilität ist ein zentrales Gütekriterium für Selbstberichtsfragebögen ihre Validität. Die Validität eines Instruments bezeichnet dabei die Eigenschaft eines Messinstruments, ein bestimmtes Konstrukt abzubilden. Das bedeutet, dass gemessene Werte tatsächlich auf das dahinterliegende Merkmal (und nicht auf andere) zurückzuführen sind (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education [AERA, APA, & NCME], 2014; Moosbrugger & Kelava, 2020). Konstruktvalidierung beschreibt entsprechend einen Prozess, in welchem Evidenz gesammelt wird, die darauf hinweist, dass dieser Schluss gültig ist (Flake et al., 2017). Dabei geht es nicht um eine dichotome Entscheidung, ob ein Instrument valide ist oder nicht, sondern darum, auf mehreren Validitätsdimensionen einzuordnen, wie valide ein bestimmtes Erfassungsinstrument für ein bestimmtes Messziel ist (AERA, APA, & NCME, 2014; Wolters & Won, 2018). Zu diesen Validitätsdimensionen gehören die Inhaltsvalidität (die Passung der im Messinstrument verwendeten Items und Skalen zur Definition des zu messenden Konstrukts), die strukturelle Validität (die Dimensionalität und faktoriellen Struktur eines Instruments), sowie die konvergente, diskriminante und prädiktive Validität eines Messinstruments (die stärkeren Zusammenhänge mit verwandten und schwächeren Zusammenhänge mit nicht-verwandten Konstrukten sowie der Vorhersagekraft

des Konstrukts für relevante Outcomes; vgl. Flake et al., 2017). Konstruktvalidierung ist besonders wichtig bei inhaltlich nah verwandten Konstrukten. Sind sich Konstrukte in ihrer Definition und Konzeptualisierung zu nah und nicht hinreichend voneinander abgegrenzt um unterschiedliche Konstrukte zu erfassen und/oder ihre Messinstrumente dadurch inhaltlich und strukturell zu ähnlich, entstehen Tautologien, wenn ein Konstrukt das andere vorhersagen soll. Außerdem kann es vorkommen, dass spezifizierte Messmodelle nicht zu den Daten passen, und Studienteilnehmende den Eindruck erhalten, mehrfach dieselben Aussagen zu beantworten, was sich auf die Teilnahmemotivation auswirken kann.

Validitätsprobleme bei der Erfassung des Motivationsregulationsprozesses

Bezüglich ihrer Validität bergen Selbstberichtsfragebögen neben den genannten Vorteilen einige Nachteile. Zum einen erfassen sie die entsprechenden Variablen häufig dekontextualisiert und aggregiert über verschiedene Situationen hinweg. Dies erfordert hohe Abstraktionsleistungen von Lernenden, die entsprechende Erlebens- und Verhaltensweisen über verschiedene Situationen hinweg erinnern und einschätzen müssen. Diese sehr allgemeine und grobe „grain size“ der erfassenden Instrumente kann dazu führen, dass ihre zugrundeliegenden Konstrukte schwerer trennbar sind (Wolters & Won, 2018, S. 312). Am Beispiel des Motivationsregulationsprozesses kann das Folgendes bedeuten: Berichten Lernende vor einer konkreten Lernsituation ihre Selbstwirksamkeitserwartungen für Motivationsregulation, erhalten dann eine demotivierende Aufgabe als Regulationsanlass, sich zum Weiterarbeiten motivieren zu müssen, und werden anschließend nach ihrem subjektiven Regulationserfolg gefragt (wie gut sie es geschafft haben, sich in dieser konkreten Situation zu motivieren), erscheinen die beiden Konstrukte deutlich trennbarer, da erstere allgemeinsituationsübergreifend, zweitere auf eine konkrete und erinnerbare Situation bezogen sind. Aggregiert über Situationen hinweg, ohne klaren Bezug zu entweder ausschließlich zurückliegenden Regulationserfolgen oder Erwartungen zukünftiger Regulationserfolge, dürften beide Einschätzungen stärker verschmelzen. Außerdem kann es aufgrund von

gemeinsamer Methodenvarianz („common method variance“, Richardson et al., 2009, S. 762) zu künstlich erhöhten Zusammenhängen zwischen Variablen kommen, wenn sie mit derselben Methode erfasst werden. Wolters und Won (2018) äußern hierzu: „relations are a function of using the same assessment method more so than the actual relation between the constructs“ (Wolters & Won, 2018; S. 313).

Neben diesen methodischen Aspekten kann auch die inhaltlich-theoretische Nähe verschiedener Konstrukte eine fehlende Trennbarkeit der entsprechenden Skalen und Konstrukte verstärken. Beispielsweise sollten Personen, die häufiger Motivationsregulationsstrategien verwenden, auch häufiger Regulationserfolge erleben und berichten (vgl. Engelschalk et al., 2017). Umgekehrt stellen Regulationserfolge eine wichtige Quelle für Selbstwirksamkeitserwartungen für ein spezifisches Verhalten dar (Schunk & Zimmerman, 2007), wobei letztere zukünftiges Verhalten und dessen Erfolg mitbestimmen (Bandura, 1977, 1997; Trautner & Schwinger, 2020). Auf situationsaggregierter Ebene, wie sie in Fragebögen erfasst wird, ist es daher möglich, dass die beiden Konstrukte nicht genau trennbar sind. Selbstwirksamkeit für Motivationsregulation ist laut gängigen, multidimensionalen Modellen des selbstregulierten Lernens eine Dimension dieses breiten Konstrukts (z.B. Pintrich, 2004). Somit müssten auch diese beiden Selbstwirksamkeitsskalen eine Überlappung aufweisen. Prokrastination als das irrationale Aufschieben von Aufgaben im Bewusstsein über dadurch entstehende negative Konsequenzen (Grunschel et al., 2013; Klingsieck, 2013; Steel, 2007) wird oft als fehlgeschlagene Regulation der eigenen Motivation definiert und untersucht (vgl. Grunschel et al., 2013). Dies schlägt sich insbesondere in Tuckmans Prokrastinationsskala (1991) nieder (Kim & Seo, 2015), wodurch sich ebenfalls ein inhaltlich-theoretischer Überlappungsbereich zwischen den beiden Konstrukten ergibt.

Die beschriebene theoretisch-konzeptuelle Überlappung verschiedener Variablen des Motivationsregulationsprozesses zeigt sich auch in den Items häufig verwendeter Selbstberichtsskalen zur Operationalisierung dieser Konstrukte. Beispielsweise scheinen die

Items aus unterschiedlichen Skalen zur Erfassung unterschiedlicher Konstrukte sehr ähnlich zu sein:

- „Ich schaffe es in dieser Situation, meine Unmotiviertheit zu überwinden.“ (Engelschalk et al., 2016, S. 77; Skala zur Erfassung von subjektivem Regulationserfolg)
- „Selbst wenn das Lernen schwierig ist, kann ich einen Weg finden, weiterzumachen.“ (Kim et al., 2018, S. 3, Übersetzung der Autorin, Kurzsкала zur Erfassung von Motivationsregulation)
- „Auch in schwierigen Lernphasen weiß ich genau, was ich tun muss, um über längere Zeit voll motiviert zu bleiben.“ (Trautner & Schwinger, 2020, S. 5, Skala zur Erfassung von Selbstwirksamkeit für Motivationsregulation)
- „Wie gut können Sie sich selbst motivieren, Aufgaben für die Uni zu erledigen?“ (Zimmerman et al., 1992, S. 668, Übersetzung der Autorin, Skala zur Erfassung von Selbstwirksamkeit für selbstreguliertes Lernen)
- „Ich investiere die nötige Zeit in selbst langweilige Aufgaben wie das Lernen.“ (Tuckman, 1991, S. 477; Übersetzung der Autorin, Skala zur Erfassung von Prokrastination)

Aus diesem Grund sind klare und theoriegeleitete Konstruktdefinitionen und –abgrenzungen ebenso wichtig wie eine genaue Prüfung der inhaltlichen und strukturellen Validität sowohl neuer als auch bestehender Selbstberichtsskalen zur Erfassung verschiedener Aspekte des Motivationsregulationsprozesses. Diese sollen bei der Konzeptualisierung der Selbstberichtsfragebögen zur Erfassung von Selbstwirksamkeitserwartungen für Motivationsregulation und impliziten Theorien über Motivation berücksichtigt werden. Es sollte ein besonderes Augenmerk auf die strukturelle Validierung dieser Skalen im Kontext weiterer Selbstberichtsfragebögen zur Erfassung von Motivationsregulation gelegt werden.

Forschungsdiesiderata und Fragestellungen

Während die adaptiven Effekte von Motivationsregulation im Lern- und Leistungskontext bereits gut erforscht sind, ist bisher weniger eindeutig, von welchen individuellen, persönlichen Faktoren der Prozess der Motivationsregulation und sein Erfolg abhängt. Dabei sind insbesondere stabile, aber veränderbare und vor allem für Motivationsregulation spezifische individuelle Dispositionen vernachlässigt worden – so auch Selbstwirksamkeitserwartungen für Motivationsregulation oder implizite Theorien über Motivation, die sich in anderen Bereichen der Selbstregulation als nützliche Prädiktoren erwiesen haben (vgl. Burnette et al., 2013; Ford & Gross, 2019; Klassen et al., (2008); Tamir et al., 2007; Thoman et al., 2020; Zimmerman et al., 1992). Genaueres Wissen darüber, welche individuellen und veränderbaren Dispositionen den Einsatz von Motivationsregulationsstrategien und ihren Erfolg durch welchen psychologischen Mechanismus beeinflussen, ist notwendig, um theoretische Modelle zu Motivationsregulation dahingehend zu explizieren, welche individuellen Dispositionen für Motivationsregulation wie mit dem Prozess zusammenhängen (vgl. Schwinger & Stiensmeier-Pelster, 2012; Smaldino, 2017, 2020). Darüber hinaus kann es für Trainings und Interventionen zur Förderung von Motivationsregulation nützlich sein, veränderbare und spezifische individuelle Dispositionen wie implizite Theorien über Motivation oder Selbstwirksamkeitserwartungen für Motivationsregulation zu integrieren. Zur Untersuchung des Einflusses dieser individuellen Dispositionen auf den Motivationsregulationsprozess bedarf es valider Messinstrumente, um Zusammenhänge zwischen ihnen allein aufgrund von Methodeneffekten auszuschließen. Aus diesem Grund ist es unabdingbar, neu entwickelte Skalen gemeinsam mit bestehenden Skalen zur Erfassung unterschiedlicher Aspekte des Motivationsregulationsprozesses zu validieren.

In der vorliegenden Dissertation werden daher die folgenden drei Fragestellungen in drei Manuskripten untersucht:

1. Wie können für den Motivationsregulationsprozess spezifische und veränderbare individuelle Dispositionen und Variablen des Motivationsregulationsprozesses (z.B. der Einsatz von Strategien zur Regulation, Bewertungen ihres Erfolges) valide in Selbstberichten erfasst werden? (Manuskripte 1, 2 & 3)
2. Können für den Motivationsregulationsprozess spezifische und veränderbare individuelle Dispositionen den Prozess besser vorhersagen als allgemeinere individuelle Dispositionen? (Manuskripte 1 & 2)
3. Wie genau, d.h. an welcher Stelle, hängen diese individuellen Dispositionen mit dem Prozess der Motivationsregulation zusammen? (Manuskripte 1 & 2)

Tabelle 1 gibt einen Überblick über die in den drei Manuskripten untersuchten Fragestellungen und damit adressierten Forschungsdesiderata.

Tabelle 1

Forschungsfragen, Studienziele und Manuskripte der vorliegenden Dissertation

Studie der vorliegenden Dissertation	Ziele und Fragestellungen	Adressierte Forschungsdesiderata
#1 Trautner, M., & Schwinger, M. (2020). Integrating the concepts self-efficacy and motivation regulation: How do self-efficacy beliefs for motivation regulation influence self-regulatory success? <i>Learning and Individual Differences</i> , Artikel 80, 101890. https://doi.org/10.1016/j.lindif.2020.101890	<ol style="list-style-type: none"> 1. Entwicklung und erste Validierung eines Fragebogens zur Erfassung von Selbstwirksamkeit für Motivationsregulation 2. Wie hängen Selbstwirksamkeitserwartungen für Motivationsregulation mit dem Motivationsregulationsprozess zusammen? 3. Hängen Selbstwirksamkeitserwartungen für Motivationsregulation mit Variablen des Prozesses über allgemeine Dispositionen hinaus zusammen? 	<ol style="list-style-type: none"> 1. valide Erfassung von Variablen des und Einflussfaktoren auf den Motivationsregulationsprozess 2. Nützlichkeit spezifischerer Prädiktoren zur Vorhersage des Motivationsregulationsprozesses 3. Wirkmechanismus individueller Dispositionen
#2 Trautner, M., & Schwinger, M. (under review). To regulate or not to regulate? - The impact of implicit theories about motivation for studying on effective motivation regulation.	<ol style="list-style-type: none"> 1. Entwicklung und erste Validierung eines Fragebogens zur Erfassung impliziter Theorien über intrinsische und extrinsische Motivation 2. Wie hängen implizite Theorien über Motivation mit dem Motivationsregulationsprozess zusammen? (Direkt vs. vermittelt über Selbstwirksamkeit für Motivationsregulation?) 3. Sind implizite Theorien über Motivation über allgemeinere implizite Theorien (z.B. über Fähigkeiten, Emotionen oder dispositionelle Interessen) hinaus mit dem Motivationsregulationsprozess assoziiert? 	<ol style="list-style-type: none"> 1. valide Erfassung von Variablen des und Einflussfaktoren auf den Motivationsregulationsprozess 2. Nützlichkeit spezifischerer Prädiktoren zur Vorhersage des Motivationsregulationsprozesses 3. Wirkmechanismus individueller Dispositionen
#3 Trautner, M., & Schwinger, M. (submitted). Conceptual fuzziness in motivation regulation research and assessment: A measurement validation study.	<ol style="list-style-type: none"> 1. Wie inhaltsvalide messen die Items verschiedener Skalen zur Erfassung unterschiedlicher Aspekte des Motivationsregulationsprozesses die jeweiligen Konstrukte (und nicht andere)? 2. Wie trennscharf sind die dahinterliegenden Konstrukte? 3. Wie können validere Skalen zur praktischen Verwendung gebildet werden? 	<ol style="list-style-type: none"> 1. valide Erfassung von Variablen des und Einflussfaktoren auf den Motivationsregulationsprozess

Zusammenfassung und Diskussion der drei Fachartikel

In den folgenden Kapiteln werden die drei Artikel der vorliegenden Dissertation zusammengefasst. Die vollständigen Manuskripte befinden sich in den Anhängen 1-3.

Studie 1: Integrating the concepts self-efficacy and motivation regulation: How do self-efficacy beliefs for motivation regulation influence self-regulatory success?

Ziel der ersten Studie war es, zu untersuchen, ob und welchen Einfluss Selbstwirksamkeitserwartungen für Motivationsregulation als spezifische individuelle Disposition für Motivationsregulation auf den Motivationsregulationsprozess haben. Dabei wurden die folgenden vier Aspekte untersucht: Aufgrund fehlender Skalen zur Erfassung von Selbstwirksamkeitserwartungen für Motivationsregulation wurde erstens eine solche Skala entwickelt und hinsichtlich ihrer strukturellen, konvergenten und diskriminanten Validität geprüft. Zweitens wurden bezüglich der Frage der Mechanismen, wie Selbstwirksamkeitserwartungen für Motivationsregulation den Prozess beeinflussen, zwei Hypothesen untersucht: a) je höher die Selbstwirksamkeitserwartungen für Motivationsregulation der Lernenden, desto effektiver wenden sie Motivationsregulationsstrategien an, d.h. desto stärker ist der Zusammenhang zwischen Strategieanwendung und Anstrengungsbereitschaft (Moderationshypothese, Abbildung 2A) und b) je höher die Selbstwirksamkeitserwartungen für Motivationsregulation der Lernenden, desto häufiger setzen sie Motivationsregulationsstrategien ein, was wiederum (direkt und indirekt) mit höherer Anstrengungsbereitschaft einhergeht (Mediationshypothese, Abbildung 2B). Drittens wurde untersucht, ob Selbstwirksamkeitserwartungen für Motivationsregulation über Anstrengungsbereitschaft als Ergebnis effektiver Motivationsregulation hinaus mit subjektivem Wohlbefinden beim Lernen sowie besserer Leistung zusammenhängen. Viertens wurde, um die Nützlichkeit spezifischerer Prädiktoren speziell für Motivationsregulation im Vergleich zu eher allgemeinen Prädiktoren zu untersuchen, getestet, ob diese Zusammenhänge

über andere, weniger spezifische Selbstwirksamkeitserwartungen (für akademische Leistung und selbstreguliertes Lernen) hinaus bestehen.

Method

In drei querschnittlichen Fragebogenstudien mit Studierenden ($N_1 = 146$, $N_2 = 588$, $N_3 = 531$) wurde ein Fragebogen zur Erfassung von Selbstwirksamkeitserwartungen für Motivationsregulation konzipiert und validiert. Die Itemkonstruktion orientierte sich an Banduras (2006) Leitlinie zur Konstruktion von Selbstwirksamkeitsskalen (Beispielitem: „Selbst für eher langweilige Aufgaben im Studium kann ich mich fast immer gut motivieren“). Zur Validierung der neu gebildeten Skala wurden konfirmatorische Faktorenanalysen berechnet. Die inhaltlichen Hypothesen wurden über Pfadmodelle in Mplus getestet.

Ergebnisse und Diskussion

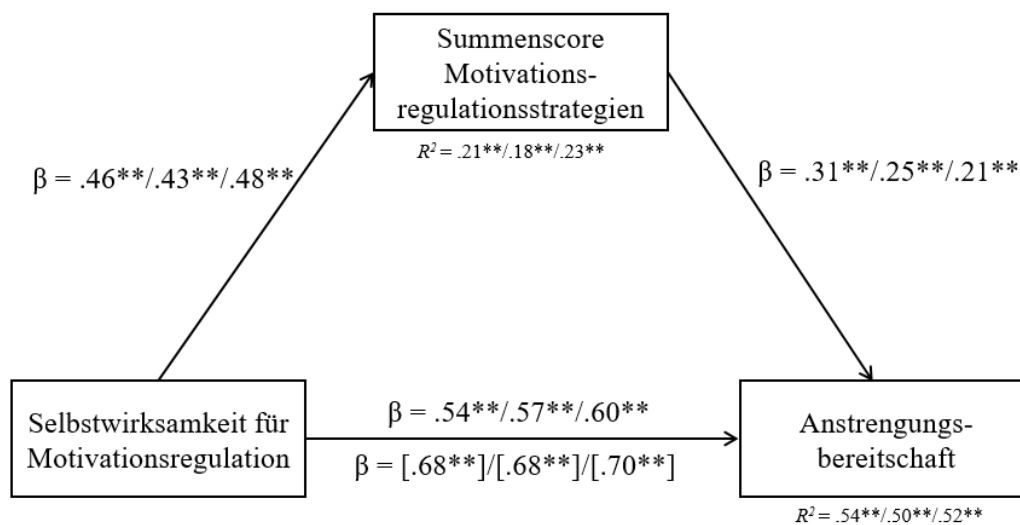
Die neu konzipierte Skala zur Erfassung von Selbstwirksamkeitserwartungen für Motivationsregulation zeigte nach Ausschluss eines Items mit geringer Faktorladung eine gute bis hervorragende Passung zu den Daten für ein eindimensionales Modell in allen drei Stichproben sowie gute Reliabilitäten ($.83 \leq \omega \leq .85$). Sie wies hohe Korrelationen mit anderen Selbstwirksamkeitsskalen und Anstrengungsbereitschaft und kleine bis moderate Korrelationen mit dem Einsatz von Motivationsregulationsstrategien und Leistung auf, was auf eine gute konvergente und diskriminante Validität hinweist.

Bezüglich der untersuchten Wirkmechanismen zeigte sich, dass Selbstwirksamkeitserwartungen für Motivationsregulation den Zusammenhang zwischen Motivationsregulationsstrategieverwendung und Anstrengungsbereitschaft nicht moderierten, d.h. dass die Effektivität des Strategieeinsatzes nicht von Selbstwirksamkeitserwartungen abhing. Hingegen fand sich in allen drei Studien, dass höhere Selbstwirksamkeitserwartungen mit einem häufigeren Einsatz von Strategien einhergingen, der wiederum mit höherer Anstrengungsbereitschaft assoziiert war (Abbildung 3). Der indirekte Zusammenhang war ebenfalls statistisch signifikant ($.09 \leq \beta \leq .14$; $ps \leq .001$). Der direkte Zusammenhang zwischen

Selbstwirksamkeit für Motivationsregulation und Anstrengungsbereitschaft war ebenfalls signifikant und groß im Vergleich zum mittelstarken Zusammenhang der Strategieverwendung mit Anstrengungsbereitschaft.

Abbildung 3

Ergebnisse der Mediationsanalysen aus Stichproben 1-3



Anmerkung. Adaptiert nach Trautner & Schwinger (2020); Stichprobe 1/Stichprobe 2/Stichprobe 3. [] = totaler Effekt. Es werden standardisierte Koeffizienten berichtet. * $p < .05$; ** $p < .01$.

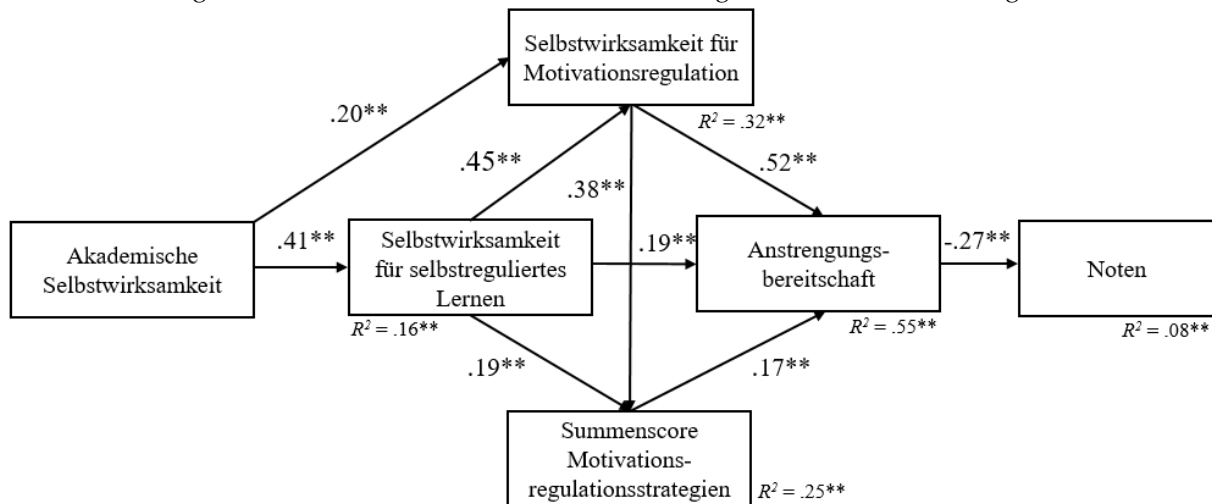
Selbstwirksamkeitserwartungen waren wie erwartet sowohl direkt mit besserer Leistung ($\beta = .14, p < .05$) und höherem subjektiven Wohlbefinden beim Lernen ($\beta = .31, p < .01$) assoziiert, also auch jeweils indirekt vermittelt über Anstrengungsbereitschaft, nicht aber über den Strategieeinsatz. Dies weist auf eine Bedeutsamkeit von Selbstwirksamkeitserwartungen für Motivationsregulation über die Anwendung von Strategien hinaus hin.

Zur Frage, ob Selbstwirksamkeit für Motivationsregulation als spezifischerer Prädiktor im Vergleich zu als allgemeineren Selbstwirksamkeitserwartungen den Prozess vorhersagt, zeigte sich wie erwartet, dass Selbstwirksamkeit für Motivationsregulation sowohl mit einem

häufigeren Strategieeinsatz als auch Anstrengungsbereitschaft assoziiert war über akademische Selbstwirksamkeit und Selbstwirksamkeit für selbstreguliertes Lernen hinaus (Abbildung 4).

Abbildung 4

Zusammenhänge zwischen Selbstwirksamkeitserwartungen und Motivationsregulation



Anmerkung. Adaptiert nach Trautner & Schwinger (2020). $\chi^2_{[6]} = 21.614$; $p = .001$; Confirmatory Fit Index (CFI) = .983; Root Mean Square Error of Approximation (RMSEA) = .070; Standardized Root Mean Square Residual (SRMR) = .044. Selbstwirksamkeit für selbstreguliertes Lernen enthielt nur sieben statt der ursprünglichen elf Items, da vier davon explizit Motivationsregulation erfassten, um konzeptuelle Klarheit zu wahren. Geringere Notenwerte entsprechen besseren Leistungen. Es werden standardisierte Koeffizienten berichtet. * $p < .05$; ** $p < .01$.

Zusammengefasst zeigte sich mit Blick auf die Fragestellungen, 1) dass sich Selbstwirksamkeit für Motivationsregulation valide, reliabel und ökonomisch in einer Selbstberichtsskala erfassen lässt, 2) dass diese sowohl vermittelt über einen häufigeren Einsatz von Motivationsregulationsstrategien als auch direkt mit höherer Anstrengungsbereitschaft zusammenhängt, und 3) den Motivationsregulationsprozess über allgemeinere und weniger spezifische Selbstwirksamkeitserwartungen hinaus vorhersagt.

Studie 2: To regulate or not to regulate? - The impact of implicit theories about motivation for studying on effective motivation regulation

Die zweite Studie verfolgte das Ziel, den Einfluss impliziter Theorien über intrinsische und extrinsische Aspekte von Motivation auf den Prozess der Motivationsregulation zu untersuchen. Dabei wurden folgende Hypothesen und Fragestellungen untersucht: Erstens, je stärker Lernende von der Veränderbarkeit ihrer Lern- und Leistungsmotivation überzeugt sind, d.h. inkrementelle Theorien über intrinsische und extrinsische Motivation vertreten, desto häufiger setzen sie Motivationsregulationsstrategien ein und desto höher ist hierüber vermittelt ihre Anstrengungsbereitschaft. Zweitens wurde bezüglich der Frage, wie implizite Theorien den Prozess der Motivationsregulation beeinflussen, angenommen, dass die Zusammenhänge inkrementeller Theorien mit Strategieanwendung und Anstrengungsbereitschaft partiell durch höhere Selbstwirksamkeitserwartungen für Motivationsregulation vermittelt werden. Da Motivation mit unterschiedlichen Erlebens- und Verhaltensweisen einhergeht (vgl. Ryan & Deci, 2017), wurde drittens untersucht, ob Veränderbarkeitsüberzeugungen über intrinsische Aspekte der eigenen Lern- und Leistungsmotivation mit einer häufigeren Verwendung von Motivationsregulationsstrategien einhergehen, die eher intrinsische Motivation steigern (z.B. Steigerung des situativen Interesses) als mit extrinsischen Strategien (z.B. Selbstbelohnung). Umgekehrt wurde untersucht, ob Veränderbarkeitsüberzeugungen über extrinsische Aspekte der eigenen Lern- und Leistungsmotivation mit einer häufigeren Verwendung von Strategien einhergehen, die auf die Veränderung extrinsischer Motivation abzielen. Viertens wurde geprüft, ob diese für Motivationsregulation spezifischeren impliziten Theorien über allgemeinere und weniger spezifische implizite Theorien (Intelligenz, Emotionen und dispositionelle Interessen) hinaus mit Motivationsregulation zusammenhängen. Zuletzt wurde untersucht, ob persönliche implizite Theorien zur Veränderbarkeit der eigenen Motivation durch persönliche Anstrengung stärkere Prädiktoren für den Motivationsregulationsprozess darstellen als allgemeine Theorien zur Veränderbarkeit von Motivation insgesamt.

Methode

In zwei querschnittlichen Fragebogenstudien mit Studierenden ($N_1 = 376$, $N_2 = 365$) wurde ein Fragebogen als Messinstrument für allgemeine und persönliche implizite Theorien über intrinsische und extrinsische Motivation in Anlehnung an bestehende Fragebögen zur Erfassung impliziter Theorien (Dweck, 1999; Tamir et al., 2007) konzipiert und validiert. Ein Beispielitem für Entitätstheorien über extrinsische Motivation lautet: „Wie nützlich das zu Lernende für einen ist, kann man nicht beeinflussen.“, ein Beispielitem für inkrementelle Theorien bzgl. intrinsischer Motivation lautet: „Man kann beeinflussen, wie viel Freude das Lernen macht.“. Entitätsaussagen wurden invertiert, sodass höhere Werte im Gesamtscore der Skalen Veränderbarkeitsüberzeugungen implizieren. Die Faktorenstruktur der Skala wurde in konfirmatorischen Faktorenanalysen getestet. Zur Prüfung der konvergenten und diskriminanten Validität wurden Korrelationen mit verwandten impliziten Theorien und weiteren Konstrukten herangezogen. Anschließend wurden die übrigen Hypothesen mittels Pfadmodellen untersucht.

Ergebnisse und Diskussion

Konfirmatorische Faktorenanalysen zeigten zwei trennbare und moderat bis hoch korrelierte Faktoren für implizite Theorien über intrinsische und extrinsische Aspekte der eigenen Lern- und Leistungsmotivation ($.38 \leq r \leq .57$) mit akzeptabler bis guter Reliabilität in beiden Studien ($.63 \leq \omega \leq .82$). Allgemeine und persönliche implizite Theorien ließen sich faktoriell nicht trennen; Items beider Erfassungsarten fielen auf jeweils den intrinsischen und extrinsischen Faktor zusammen, welche allerdings eine gute Modellpassung aufwiesen ($\chi^2_{(47)} = 100.715$; $p < .001$; Confirmatory Fit Index (CFI) = 0.958; Root Mean Square Error of Approximation (RMSEA) = 0.056; Standardized Root Mean Square Residual (SRMR) = 0.048). Zwar trennten bisherige Studien persönliche und allgemeine implizite Theorien über eigene Fähigkeiten in zwei Faktoren; diese waren allerdings sehr hoch miteinander korreliert (z.B. $r = .80$, de Castella & Byrne, 2015) und die relevanten Modelle zur Prüfung der

faktoriellen Trennbarkeit wurden nicht berichtet (siehe auch de Castella et al., 2013; Spinath, 1998). Die fehlende Trennbarkeit persönlicher und allgemeiner Theorien könnte darin begründet sein, dass a) im alltagssprachlichen Gebrauch Aussagen über die eigene Person oft mit allgemeinen „man“-Formulierungen getätigt werden, wodurch sie inhaltlich gleichbedeutend trotz einer explizit den Unterschied verdeutlichenden Instruktion waren, oder b) Lernende speziell bei motivationalen Aspekten eine höhere Übereinstimmung wahrnehmen zwischen ihren eigenen Erfahrungen zur Veränderbarkeit von Motivation und den Erfahrungen anderer als bei Intelligenz/Fähigkeiten, die in bisherigen Studien untersucht wurden (de Castella & Byrne, 2015; de Castella et al., 2013).

Geringe Korrelationen mit anderen impliziten Theorien, Motivationsregulation und Anstrengungsbereitschaft und moderate Zusammenhänge mit Selbstwirksamkeitserwartungen für Motivationsregulation weisen darauf hin, dass die Skalen implizite Theorien über intrinsische und extrinsische Aspekte der eigenen Lern- und Leistungsmotivation valide abbilden.

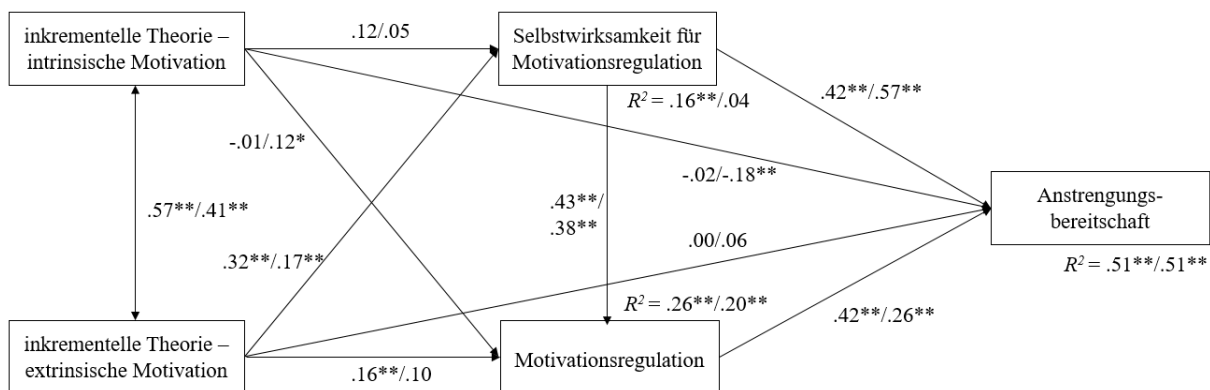
Die Pfadmodelle in beiden Stichproben zeigten, dass inkrementelle Theorien über intrinsische und extrinsische Motivation inkonsistent mit dem Einsatz von Motivationsregulationsstrategien und Anstrengungsbereitschaft zusammenhängen (Abbildung 5). Implizite Theorien über intrinsische Motivation hingen in beiden Studien auch nicht mit Selbstwirksamkeitserwartungen für Motivationsregulation zusammen. Je stärker Lernende hingegen von der Veränderbarkeit extrinsischer Aspekte von Motivation überzeugt waren, desto höher waren ihre Selbstwirksamkeitserwartungen und vermittelt dadurch ihre Anstrengungsbereitschaft und die von ihnen berichtete Häufigkeit des Einsatzes von Motivationsregulationsstrategien.

Auf Ebene der einzelnen Strategien war das Befundmuster inkonsistent; es zeigten sich insgesamt keine differentiellen Zusammenhänge zwischen impliziten Theorien über

intrinsische Motivation und dem Einsatz intrinsischer Strategien bzw. impliziten Theorien über extrinsische Motivation und dem Einsatz extrinsischer Strategien.

Abbildung 5

Zusammenhänge zwischen impliziten Theorien, Selbstwirksamkeit für Motivationsregulation, Strategieranwendung und Anstrengungsbereitschaft



Anmerkung. Es werden standardisierte Pfadkoeffizienten berichtet. Studie 1/Studie2. * $p < .05$; ** $p < .01$.

Weder implizite Theorien über Intelligenz noch Emotionen sagten Variablen des Motivationsregulationsprozesses über implizite Theorien über Motivation hinaus vorher; implizite Theorien über dispositionelle Interessen waren lediglich mit einem leicht häufigeren Einsatz von Motivationsregulationsstrategien verbunden. Auch diese Befunde implizieren daher die Nützlichkeit spezifischerer Prädiktoren für den Motivationsregulationsprozess.

Bezüglich der zugrundeliegenden Fragestellungen lässt sich festhalten, 1) dass sich implizite Theorien über intrinsische und extrinsische Aspekte von Motivation abgrenzbar von allgemeineren impliziten Theorien valide in Selbstberichtsskalen erfassen lassen, 2) dass diese weniger direkt als (besonders implizite Theorien über extrinsische Motivation) indirekt, vermittelt über Selbstwirksamkeitserwartungen für Motivationsregulation, mit Strategieranwendung und Anstrengungsbereitschaft zusammenhängen und 3) dass sie über allgemeinere

implizite Theorien hinaus mit Variablen des Motivationsregulationsprozesses zusammenhängen.

Studie 3: Conceptual fuzziness in motivation regulation research and assessment: A measurement validation study

In beiden vorangegangenen Studien wurden Fragebogeninstrumente zur Erfassung von individuellen Überzeugungen über die eigene Motivation und ihre Regulation entwickelt und validiert. Weitere Evidenz bezüglich ihrer Validität und Abgrenzbarkeit von weiteren Selbstberichtsskalen zur Erfassung verschiedener Variablen des Motivationsregulationsprozesses ist jedoch nötig, da diese inhaltlich-theoretisch und empirisch eng verbunden sind durch ihre konzeptuelle Nähe im nomologischen Netzwerk der Selbstregulation der eigenen Motivation (Cronbach & Meehl, 1955). Während dieser Umstand prinzipiell auf viele Variablen des Motivationsregulationsprozesses zutrifft (vgl. Wolters & Won, 2018), werden in der vorliegenden Studie fünf häufig verwendete und inhaltlich nah verwandte Selbstberichtsfragebögen und ihre dahinterliegenden Konstrukte exemplarisch hinsichtlich ihrer Validität und empirischen Trennbarkeit untersucht. Die verwendeten Skalen, zugehörigen Konstruktdefinitionen und potentiell problematisch überlappende Beispielitems sind in Tabelle 2 dargestellt. Für die meisten dieser Skalen liegen über die Erst- und Originalpublikationen hinaus eine Vielzahl von Studien mit Evidenz zu ihrer Validität vor. Allerdings sind die Skalen noch nicht gemeinsam überprüft worden.

Ziel der Studie war daher, diese fünf bestehenden und teilweise häufig genutzten Messinstrumente zur Erfassung verschiedener, aber konzeptuell verwandter Aspekte hinsichtlich ihrer Validität zu prüfen mit einem Fokus darauf,

1. wie inhaltsvalide die Items die jeweiligen Konstrukte ihrer Skala (und möglichst wenig andere) messen,
2. wie trennscharf die dahinterliegenden Konstrukte sind und
3. wie, falls nötig, validere Skalen zur praktischen Verwendung gebildet werden können.

Tabelle 2

Skalen zur Erfassung des Motivationsregulationsprozesses, Konstruktdefinitionen und Beispielitems

Skala & Originalpublikation	der Skala zugrundeliegende Konstruktdefinition	Beispielitem
kurze Motivationsregulationsskala (Kim et al., 2018)	“Regulation of motivation, or students' active efforts to sustain or enhance their own motivation (Wolters, 2003)” (S. 259)	Wenn das Lernen zu langweilig wird, finde ich einen Weg, es unterhaltsam zu machen.
Selbstwirksamkeit für Motivationsregulation (Trautner & Schwinger, 2020)	Lernende können “effectively implement measures to successfully regulate their motivation even in the face of boring or difficult tasks” (Trautner & Schwinger, 2020, p. 1)	Selbst für eher langweilige Aufgaben im Studium kann ich mich fast immer gut motivieren.
subjektiver Regulationserfolg (Engelschalk et al., 2016)	“effective mastery of a motivational blockage, the maintenance of motivation levels while studying” (Engelschalk et al., 2017, S. 1155) “These appraisals of the effectiveness of motivational regulation should mirror the learners' individual experiences with specific demanding situations” (Engelschalk et al., 2016, S. 73) “Overcoming specific motivational problems” (Engelschalk et al., 2017, p. 1158)	Mir gelingt es gut, mich in dieser Situation zu motivieren.
Selbstwirksamkeit für selbst-reguliertes Lernen (Zimmerman et al., 1992)	“The scales for perceived self-efficacy for self-regulated learning assess students' perceived capability to use a variety of self-regulated learning strategies such as planning and organizing their academic activities, transforming instructional information using cognitive strategies to understand and remember material being taught, resisting distractions, motivating themselves to complete school work, structuring environments conducive to study, and participating in class.” (Zimmerman et al., 1992, S. 665)	Wie gut können Sie sich selbst motivieren, Aufgaben für die Uni zu erledigen?
Prokrastination Tuckman (1991)	„The lack or absence of self-regulated performance has been labelled procrastination, the tendency to put off or completely avoid an activity under one's control (Tuckman and Sexton, 1989).” (Tuckman, 1991, S. 474)	Ich schiebe die Erledigung von Arbeiten unnötigerweise auf, auch wenn sie wichtig sind.

Methode

Zur Untersuchung der Inhaltsvalidität bewerteten Expert:innen (definiert als Forschende, die in den letzten 5 Jahren an mindestens einer Publikation zum Thema Motivationsregulation mitgearbeitet haben, $N = 16$) die Items der Skalen dahingehend, welches Konstrukt sie hauptsächlich erfassen und welche weiteren Konstrukte nebensächlich mitgemessen werden. Zur Prüfung der strukturellen, konvergenten und diskriminanten Validität wurden anhand von Daten einer Studierendenstichprobe ($N = 365$) zunächst konfirmatorische Faktorenanalysen für die fünf einzelnen Skalen berechnet, sowie ein Modell mit allen fünf als „independent cluster model confirmatory factor analysis“ (ICM-CFA; Marsh et al., 2014), um die Modellgüte und Trennbarkeit der Skalen zu untersuchen. Da ICM-CFA allerdings besonders bei konzeptuell nah verwandten Skalen einige Probleme aufweisen, wurden weiterhin explorative Strukturgleichungsmodelle (ESEM; Marsh et al., 2014; Morin et al., 2020) berechnet. Da die Skala zur Erfassung des subjektiven Regulationserfolgs (Engelschalk et al., 2016) mehrfach dieselben Items je zu Vignetten mit unterschiedlichen Motivationsproblemen präsentieren, wurden korrelierte Residuen zwischen den je parallelen Items zugelassen.

Durch die konzeptuelle Nähe der Konstrukte ist davon auszugehen, dass die Antworten zu einzelnen Items zwar von einem Konstrukt (z.B. Selbstwirksamkeit für Motivationsregulation) hauptsächlich, aber zumindest zu einem kleinen Teil auch durch verwandte Konstrukte (z.B. subjektivem Regulationserfolg) beeinflusst werden. In ICM-CFA wird nur der Einfluss eines einzigen latenten Faktors auf das jeweilige Item zugelassen, alle weiteren Faktorladungen werden auf Null restringiert. Durch die künstliche Reduktion solcher Mehrfachladungen auf Null in ICM-CFA kann es zu „error propagation“ kommen (Morin et al., 2020), was bedeutet, dass Korrelationen zwischen latenten Faktoren künstlich erhöht sind und damit nicht die tatsächlichen Zusammenhänge zwischen latenten Konstrukten widerspiegeln. ESEM erlauben im Gegensatz zu ICM-CFA solche Mehrfachladungen.

Die Ergebnisse der Expert:innenbefragung und der ESEM wurden verwendet, um Items mit geringer inhaltlich-theoretischer und empirischer Passung zu identifizieren und auszuschließen. Anschließend wurden die explorativen Strukturgleichungsmodelle erneut berechnet, um zu testen, ob so strukturell validere Skalen entstehen, und Empfehlungen für die zukünftige Verwendung zu gewinnen.

Ergebnisse und Diskussion

Fast allen Items wurden im Rahmen der Expert:innenbefragung mindestens zwei Konstrukte zugewiesen, welche sie hauptsächlich messen. Nur wenige Items maßen laut Expert:inneneinschätzung ausschließlich das Konstrukt, welches sie laut ihrer Ursprungsskala und der zugehörigen Konstruktdefinition messen sollten. Separate konfirmatorische Faktorenanalysen für die Skalen zur Erfassung des subjektiven Regulationserfolgs, zur Selbstwirksamkeit für Motivationsregulation und zur Erfassung von Motivationsregulation zeigten eine gute Passung (Tabelle 3). Dies war nicht der Fall für Tuckmans Prokrastinationsskala und die Skala zur Selbstwirksamkeit für selbstreguliertes Lernen. Während letztere bei Aufteilung der unidimensionalen Skala in drei Subskalen gemäß theoretisch vorgeschlagener Dimensionen des selbstregulierten Lernens (Pintrich, 2004; Trautner & Schwinger, 2020) eine bessere Modellgüte aufwies, ließ sich aus den Modellergebnissen der Prokrastinationsskala keine entsprechende Modellmodifikation ableiten. Auch die ICM-CFA mit allen eingeschlossenen Skalen (inkl. der Adaptionen der Skala für Selbstwirksamkeit für selbstreguliertes Lernen) zeigte wie erwartet keine gute Passung an die Daten und extrem hohe Korrelationen zwischen den latenten Konstrukten ($.40 \leq r \leq .96$), was entweder für eine fehlende Trennbarkeit zugrundeliegender Konstrukte oder error propagation durch unrealistische Modellannahmen der ICM-CFA spricht. Zusammengefasst weisen die Ergebnisse aus der Expert:innenbefragung und den ICM-CFA darauf hin, dass nicht alle Items der ursprünglichen Skalen ihre jeweiligen Konstrukte

inhaltsvalide erfassen und eventuelle inhaltlich-theoretische und methodische Überlappungen sich auf die Güte der Messmodelle auswirken.

Tabelle 3*Ergebnisse konfirmatorischer Faktorenanalysen und explorativer Strukturgleichungsmodelle*

Modell	$\chi^2_{(df)}; p$	CFI	TLI	RMSEA	SRMR
independent cluster model confirmatory factor analyses (ICM-CFA)					
Motivationsregulation	77.10 (20); < .001	.941	.918	.090	.042
Selbstwirksamkeit MR	32.77 (5); < .001	.957	.915	.124	.029
Regulationserfolg	265.60 (177); < .001	.987	.980	.038	.024
Selbstwirksamkeit SRL	207.35 (44); < .001	.842	.803	.101	.056
Selbstwirksamkeit SRL (3)	74.095 (41); .001	.968	.957	.047	.039
Prokrastination	334.63 (104); < .001	.908	.894	.079	.048
Gesamtmodell	3289.16 (1847); < .001	.915	.907	.046	.050
Gesamtmodell (3)	3093.188 (1826); < .001	.925	.918	.044	.048
explorative Strukturgleichungsmodelle (ESEM)					
Modell 1 (3 Faktoren)	2446.98 (983); < .001	.849	.827	.065	.046
Modell 2 (4 Faktoren)	2045.02 (938); < .001	.886	.863	.057	.039
Modell 3 (5 Faktoren)	1783.32 (894); < .001	.910	.886	.052	.035
Modell 4 (6 Faktoren)	1651.68 (851); < .001	.919	.892	.051	.030
Modell 5 (7 Faktoren)	1421.13 (809); <.011	.938	.913	.046	.027
explorative Strukturgleichungsmodelle (ESEM) nach Itemausschluss					
Modell 6 (3 Faktoren)	1600.038 (554); .001	.872	.846	.072	.046
Modell 7 (4 Faktoren)	1232.860 (520); .001	.913	.888	.062	.036
Modell 8 (5 Faktoren)	980.532 (487); .001	.939	.917	.053	.029
Modell 9 (6 Faktoren)	816.187 (455); .001	.956	.935	.047	.024
Modell 10 (7 Faktoren)	738.135 (424); <.001	.961	.939	.045	.020

Anmerkung. CFI = Comparative Fit Index, TLI = Tucker Lewis Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual. Motivationsregulation: BRoMS (Brief Motivational Regulation Scale, (Kim et al., 2018); Selbstwirksamkeit für MR: Selbstwirksamkeit für Motivationsregulation (Trautner & Schwinger, 2020); Regulationserfolg: Engelschalk et al. (2016); Selbstwirksamkeit SRL: Selbstwirksamkeit für selbstreguliertes Lernen (Zimmerman et al., 1992), Selbstwirksamkeit SRL (3): Skala aufgeteilt in 3 Faktoren nach Trautner & Schwinger (2020); Prokrastination: Tuckmans Prokrastinationsskala (Tuckman, 1991); Gesamtmodell: enthält alle fünf Originalskalen. Gesamtmodell (3): alle fünf Originalskalen, Selbstwirksamkeit für selbstreguliertes Lernen aufgeteilt in drei Faktoren. In ESEM wurden zur Reduktion der Modellkomplexität nur zwei der sechs Subskalen der Regulationserfolgsskala verwendet (Subskalen Regulationserfolg in aktionalen Handlungsphasen bei Erwartungs- und Wertproblemen). Itemausschluss: basierend auf Ergebnissen von Expert:innenbefragungen und statistischen Kriterien aus ESEM mit 5 und 6 Faktoren als inhaltlich interpretierbare Lösungen wurden 11 Items geringer Validität und Passung zu latenten Faktoren ausgeschlossen. In fett markiert ist das Modell mit bester statistischer Passung bei gleichzeitig bester inhaltlicher Interpretierbarkeit.

Die explorativen Strukturgleichungsmodelle mit steigender Faktorenanzahl zeigten zunächst ebenfalls keine gute Passung zu den Daten, da die Modelle mit guter Modellpassung keine interpretierbaren Faktorladungsmuster aufwiesen (und umgekehrt). Nach Ausschluss von elf Items, die sowohl laut Expert:innenbefragung eine schlechte inhaltliche Passung zu ihrem jeweiligen Konstrukt (und anderen) aufwiesen, als auch in bisherigen explorativen Strukturgleichungsmodellen keine signifikanten oder geringe und indifferente Ladungen auf mehreren Faktoren aufwiesen, zeigte besonders das Modell mit sechs inhaltlichen Faktoren eine gute Passung zu den Daten und sechs gut interpretierbare latente Faktoren: *Motivationsregulation* als allgemeine Tendenz, Motivationsregulationsstrategien in langweiligen und/oder schwierigen Situationen anzuwenden, *Selbstwirksamkeit für Motivationsregulation* als subjektive Überzeugung, sich selbst auch in langweiligen und/oder schwierigen Situationen selbst zum Lernen motivieren zu können, *Selbstwirksamkeit für Planen und Organisieren* als Erwartung, das eigene Lernen selbst durch Planung und Organisation steuern zu können, *Prokrastination* als Tendenz zum Aufschieben (aversiver) Tätigkeiten, *Regulationserfolg bei Erwartungsproblemen* als subjektive Einschätzung, Motivationsprobleme aufgrund geringer Erfolgserwartungen bewältigen zu können, und *Regulationserfolg bei Wertproblemen* als subjektive Einschätzung, Motivationsprobleme aufgrund eines wahrgenommen sinnlosen, unnützen und langweiligen Aufgabeninhalts bewältigen zu können. Die meisten Items zeigten Nebenladungen auf mindestens einem weiteren Faktor; diese waren allerdings zumeist sehr klein, besonders im Vergleich zu einer deutlichen Hauptladung auf dem Faktor ihres jeweiligen Konstrukts. Die Korrelationen zwischen den sechs Faktoren waren moderat bis hoch, aber deutlich geringer als in der ICM-CFA ($-.19 \leq r \leq .47$) und dadurch interpretierbar als Zusammenhänge zwischen konzeptuell trennbaren Konstrukten. Da die Ergebnisse von Faktorenanalysen allerdings stichprobenabhängig sind (Costello & Osborne, 2005), sollten die Befunde der vorliegenden Studie zunächst mit Vorsicht interpretiert und repliziert werden.

Zusammenfassende Diskussion der Ergebnisse und theoretische Implikationen

Ziel der vorliegenden Dissertation war es, herauszufinden, 1) ob die für den Motivationsregulationsprozess spezifischen und veränderbaren Dispositionen der Selbstwirksamkeitserwartung für Motivationsregulation und implizite Theorien über Motivationsregulation gemeinsam mit anderen Variablen des Motivationsregulationsprozesses valide und trennbar erfasst werden können, 2) ob diese beiden Dispositionen über allgemeine, unspezifischere Dispositionen hinaus mit dem Motivationsregulationsprozess assoziiert sind und 3) an welchen Stellen diese beiden Dispositionen mit dem Motivationsregulationsprozess zusammenhängen.

Valide Erfassung individueller Dispositionen und des Motivationsregulationsprozesses

Um Selbstwirksamkeitserwartungen für Motivationsregulation und implizite Theorien über intrinsische und extrinsische Motivation zu erfassen, wurden in Studien 1 und 2 jeweils kurze, ökonomisch einsetzbare Selbstberichtsskalen entwickelt und validiert. Beide Skalen zeigten sich hinsichtlich ihrer Zusammenhänge mit verwandten Konstrukten als inhaltlich und strukturell valide. Darüber hinaus erwies sich die Skala zur Erfassung von Selbstwirksamkeitserwartungen für Motivationsregulation in Studie 3 durch erwartungsgemäße Zusammenhänge mit weiteren, nah verwandten und ebenfalls durch Selbstberichtsfragebögen erfassten Variablen des Motivationsregulationsprozesses als valide. In Studie 3 erwiesen sich verschiedene inhaltlich nah verwandte Konstrukte des Motivationsregulationsprozesses (Motivationsregulation, Selbstwirksamkeitserwartungen für Motivationsregulation, Selbstwirksamkeit für selbstreguliertes Lernen, subjektiver Regulationserfolg und Prokrastination) nach einem Prozess der Itemselektion als trennbar in mit bestehenden Selbstberichtsfragebögen auf situationsübergreifender Ebene erfassbar. Motivationsregulation, Selbstwirksamkeit für Motivationsregulation und Regulationserfolg zeigten untereinander stärkere Zusammenhänge als mit Prokrastination, was einerseits für konzeptuell nahe, aber trennbare Konstrukte spricht.

Gleichzeitig wurden verschiedene Probleme bei der Erfassung dieser Variablen des Motivationsregulationsprozesses durch Selbstberichtsfragebögen deutlich. Durch ihre inhaltlich-theoretische Nähe als verschiedene Facetten der Motivationsregulation und ihre methodische Nähe durch die geteilte Erfassungsmodalität der Selbstberichtsfragebögen wiesen traditionelle konfirmatorische Faktorenanalysen (ICM-CFA) keine gute Passung zu den Daten auf. Explorative Strukturgleichungsmodelle stellen dadurch, dass sie einige methodische Probleme der ICM-CFA wie die restriktive Annahme, dass jedes Item nur durch ein zugrundeliegendes latentes Konstrukt beeinflusst wird, umgehen und gleichzeitig Methodenfaktoren zulassen (Marsh et al., 2014, Morin et al., 2020,), einen methodisch passenderen Ansatz zur Evaluation der strukturellen Validität von inhaltlich und methodisch überlappenden Skalen dar. Aber auch in explorativen Strukturgleichungsmodellen wurden diverse inhaltliche Probleme der Skalen zur Erfassung verschiedener Variablen des Motivationsregulationsprozesses sichtbar. Diese Probleme waren 1) zu breite und ungenaue Definitionen von Konstrukten, die beispielsweise Ursachen für das eigentlich zu messende Verhalten oder Ereignis einschlossen oder keine Abgrenzung zu verwandten Konstrukten enthielten, was sich auch im Inhalt der Items widerspiegelte; 2) eine fehlende Passung der Items zum jeweiligen Konstrukt, da sie inhaltlich zu unspezifisch waren (z. B. weil das im Item beschriebene Verhalten zu verschiedenen Zielen hätte eingesetzt werden können und aufgrund der fehlenden Kontextualisierung nicht mehr spezifisch für das jeweilige zu messende Ziel war; und 3) eine fehlende Berücksichtigung der theoretisch implizierten Multidimensionalität und Subfacetten der Konstrukte sowohl in der Umsetzung der Skala durch Items als auch der zugrundeliegenden Konstruktdefinition.

Diese drei Aspekte sollten in Einklang mit Empfehlungen zur Steigerung der Validität (AERA, APA, NCME, 2014; Flake et al., 2017) in der zukünftigen Konzipierung, Modifikation, Prüfung und Verwendung dieser und ähnlicher Skalen zur Erfassung von Motivationsregulation berücksichtigt werden. Erstens sollten den jeweiligen

Operationalisierungen klare Konstruktdefinitionen mit besonderem Fokus auf die Abgrenzungen von anderen Konstrukten und von Ursachen oder Outcomes der Konstrukte zugrunde gelegt werden. Eine fehlende explizite theoretische Abgrenzung zwischen Konstrukten könnte auch erklären, warum Expert:innen auch bei Items und Skalen, die keine Auffälligkeiten in statistischer Hinsicht aufwiesen, keine absolute Übereinstimmung zeigten bzgl. des Hauptinhalts des Items.

Zweitens sollten Items passend zu diesen Definitionen und Abgrenzungen formuliert werden. Um Uneindeutigkeiten von Items vorzubeugen, sollten erfragte Verhaltensweisen und Überzeugungen im Sinne des zu erfassenden Konstrukts kontextualisiert werden. Erfragt man mit einer Aussage, ob ein bestimmtes Verhalten erfolgreich ausgeführt werden kann (z.B. „Wie gut kannst du deinen Arbeitsplatz so gestalten, dass du ohne Ablenkungen lernen kannst?“, Zimmerman et al., 1992), ist noch nicht klar, zu welchem Ziel (z.B. Motivationsregulation, Regulation der Umwelt, kognitiver Regulation...) dieses Verhalten ausgeführt wird. Möchte man dieses Verhalten jedoch speziell im Sinne von Motivationsregulation erfassen, muss diese multifinale Verhaltensweise entsprechenden Kontext, z.B. ein Ziel, zu dem es ausgeführt wird, erhalten. Dies kann beispielsweise durch Anpassung der Instruktion zur Skala oder des Items erfolgen: „Wie gut kannst du Ablenkungen aus deiner Lernumgebung entfernen, um dich zum Lernen zu motivieren?“. Dies steht zwar im Kontrast zu Banduras (2006) Empfehlung, zur Erfassung von Selbstwirksamkeitserwartungen möglichst nur nach der Einschätzung zu fragen, wie gut man ein bestimmtes Verhalten ausführen kann, erscheint aber bei multifinalen Verhaltensweisen, die zur Regulation verschiedener Dimensionen selbstregulierten Lernens eingesetzt werden können, notwendig, um diese trennscharf und im Sinne des gewünschten Konstrukts erfassen zu können.

Drittens sollte sichergestellt werden, dass eine ausreichende Anzahl an Items für theoretisch erwartbare Subdimensionen des Konstrukts vorhanden ist, um diese valide abzubilden. Dies gilt in besonderem Maße für die Erfassung von

Selbstwirksamkeitserwartungen für selbstreguliertes Lernen als multidimensionales Konstrukt (Pintrich, 2004). Gleichzeitig ist darauf zu achten, dass die Items hinreichend distinkt voneinander sind, um sowohl das Konstrukt hinreichend valide abbilden zu können als auch künstlicher Erhöhung der Reliabilität und weiteren Problemen durch zu parallele Itemformulierungen entgegenzuwirken (Gäde et al., 2020).

Insgesamt liegt die Stärke von Selbstberichtsfragebögen darin, dass sie die Möglichkeit zur Erfassung der subjektiven Überzeugungen und Einstellungen bieten (Wolters & Won, 2018). Selbstberichtsfragebögen haben jedoch auch einige Schwächen, die sich kaum oder gar nicht durch die genannten inhaltlich-theoretischen Verbesserungen der Skalen und Items lösen lassen. Diese Schwächen zeigten sich beispielsweise in den beschriebenen Problemen inhaltlich-theoretischer Überlappungen der Selbstberichtsskalen zur Erfassung der verschiedenen Variablen des Motivationsregulationsprozesses durch ihre stark situationsübergreifende Perspektive. Diese vermindert die Abgrenzbarkeit von beispielsweise subjektivem Regulationserfolg, Motivationsregulation als allgemeiner Tendenz zum Einsatz von Gedanken und Verhaltensweisen um sich zu motivieren (statt dem konkreten Einsatz bestimmter Strategien), und Selbstwirksamkeit für Motivationsregulation. Dies offenbarte sich in den Ergebnissen aus Studie 3: Obwohl die postulierten Konstrukte der Skalen nach Ausschluss unpassender Items strukturell trennbar waren, zeigte die Expert:innenbefragung, dass die meisten Items nicht eindeutig nur einem Konstrukt auf dieser situationsübergreifenden Ebene zuzuordnen waren. Zudem stellen Selbstberichtsfragebögen hohe Anforderungen an das Erinnerungs- und Abstraktionsvermögen der Befragten, wodurch mögliche Verzerrungen entstehen oder sich geringe Zusammenhänge mit tatsächlichem Verhalten ergeben können (Roth et al., 2016; Spörer & Brunstein, 2006; Wolters & Won, 2018). Diese Probleme der Selbstberichtsfragebögen lassen sich im Fall der vorliegenden Konstrukte jedoch umgehen, indem Variablen des Motivationsregulationsprozesses situationsspezifisch oder mit stärker verhaltensbezogenen Maßen erfasst werden (Roth et al., 2016, Winne & Perry, 2000). Hierzu

bietet es sich beispielsweise an, in einer konkreten Lernsituationen ein Motivationsproblem mit einem Regulationsanlass zu induzieren, sodass Lernende konkrete Motivationsregulationsstrategien in der Situation anwenden müssen (statt im Nachhinein über verschiedene Situationen mit bestimmten Merkmalen hinweg angeben zu müssen, wie häufig sie wie effektiv welche Strategien in solchen Situationen allgemein anwenden). Größtenteils internal ablaufende Prozesse wie die Anwendung von Motivationsregulationsstrategien könnten beispielsweise über die Methode des „lauten Denkens“ (auch: Denkprotokolle, Winne & Perry, 2000; Roth et al., 2016) oder trace data (z.B. log files oder eye-tracking-Methoden zur Interaktion mit der Lernaufgabe, Hadwin et al., 2007) sichtbar gemacht oder direkt nach der Situation erfragt werden (z.B. Dörrenbächer-Ulrich et al., 2021). Ähnlich könnten standardisierte Lerntagebücher (Eckerlein et al. 2019; Schmitz & Perels, 2011), ambulante Assessments und experience sampling-Methoden, die mehrfach in konkreten Lernsituation nach verschiedenen Aspekten des Motivationsregulationsprozesses wie Strategieanwendung und Regulationserfolg fragen, verwendet werden (Csikszentmihalyi & Larson, 2014; Trull & Ebner-Priemer, 2014), um den Auflösungsgrad der Erfassung zu erhöhen (Wolters & Won, 2018). Situationsspezifischere prozess- statt situationsübergreifende, komponentenorientiertere Erfassungsmethoden scheinen daher besonders für eine valide Erfassung des Prozessmodells der Motivationsregulation sinnvoll (Roth et al., 2016; Wolters & Won, 2018).

Theoretische Integration der Befunde zum Zusammenhang individueller Dispositionen mit verschiedenen Aspekten des Motivationsregulationsprozesses

Spezifische vs. allgemeine individuelle Dispositionen für Motivationsregulation

Sowohl in Studie 1 als auch in Studie 2 zeigte sich, dass spezifische individuelle Dispositionen für Motivationsregulation den Prozess besser vorhersagen als allgemeine Dispositionen. Höhere Selbstwirksamkeitserwartungen für Motivationsregulation hingen im Gegensatz zu allgemeinen akademischen Selbstwirksamkeitserwartungen mit einem häufigeren Einsatz von Motivationsregulationsstrategien zusammen. Implizite Theorien über die

Veränderbarkeit von Motivation waren ebenfalls mit verschiedenen Aspekten des Motivationsregulationsprozesses über implizite Theorien über andere im Lern- und Leistungskontext relevante Eigenschaften wie Fähigkeiten (Dweck, 1999) und Erlebensweisen wie Emotionen (Tamir et al., 2007) und dispositionelle Interessen (O’Keefe et al., 2018) hinaus, assoziiert. Diese Ergebnisse stehen im Einklang mit Vorüberlegungen zur inhaltlich-theoretischen Passung zwischen Prädiktor und Kriterium (Baranik et al., 2010; O’Keefe et al., 2018, Studie 2).

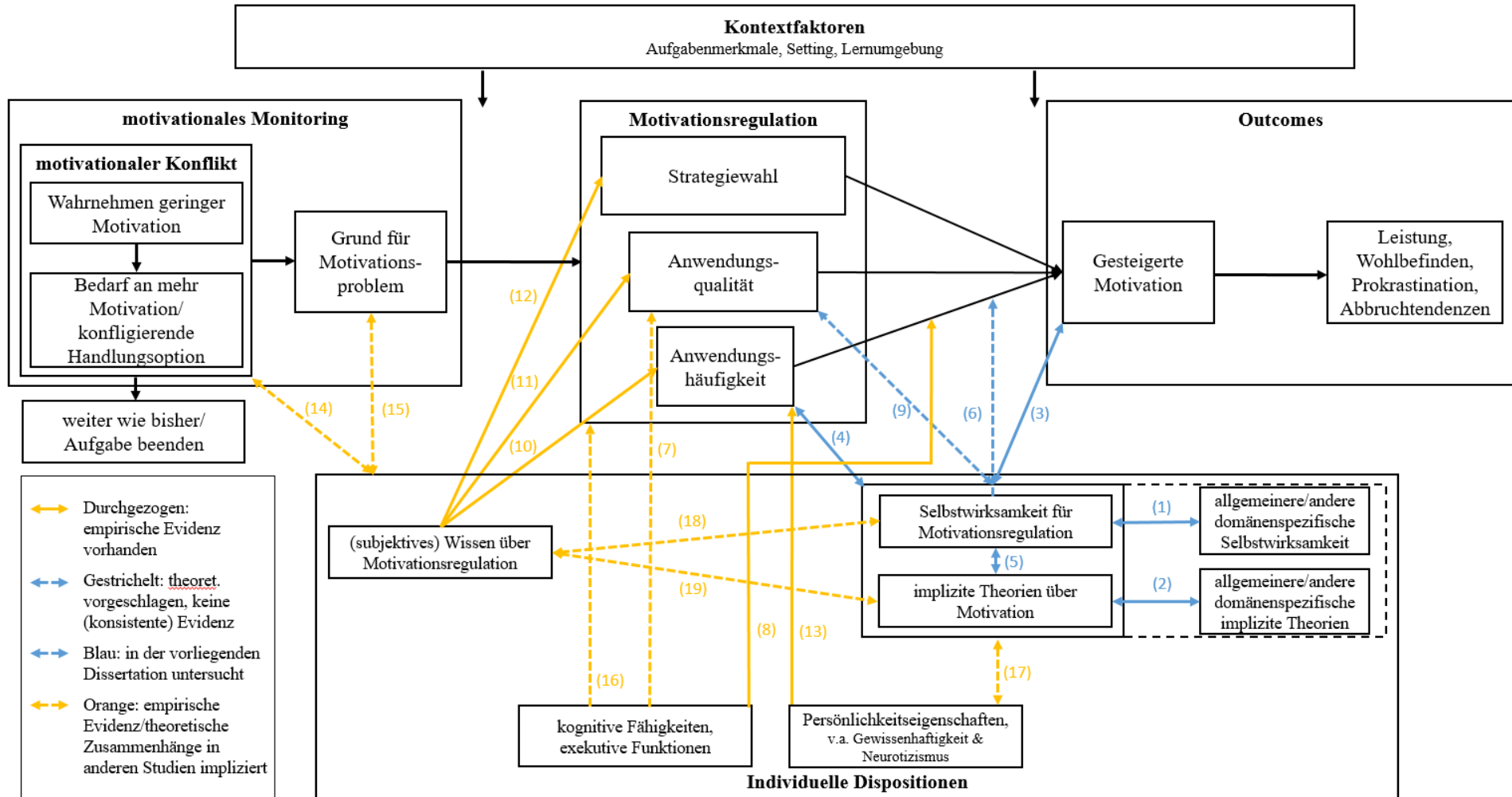
Die spezifischen Konstrukte Selbstwirksamkeitserwartungen für Motivationsregulation und implizite Theorien über Motivation hingen sowohl mit dem Regulationsprozess zusammen als auch mit ähnlichen und allgemeineren Facetten der jeweiligen Konstrukte, z. B. allgemeiner akademischer Selbstwirksamkeit und Selbstwirksamkeit für selbstreguliertes Lernen, bzw. impliziten Theorien über Fähigkeiten oder Emotionen (Abbildung 6, Pfade 1 & 2). Das Zusammenspiel allgemeiner und domänenspezifischer Facetten beider Dispositionen (auch im zeitlichen Verlauf) ist dabei noch wenig erforscht: Erstens ist anzunehmen, dass allgemeine, globale (Un)Veränderbarkeitsüberzeugungen und Selbstwirksamkeitserwartungen die Ausprägung in spezifischen Dimensionen, z.B. (Un)Veränderbarkeitstheorien über Motivation oder Selbstwirksamkeit speziell für Motivationsregulation, beeinflussen und umgekehrt. Bandura (1997) nennt vier Hauptmöglichkeiten, unter denen sich Selbstwirksamkeitserwartungen aus unterschiedlichen Domänen gegenseitig beeinflussen können: 1) Wenn unterschiedliche Aufgaben dieselben spezifischen Fertigkeiten benötigen, 2) wenn unterschiedliche Fertigkeiten für die jeweiligen Domänen gleichzeitig und in Abhängigkeit voneinander erworben werden, 3) wenn die Fertigkeiten, auf die sie sich beziehen, erst durch die jeweils andere möglich werden, und 4) durch große, bedeutsame Erfolgserlebnisse, die durch ihre Wichtigkeit auf Selbstwirksamkeitserwartungen in anderen Lebensbereichen ausstrahlen. Übertragen auf Motivationsregulation könnte dies beispielsweise bedeuten, dass Selbstwirksamkeit für Self-Monitoring (das Beobachten und Interpretieren

interner Prozesse und Zustände), was auch eine Voraussetzung für die Strategianwendung in anderen Bereichen der Selbstregulation wie dem selbstregulierten Lernen ist, sich auf den spezifischeren Bereich der Motivationsregulation auswirkt, d. h. dass Selbstwirksamkeit für Self-Monitoring aus anderen Bereichen in den Bereich der Motivationsregulation generalisiert. Ähnliche Überlegungen sind zur Domänenspezifität und hierarchischen Struktur impliziter Theorien angestellt worden: Zhu et al. (2020) fanden, dass implizite Theorien für manche Domänen eine allgemeinere Überzeugung teilten (z.B. über Kognition, Verhalten und Emotionen), während andere dies nicht taten (z.B. implizite Theorien über Intelligenz und Persönlichkeit). Ein ähnliches Muster zeigte sich auch für Veränderbarkeitsüberzeugungen über verschiedene Aspekte psychischer Gesundheit (Ängstlichkeit, soziale Ängste, Depressivität, Alkoholkonsum, Emotionen, Intelligenz und Persönlichkeit, Schroder et al., 2016). Dies mag zum einen an der konzeptuellen Nähe bestimmter Eigenschaften oder Erfahrungen liegen, auf die sich die impliziten Theorien beziehen, kann zum anderen aber Aufschluss darüber geben, welche Aspekte Lernende eher als stabile, situationsübergreifende Eigenschaften bzw. als variable, von Situation und Umwelt beeinflusste Dispositionen wahrnehmen und welche Domänen sich somit gegenseitig beeinflussen können.

Zweitens ist denkbar, dass implizite Theorien über Motivation und Selbstwirksamkeitserwartungen für Motivationsregulation vom Erleben erfolgreicher Motivationsregulationsversuche abhängen (Abbildung 6, Pfad 3; Vgl. Schunk & Zimmerman, 2007) abhängen. Weitere Forschung zur Dimensionalität und den (reziproken) Zusammenhängen zwischen allgemeinen und spezifischen Dimensionen von Selbstwirksamkeitserwartungen und impliziten Theorien ist daher nötig, um das theoretische Verständnis über die Konstrukte zu verbessern und in der Praxis die Veränderung solcher spezifischen Überzeugungen effektiver zu gestalten.

Abbildung 6

Aktualisiertes Prozessmodell der Motivationsregulation nach Schwinger & Stiensmeier-Pelster (2012)



Anmerkung. Blaue/orangene Pfade stellen die Zusammenhänge individueller Dispositionen mit dem Prozess der Motivationsregulation dar.

Zusammenhänge mit spezifischen Aspekten des Motivationsregulationsprozesses

(Wirkmechanismen)

Sowohl in Studie 1 als auch in Studie 2 zeigte sich, dass Selbstwirksamkeitserwartungen für Motivationsregulation mit der Häufigkeit der Anwendung von Motivationsregulationsstrategien zusammenhingen (Abbildung 6, Pfad 4). Vermittelt über den Einsatz von Strategien gingen sie mit höherer Anstrengungsbereitschaft, Leistung und Wohlbefinden einher. Während implizite Theorien über Motivation eher inkonsistent direkt mit einem häufigeren Strategieeinsatz einhergingen, zeigte sich, dass insbesondere implizite Theorien über extrinsische Aspekte der eigenen Lern- und Leistungsmotivation indirekt, vermittelt über höhere Selbstwirksamkeitserwartungen, die eigene Motivation regulieren zu können (Abbildung 6, Pfad 5), mit Anstrengungsbereitschaft zusammenhingen. Dieser vermittelte Effekt impliziter Theorien steht im Einklang mit bisherigen Befunden (Tabernero & Wood, 1999; Tamir et al., 2007) und theoretischen Annahmen, dass implizite Theorien als grundlegende Überzeugungen weitere Überzeugungen z.B. durch Attributionen beeinflussen (Dweck & Leggett, 1988; Ford et al., 2018; Molden & Dweck, 2006).

Bezüglich der diskutierten Wirkmechanismen zeigte sich, dass diese individuellen Dispositionen eher mit der Häufigkeit des Einsatzes von Motivationsregulationsstrategien zusammenhängen als mit ihrer Effektivität (Abbildung 6, Pfad 4 vs. Pfad 6, Wolters & Rosenthal, 2000). Möglicherweise könnte ein Effekt dieser spezifischen Dispositionen auf die Effektivität von Motivationsregulation bestehen, wenn Effektivität nicht wie in den vorliegenden Studien über Anstrengungsbereitschaft operationalisiert wird, sondern über spezifischere Outcomes wie subjektiven Regulationserfolg bei unterschiedlichen Motivationsproblemen (Engelschalk et al., 2016), Aufgabenwert, Aufgabenkosten oder Erfolgserwartungen (Kryshko et al., 2022). Zukünftige Studien sollten diesen Mechanismus (Abbildung 6, Pfad 6) daher weiter untersuchen.

Die Hypothese, dass bei höheren Selbstwirksamkeitserwartungen oder Veränderbarkeitstheorien der Strategieeinsatz effektiver sei, ist angelehnt an die Begründung von Schwinger et al. (2009). Die Autor:innen argumentierten am Beispiel kognitiver Fähigkeiten, dass intelligentere Lernende Selbstregulationsstrategien qualitativ besser einsetzen (Abbildung 6, Pfad 7), sodass diese effektiver wirken (Schwinger et al., 2009, Abbildung 6, Pfad 8). Es konnte bereits nachgewiesen werden, dass ein qualitativ besserer Einsatz von Motivationsregulationsstrategien (vermittelt über subjektiven Regulationserfolg) mit höherer Anstrengungsbereitschaft einhergeht, wenn die Anwendungsqualität eigenständig operationalisiert wird als subjektive Einschätzung darüber, wie präzise und effektiv Motivationsregulationsstrategien eingesetzt werden (Engelschalk et al., 2017). Weitere Studien sollten daher den Zusammenhang von Selbstwirksamkeit für Motivationsregulation und impliziten Theorien über Motivation mit der Anwendungsqualität der Strategien (Abbildung 6, Pfad 9) untersuchen.

In Studie 2 hingen Selbstwirksamkeit für Motivationsregulation und implizite Theorien über Motivation nicht konsistent mit dem Einsatz bestimmter Strategien zusammen. Bezüglich ihres Mechanismus scheinen sie daher eher zu erklären, ob und wie häufig reguliert wird, aber weniger ausschlaggebend dafür zu sein, welche Strategie dazu eingesetzt wird. Dieses Ergebnis ist teilweise überraschend, da bisherige Studien zum Effekt von inkrementellen Theorien über Emotionen eine häufigere Wahl adaptiver vs. maladaptiver Strategien gefunden haben (Kneeland et al., 2016). Möglicherweise ist die Wahl einer konkreten Strategie stärker von anderen Faktoren abhängig, wie z. B. den Ursachen für das Motivationsproblem der jeweiligen Situation (Dresel et al., 2015; Engelschalk et al., 2015; Schwinger & Stiensmeier-Pelster, 2012), dem deklarativen, prozeduralen und konditionalen Wissen über den wirkungsvollen Einsatz von Motivationsregulationsstrategien (Eckerlein, 2020; Miele & Scholer, 2018; Steuer et al., 2019) oder subjektiven Überzeugungen von Lernenden, welche Aspekte ihrer Lern- und Leistungsmotivation durch welche Strategien veränderbar sind (Engelschalk et al., 2015,

Scholer et al., 2018; Abbildung 6, Pfade 10-12). Da Motivationsregulationsstrategien sehr vielfältig sind (Engelschalk et al., 2015; Norouzi et al., 2021; Wolters, 1998) und implizite Theorien nur hinsichtlich intrinsischer und extrinsischer Aspekte bzw. Selbstwirksamkeitserwartungen nur für Motivationsregulation insgesamt, aber nicht auf Ebene einzelner Strategien, erfasst wurden, ist es möglich, dass die fehlenden Effekte sich durch eine zu geringe Passung zwischen Prädiktor und Kriterium erklären lassen (Bandura, 2006; Baranik et al., 2010).

Ausblick auf zukünftige Forschung

Weitere Wirkmechanismen individueller Dispositionen

Sowohl der starke direkte Zusammenhang von Selbstwirksamkeitserwartungen mit Anstrengungsbereitschaft in Studien 1 und 2 (Abbildung 6, Pfad 3), als auch die inkonsistenten Befunde zu direkten Zusammenhängen impliziter Theorien über Motivation mit dem Strategieeinsatz weisen darauf hin, dass individuelle Dispositionen auch auf andere, in der vorliegenden Dissertation nicht berücksichtigte Weisen eine Rolle spielen. Bäumle et al. (2019) argumentieren diesbezüglich, dass gewissenhaftere Personen Motivationsregulationsstrategien ggf. nicht häufiger (Ljubin-Golub et al., 2019; Abbildung 6, Pfad 13) oder effektiver (Schwinger & Otterpohl, 2017), sondern vor allem früher (und dadurch effektiver) einsetzen. Dies würde dafür sprechen, dass individuelle Dispositionen nicht nur einen Einfluss auf die Kontrolle von Motivation (Häufigkeit, Qualität und Effektivität des Strategieeinsatzes) haben, sondern auch auf das Monitoring und die Bewertung von Motivationsproblemen und motivationalen Konflikten in dem Sinne, dass gewissenhaftere, selbstwirksamere oder von der Veränderbarkeit von Motivation überzeugtere Personen solche Konflikte seltener oder weniger intensiv erleben (Capelle et al., 2021; Hofer et al., 2005). Diese Annahme, dass auch implizite Theorien als individuelle Dispositionen selbstregulative Prozesse nicht nur durch den Einsatz adaptiver Selbstregulationsstrategien beeinflussen, sondern auch durch Monitoring, ist auch im SOMA (setting/operating/monitoring/achievement)-Modell von Burnette et al. (2013)

impliziert. Für einen solchen Einfluss individueller Dispositionen auf Monitoring und Bewertung von Motivation und motivationalen Konflikten (Abbildung 6, Pfade 14 und 15) sprechen auch erste empirische Befunde: Sansone et al. (1999) fanden, dass gewissenhaftere Personen ausdauernder an langweiligen Aufgaben arbeiteten als weniger gewissenhafte Personen, unabhängig davon, welchen Grund sie für die Aufgabe hatten oder ob sie Strategien zur Interessenssteigerung verwendeten. Thoman et al. (2020) interpretierten dieses Ergebnis so, dass Gewissenhaftere die wahrgenommene Nützlichkeit und Kosten einer Aufgabe anders bewerten als weniger Gewissenhafte. Kryshko et al. (2022) konnten in diesem Sinne nachweisen, dass Selbstwirksamkeitserwartungen für Motivationsregulation auch mit der Bewertung spezifischerer motivationaler Outcomes wie Aufgabenwert (inkl. Nützlichkeit), Kosten und Erfolgserwartungen zusammenhingen. Eine weniger häufige und intensive Wahrnehmung von Motivationskonflikten könnte mit einer weniger stark in Mitleidenschaft gezogenen Anstrengungsbereitschaft einhergehen, was den Einsatz von Motivationsregulationsstrategien weniger notwendig machen würde (Wolters, 2003). Weitere Forschung zu Wirkmechanismen individueller Dispositionen für Motivationsregulation auf a) die Qualität des Einsatzes von Motivationsregulationsstrategien und b) verschiedene Aspekte des Monitorings von Motivation (Hofer et al., 2005; Schwinger & Stiensmeier-Pelster, 2012) ist daher nötig.

Nicht zuletzt ist es möglich, dass weitere spezifische(re) individuelle Dispositionen den Zusammenhang zwischen allgemeineren Dispositionen (z.B. kognitiven Fähigkeiten) und Motivationsregulation vermitteln, wie beispielsweise exekutive Funktionen (Diamond, 2013; Nigg, 2017; Abbildung 6, Pfad 16). Dweck (2017) argumentiert, dass stabilere Merkmale wie Persönlichkeitseigenschaften „styles of pursuing need-fulfilling goals“ (S. 689) darstellen und Verhalten nicht nur direkt, sondern indirekt, vermittelt über Überzeugungen, Einstellungen und Ziele, motivieren (Abbildung 6, Pfad 17). Eine genauere Untersuchung des Zusammenspiels

verschiedener basaler und allgemeiner individueller Dispositionen wie kognitiven Fähigkeiten und Persönlichkeit und ihres Einflusses auf Motivationsregulation sollte daher geprüft werden.

Kausalität, Reziprozität und temporale Dynamik

Obwohl das Prozessmodell der Motivationsregulation (Schwinger & Stiensmeier-Pelster, 2012) eine kausale Wirkung individueller Dispositionen auf den Motivationsregulationsprozess nahelegt, sind bisherige Befunde zu den Wirkmechanismen weitestgehend querschnittlich-korrelativ. Um einen kausalen Einfluss individueller Dispositionen auf Motivationsregulation durch die diskutierten Mechanismen feststellen zu können, sind längsschnittliche und experimentelle Studien nötig. Hierzu haben sich sowohl Selbstwirksamkeitserwartungen (z.B. Bouffard et al., 2005) als auch implizite Theorien (z.B. für situatives Interesse, Thoman et al., 2020, oder dispositionelle Interessen, O’Keefe et al., 2018, Studie 3) als experimentell induzierbar und veränderbar erwiesen. Um kausale Effekte impliziter Theorien über Motivation experimentell zu testen könnten diese beispielsweise induziert werden, indem Teilnehmende einen fingierten populärwissenschaftlichen Artikel lesen, der entweder in Richtung inkrementeller Theorien oder Entitätstheorien über Motivation verzerrt ist (O’Keefe et al., 2018; Thoman et al., 2020), oder gebiaste Fragebogenitems in entsprechende Richtungen beantworten (Job et al., 2010). Um anschließend Motivationsregulation und ihren Erfolg untersuchen zu können, kann eine langweilige und schwierige Aufgabe gestellt werden (z.B. das Lösen komplexer, aber sinnlos und repetitiv erscheinender Zahlenquizze oder mathematischer Gleichungen oder das Lernen langweiliger und schwieriger Texte), deren Erfolg aber wichtig zum Abschneiden in einem anschließenden für die Teilnehmenden wichtigen Quiz ist, um einen Motivationsregulationsanlass zu geben. Anstrengungsbereitschaft kann über die Bereitschaft für zusätzliche Übungsaufgaben zur Vorbereitung auf das Quiz und die Dauer der Auseinandersetzung mit dem Material operationalisiert werden, während Leistung über die Ergebnisse im abschließenden Quiz abgebildet werden kann. Ob und wie sich Lernende zum Weiterarbeiten motiviert haben, kann

im Anschluss an die Aufgabenbearbeitung erfragt werden. Über experimentelle Studien hinaus eignen sich Interventionsstudien zur Effektivität von Trainings, die z.B. Selbstwirksamkeitserwartungen für Motivationsregulation oder Veränderbarkeitsüberzeugungen über Motivation explizit (mit)fördern, zur Untersuchung kausaler Effekte (siehe „praktische Implikationen“).

Neben kausalen Effekte von individuellen Dispositionen auf den Motivationsregulationsprozess sind über die Zeit hinweg betrachtet auch reziproke Effekte zwischen beispielsweise erfolgreicher Motivationsregulation und Selbstwirksamkeitserwartungen für Motivationsregulation denkbar, weil Mastery-Erlebnisse eine Hauptquelle für Selbstwirksamkeitserwartungen darstellen (Schunk & Zimmerman, 2007). Da Selbstwirksamkeitserwartungen für Motivationsregulation in Studie 2 mit impliziten Theorien über die Veränderbarkeit von Motivation zusammenhängen, wäre ein indirekter Einfluss von effektiver Motivationsregulation auf implizite Theorien ebenso anzunehmen (Abbildung 6, Pfade 3 & 5). Dieses Zusammenspiel sollte in längsschnittlich angelegten Studien geprüft werden.

Zudem wurde der Zusammenhang individueller Dispositionen mit Motivationsregulation bisher primär auf Ebene interindividueller Unterschiede zur Vorhersage von Outcomes betrachtet – es wurde also untersucht, ob Unterschiede zwischen Personen in bestimmten Dispositionen wie Gewissenhaftigkeit, Intelligenz, Selbstwirksamkeitserwartungen für Motivationsregulation oder impliziten Theorien über Motivation Unterschiede in der Häufigkeit des Strategieeinsatzes zwischen Personen vorhersagen. Da die Effekte interindividueller Unterschiede nicht unbedingt auf Ebene einzelner Personen generalisierbar sind (Moeller, 2021; Molenaar, 2013), sollten Studien auf intraindividuelle Ebene die angenommenen Mechanismen replizieren (z.B. Schnettler et al., 2020).

Generalisierbarkeit der Befunde

Studierende haben aufgrund der hohen Anforderungen an Selbstregulation im Studium tendenziell viel Erfahrung mit der Regulation ihrer eigenen Lernmotivation (Vgl. Dresel et al., 2015). Daher sollte in weiteren Studien geprüft werden, ob sich die Befunde bzgl. der Veränderbarkeitsüberzeugungen über die eigene Motivation auf andere Lernkontexte und –gruppen (z.B. Schüler:innen) übertragen lassen. Besonders spannend für zukünftige Forschung ist außerdem die Untersuchung der Entstehung von und Ursachen für implizite Theorien über die (Un)Veränderbarkeit eigener Motivation im Entwicklungsverlauf, um ggf. Trainings, Interventionen und Strategien im Klassenraum zur Förderung von Motivationsregulation zu verbessern.

Damit einhergehend ist auch weitere Evidenz zur Konstruktvalidierung der neuen Skalen zur Erfassung von Selbstwirksamkeit für Motivationsregulation und impliziten Theorien über Motivation nötig. Ob die Skalen die jeweiligen Konstrukte auch in anderen Stichproben messen, sollte ebenso geprüft werden wie Zusammenhänge mit weiteren Skalen zur Erfassung verschiedener Variablen des Motivationsregulationsprozesses (z.B. Schwinger et al., 2007) oder behavioralen Maßen für Motivationsregulation und Regulationserfolg zur Prüfung konvergenter und diskriminanter Validität (AERA, APA, NCME, 2014; Flake et al., 2017).

Praktische Implikationen

Die gefundenen Zusammenhänge zwischen spezifischen motivationsbezogenen Dispositionen (Selbstwirksamkeitserwartungen für Motivationsregulation und impliziten Theorien über Motivation) mit einer häufigeren Anwendung von Motivationsregulationsstrategien und der damit verbundenen adaptiven Effekte auf Anstrengungsbereitschaft, Leistung und Wohlbefinden stellen einen vielversprechenden Ansatz zur Förderung von Motivationsregulation durch Trainings adaptiver Überzeugungen über Motivation dar. Selbstwirksamkeitserwartungen sind durch unterschiedliche Interventionsmethoden veränderbar (Schunk & Zimmerman, 2007; Zinken et al., 2008). Dazu

gehören sowohl verbale Bestärkung (z.B. durch positives Feedback von Anderen), als auch Modelllernen an kompetenten Anderen im Rahmen von Motivationsregulationsstrategietrainings (z.B. Eckerlein, 2020; Leutner et al., 2001, Abbildung 6, Pfade 10-12), Erfolgserlebnisse (beispielsweise durch erfolgreiche Motivationsregulation, Reflexion vergangener Erfolgserlebnisse und das Bewusstmachen vorhandener Fertigkeiten für Motivationsregulation (Abbildung 6, Pfad 3), und das Einplanen von und Umgang mit Hindernissen im Selbstregulationsprozess), sowie physiologische und affektiver Zustände, die Lernende im Sinne hoher Kompetenz und Selbstwirksamkeit interpretieren können (Zinken et al., 2008). Da für Erfolgserlebnisse durch eigene Motivationsregulationsversuche Wissen über Motivationsregulationsstrategien und ihren Einsatz wichtig ist (Schunk & Zimmerman, 2007, Abbildung 6, Pfade 18 & 19), können Trainings auch hier ansetzen. Bestehende Strategietrainings könnten darüber hinaus um eine explizite Förderung von Selbstwirksamkeitserwartungen erweitert werden, indem Strategien an erfolgreichen Modellen erlernt werden, Möglichkeiten zum erfolgreichen Ausprobieren der erworbenen Selbstregulationsstrategien gegeben werden, erfolgreiche Motivationsregulationsversuche reflektiert und bewusst gemacht werden, ein Umgang mit Hindernissen bei der Motivationsregulation und Misserfolgen besprochen und geplant wird und positives Feedback auch für Teilerfolge in der Anwendung von Motivationsregulationsstrategien gegeben werden. Interessant wäre hierbei zu evaluieren, ob eine gezielte Förderung von Selbstwirksamkeitserwartungen durch verschiedene Methoden über das Trainieren von Motivationsregulationsstrategien hinaus positivere Effekte birgt als ein reines Strategietraining. Von Methoden verbaler Persuasion zur Förderung von Selbstwirksamkeit für Motivationsregulation (z.B. durch falsches Feedback) sollte hingegen bei Teilnehmenden mit viel Erfahrung mit Motivationsregulation abgesehen werden, da sie angesichts eigener, diesem Feedback widersprechenden Erfahrungen und Erwartung der Lernenden unglaubwürdig wirken und damit ineffektiv sein können (Schwan, 2020).

Auch implizite Theorien lassen sich in kurzen Interventionen verändern (Yeager et al., 2019; Yeager & Walton, 2011). Eine viel genutzte Methode dieser Trainings besteht darin, die Veränderbarkeit bestimmter Eigenschaften, z.B. Fähigkeiten, zu thematisieren und auf zeitlich und situativ variable und vor allem kontrollierbare und veränderbare (statt stabiler, unkontrollierbarer) Faktoren, umzuattribuieren (Yeager & Walton, 2011). Ähnliche Trainings wären zur Förderung von Veränderbarkeitsüberzeugungen über Motivation denkbar, in denen Lernende die Ursachen für ihre Motivationsprobleme und –konflikte als durch eigene Anstrengung veränderbar und kontrollierbar attribuieren (statt beispielsweise auf externale und unkontrollierbare Ursachen wie langweiligen Unterricht oder sinnlose Inhalte). Gutentag et al. (2017) konnten zeigen, dass für den erfolgreichen Einsatz von Selbstregulationsstrategien nicht nur funktionale Strategien eingesetzt werden, sondern auch Veränderbarkeitstheorien vorliegen müssen. Eine bewusste Integration von impliziten Theorien über Motivation in Strategietrainings erscheint daher sinnvoll. Darüber hinaus kann eine solche Integration nützlich sein, um möglichen ablehnenden Reaktionen gegenüber reinen Strategietrainings vorzubeugen, die Teilnehmende erleben können, wenn sie von der Unveränderbarkeit und Unkontrollierbarkeit ihrer Motivation überzeugt sind, sich aber mit Strategien zu diesem Ziel auseinandersetzen sollen (vgl. Yeager & Walton, 2011). Dabei scheint es sinnvoll, Interventionen zur Veränderung impliziter Theorien in Gruppen durchzuführen, da wahrgenommene (Un)Veränderbarkeitsüberzeugungen von Mitlernenden und Lehrpersonen mit eigenen Überzeugungen zusammenhängen (Muenks et al., 2021).

Fazit

Die vorliegende Arbeit konnte zeigen, dass Selbstwirksamkeitserwartungen für Motivationsregulation und implizite Theorien über die (Un)Veränderbarkeit von Motivation als für den Motivationsregulationsprozess spezifische individuelle Dispositionen mit einem häufigeren Einsatz von Motivationsregulationsstrategien einhergehen. Hervorzuheben ist, dass sie über allgemeine und unspezifische Dispositionen hinaus mit dem

Motivationsregulationsprozess assoziiert waren. Da sich Selbstwirksamkeitserwartungen und implizite Theorien in anderen Bereichen der Selbstregulation, z.B. der eigenen Emotionen, als im Rahmen von Interventionen veränderbar erwiesen haben stellt die Förderung adaptiver Überzeugungen über die eigene Motivation einen relevanten, konkreten und spezifischen Ansatzpunkt für Trainings und Förderung von Motivationsregulation als einem wichtigen Teilaspekt selbstreguliertem Lernens dar. Während die vorliegenden Studien Zusammenhänge mit der Häufigkeit des Strategieeinsatzes, nicht aber seiner Effektivität, fanden, sind verschiedene weitere Einflussmechanismen, beispielsweise auf die Wahrnehmung von Motivationsproblemen und motivationalen Konflikten und die Anwendungsqualität der Strategien, wahrscheinlich, da diese Überzeugungen auch direkt mit höherer Anstrengungsbereitschaft als Outcome effektiver Motivationsregulation zusammenhängen. Insgesamt erweitern diese Befunde auch das theoretische Verständnis darüber, in Abhängigkeit welcher individuellen Dispositionen Lernende wie ihre Motivation regulieren. Die vorliegenden Studien konnten außerdem zeigen, dass individuelle Überzeugungen über Motivation und ihre Regulation valide in Selbstberichtsfragebögen erfassbar sind. Gleichzeitig wurde deutlich, dass durch die Erfassung des gesamten Motivationsregulationsprozesses auf situationsaggregierender Ebene in Fragebögen verschiedene Aspekte, z.B. Selbstwirksamkeit für Motivationsregulation und subjektiver Regulationserfolg, konzeptuell sehr nah und kaum trennbar sind. Ein möglicher Ausweg ist hier, individuelle Dispositionen als situationsübergreifende Faktoren in Selbstberichtsfragebögen, konkret situationsbezogene Aspekte wie Strategieranwendung oder Regulationserfolg hingegen auf situativer Ebene zu erfassen, um eine möglichst klare konzeptuelle Trennbarkeit der Aspekte des Prozesses und ihrer Messung zu ermöglichen. Dies sollte in zukünftigen Studien zum kausalen Einfluss, temporalen Dynamiken und intraindividuellen Effekten individueller Dispositionen auf den Motivationsregulationsprozess berücksichtigt werden.

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Anhang

A1. Artikel 1

Trautner, M., & Schwinger, M. (2020). Integrating the concepts self-efficacy and motivation regulation: How do self-efficacy beliefs for motivation regulation influence self-regulatory success? *Learning and Individual Differences*, 80, Article 101890.
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Integrating the concepts self-efficacy and motivation regulation: How do self-efficacy beliefs for motivation regulation influence self-regulatory success?



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ABSTRACT

Integrating findings from research on self-efficacy and motivation regulation, the present studies explored the concept of self-efficacy for motivation regulation, which refers to students' beliefs about effectively using strategies to regulate their motivation. In this work, we suggest that students' self-efficacy for motivation regulation represents an additional source of potential success or failure in motivation regulation in two ways. It could (a) lead to a more frequent use of motivation regulation strategies, thereby enhancing effort (mediation effect), whereas it may also (b) increase the effectivity of strategy use with more self-efficacious individuals applying strategies more thoroughly (moderation effect). We explored the two suggested mechanisms in three large samples of German university students. Path analyses revealed direct associations between self-efficacy beliefs and frequency of motivation regulation strategy use ($\beta = 0.43$ to 0.47). Further, self-efficacy for motivation regulation influenced effort via an increased frequency of motivation regulation strategy use (indirect effects of $\beta = 0.11$ to 0.14), while the expected interaction effect of self-efficacy and strategy use was not significant. Furthermore, self-efficacy for motivation regulation more strongly predicted positive affect than grades, indicating a stronger role within the motivational-affective components of self-regulated learning and thus rather indirect links to actual achievement. Overall, our findings imply that supporting students' self-efficacy beliefs for motivation regulation can enhance self-regulatory success.

1. Introduction

Self-regulated learning refers to the process in which students actively regulate their learning via cognitions, metacognitions, motivation, and behavior (Schunk & Zimmerman, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992). Numerous studies in this area have focused on cognitive and metacognitive processes, such as learning strategies and their influence on the learning process (see also Wolters & Benzon, 2013). However, theoretical concepts of self-regulated learning also emphasize the importance of motivation as well as the self-regulation of motivation for successful learning (e.g. Boekaerts, 1996; Dresel et al., 2015; Miele & Scholer, 2018; Pintrich, 2000; Sansone & Thoman, 2006; Schwinger & Stiensmeier-Pelster, 2012; Winne & Hadwin, 2008; Zimmerman & Kitsantas, 2005). Self-regulation of motivation, or motivation regulation, describes the active, more or less conscious control of one's own motivation (Wolters, 1998, 1999, 2003) with the aim of enhancing or maintaining its levels or changing it

qualitatively (Senko & Harackiewicz, 2005). In this regard, the term motivation refers to a general willingness to exert effort or persistence for an activity (cf. Wolters, 2003). There is ample research indicating that motivation is an important precursor of achievement even beyond cognitive abilities and prior knowledge (e.g., Hattie, 2009; Steinmayr, Weidinger, Schwinger, & Spinath, 2019) and so is self-regulation of motivation (e.g., Schwinger, Steinmayr, & Spinath, 2009; Schwinger & Stiensmeier-Pelster, 2012).

The process of motivational regulation is assumed to be affected by individual factors such as cognitive abilities, personality traits, and motivational dispositions that may influence how often and how effectively particular motivational strategies are used (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012; Smit, de Brabander, Boekaerts, & Martens, 2017; Wolters & Benzon, 2013). Among the wide range of individual factors, students' self-efficacy for motivation regulation, i.e. their beliefs whether they can effectively implement measures to successfully regulate their motivation even in the face of boring

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or difficult tasks, seems to represent an important additional source of potential success or failure in motivation regulation. However, while self-efficacy beliefs have already been shown to impact successful learning in general (Honicke & Broadbent, 2016), as well as self-regulatory processes (e.g., Dent & Koenka, 2016; Zimmerman et al., 1992), we are not aware of any study to date which has examined the specific benefits of self-efficacy for motivation regulation. The present article therefore explores possible mechanisms in which self-efficacy beliefs for motivation regulation may influence students' use of motivation regulation strategies, effort expenditure, and achievement. Across three studies based on large samples of German university students, we investigate (a) whether self-efficacy for motivation regulation determines the frequency of motivational strategy use, which in turn influences effort and achievement (mediation effect) and/or (b) whether self-efficacy for motivation regulation enhances or diminishes the effectiveness of motivational strategy use (moderation effect).

1.1. Motivation regulation in the context of self-regulated learning

In order to learn successfully, it is not only important to use adequate cognitive and metacognitive learning strategies, but also to maintain a minimum level of motivation. To do so, three components of self-regulation are crucial (e.g., Boekaerts, 1996; Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012; Wolters & Benzon, 2013; Zimmerman, 2000): First, learners are required to have sufficient knowledge about motivation which includes declarative, procedural, and conditional (meta-)knowledge of motivational beliefs, motivational characteristics of learning situations, tasks they find interesting and more. Second, learners need to monitor their current level and changes of motivation in order to detect possible needs to regulate their motivation by, third, choosing effective regulation strategies to maintain or increase their level of motivation. In order to increase situation-specific motivation, various regulation strategies have been identified (Kim, Brady, & Wolters, 2018; Schwinger et al., 2009; Schwinger, von der Laden, & Spinath, 2007; Wolters, 2003). Some of these strategies aim at increasing general interest. For this purpose, learners can *Enhance Situational Interest* (e.g., by making a learning situation more playful) or *Enhance Personal Significance* of the learning task (e.g., by connecting personal interests with the learning object). Besides this, three strategies based on achievement goal theory (e.g., Dweck & Leggett, 1988; Elliot, 1999) have been identified: *Mastery Self-Instruction*, *Performance-Approach Self-Instruction* and *Performance-Avoidance Self-Instruction*. Applying each of these strategies, learners highlight the goal of their learning efforts such as achieving a better grade than their classmates (performance-approach self-instruction) or not embarrassing oneself with a bad grade (performance-avoidance self-instruction). *Environmental Control* (e.g., avoiding distraction during learning), *Proximal Goal Setting* (e.g., splitting the learning material into smaller pieces which are easier to handle and lead to quicker successes), and *Self-Consequating* (e.g., having self-administered rewards for achieving learning goals) can also be used in order to maintain or increase one's motivation. Further motivational strategies relate to *Ability-Related Self-Instruction* (e.g., highlighting previous successful coping in similar situations) and *Utilizing Social Resources* (e.g., learning together with others). The difference between motivation regulation strategies and other strategies of self-regulated learning such as goal setting or regulating one's environment (Pintrich, Smith, Garcia, & McKeachie, 1991; Wolters, 2003) is that the behaviours subsumed under the respective strategies are applied with the intention of increasing or maintaining one's motivation as opposed to the mere regulation of cognitive aspects of the task. Therefore, it is not surprising that environmental control as a motivation regulation strategy and managing one's learning environment as a self-regulated learning strategy were found to be correlated at $r = 0.52$ (Schwinger et al., 2007). Similarly, Wolters (1999) found only small to medium correlations between learning strategies as measured by the Motivated Strategies for Learning Questionnaire and

motivation regulation strategies.

When learners perceive a decline in motivation, they can select any of these motivation regulation strategies. Theoretically, the strategy should be selected depending on the attributed cause of the motivational problem (Schwinger & Stiensmeier-Pelster, 2012). In line with this assumption, Engelschalk, Steuer, and Dresel (2015) found that students more frequently chose ability-based self-instruction strategies when motivational deficits were based on low expectations of success, whereas for motivational deficits due to low perceived task value (e.g., lack of interest in a task) students tended more often to choose strategies like enhancement of situational interest or personal significance. Overall, however, it seems that students tend to have different ideas as to which strategy suits which occasion (cf. Engelschalk et al., 2015; Engelschalk, Steuer, & Dresel, 2016). In case motivation regulation is successful, effort and persistence in a task are increased which in turn positively influences achievement: Schwinger et al. (2009) and Schwinger and Stiensmeier-Pelster (2012) demonstrated this indirect effect of the use of motivation regulation strategies on effort expenditure and achievement. Similarly, motivation regulation has an impact on students' subjective well-being. Well-being can be defined as people's evaluations about their lives, including both cognitive and affective judgements and reactions to this (Diener, Oishi, & Lucas, 2003). Grunschel, Schwinger, Steinmayr, and Fries (2016) found that a more frequent use of motivation regulation strategies was associated with higher affective well-being as operationalized as the experience of positive affect. Further, besides the direct effect, there was also an indirect effect via reduced procrastination, implying that motivation regulation is associated with the use of less maladaptive learning strategies and thus, both achievement and well-being. Overall, it can be concluded that motivation regulation seems to be associated with higher effort expenditure and more adaptive studying, thereby enhancing achievement and well-being.

1.2. Self-efficacy beliefs as disposition for successful motivation regulation

As suggested by the framework model for motivation regulation (Schwinger & Stiensmeier-Pelster, 2012), the application of motivation regulation strategies does not only depend on the underlying motivational problem, but also on individual dispositions, such as cognitive abilities (Schwinger et al., 2009), goal orientations, and task value (Schwinger et al., 2007; Wolters, 1998; Wolters & Benzon, 2013; Wolters & Rosenthal, 2000). One important individual disposition refers to self-efficacy beliefs, one's subjective certainty of coping with difficult or new situations considering one's own available competences (Bandura, 1977; Honicke & Broadbent, 2016; Schwarzer & Jerusalem, 2002). As numerous studies have shown, efficacy beliefs enhance resilience, motivation, and persistence in the face of setbacks and adversities, as they are associated with causal attributions, goal orientations, achievement, and various other outcomes (Bandura, 1997). Self-efficacy beliefs are specific for respective domains and can thus vary between them (Bandura, 2006; Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003). For example, a student can have high self-efficacy beliefs regarding academic achievement, but low self-efficacy beliefs with respect to solving interpersonal problems.

In the broader context of self-regulated learning, academic self-efficacy beliefs as well as self-efficacy beliefs for self-regulated learning and their effects on learning and affective outcomes have been examined both in cross-sectional and longitudinal studies, as well as across different samples of university and school students and also controlling for covariates. Zimmerman et al. (1992) assessed the impact of self-efficacy for self-regulated learning (e.g., structuring one's learning environment, using cognitive strategies, planning learning activities and motivating oneself for studying) in a sample of 102 ninth and tenth grade students. Path analysis revealed an indirect relation of self-efficacy for self-regulated learning via self-efficacy for academic

achievement, as well as students' grade goals on academic achievement. This result was interpreted as in accordance with social cognitive theory: higher self-efficacy beliefs lead to higher goals, which lead to higher attainment. In a sample of 279 sixth and seventh grade children, Bandura et al. (1996) found self-efficacy for self-regulated learning (assessed as in Zimmerman et al., 1992) to predict academic achievement both directly, as well as indirectly via reduced moral disengagement and problem behavior. In a longitudinal study with 14 to 19 (T1) and 16 to 21 (T2) year old adolescents, Bandura et al. (2003) linked self-efficacy for self-regulated learning (labelled academic self-efficacy) to attenuated levels of depression in females, but not males, as well as lower involvement in delinquent activities cross-sectionally. However, self-efficacy for self-regulated learning at T1 predicted neither depression levels nor delinquency at T2. Further, self-efficacy for self-regulated learning was predicted by self-efficacy beliefs to regulate positive and negative affect. Unfortunately, the measure of self-efficacy for self-regulated learning was mixed with general academic self-efficacy for mastering coursework and fulfilling parental expectations. Caprara et al. (2008) examined self-efficacy for self-regulated learning in relation to grades and school dropout longitudinally in a sample of 12 to 22 year old students: stronger declines in self-efficacy for self-regulated learning were associated with lower high school grades and an increased likelihood of dropping out of high school. Further, self-regulatory efficacy functioned as a partial mediator between junior and senior high school grades and the likelihood of remaining in school. Klassen, Krawchuk, and Rajani (2008) found that students with higher self-efficacy beliefs procrastinated less frequently and less severely. Thus, self-efficacy seems associated with less maladaptive studying behaviour and self-regulatory failure. Although the measures used in these studies were not always directly related to self-regulated learning or motivation regulation, they show that self-efficacy beliefs are associated with achievement-related outcomes, less maladaptive self-regulation, and affective well-being both directly and indirectly via intermediary psychological mechanisms.

In the context of motivation regulation research, self-efficacy beliefs have so far only been assessed globally with respect to academic achievement. Wolters and Benzon (2013), for instance, reported global academic self-efficacy to predict the use of some motivation regulation strategies, but not others: positive associations were found for performance approach self-instruction and environmental structuring, whereas associations with regulation of situational interest were negative. There were no significant associations with self-consequating, regulation of mastery-orientation and regulation of value. In contrast, Wolters and Rosenthal (2000) found no correlation between academic self-efficacy and the use of any motivation regulation strategy when accounting for achievement. In their review on the influence of academic self-efficacy on academic performance, Honicke and Broadbent (2016) concluded that academic self-efficacy influenced achievement both directly and indirectly via effort regulation, which is often operationalized as academic self-discipline or persistence and effort in the face of setbacks. However, in all of these studies, academic self-efficacy beliefs were assessed at a global level. Thus, while some evidence points towards even broad academic self-efficacy enhancing motivation regulation strategy use, the question of whether more specific forms of self-efficacy such as the one referring to motivation regulation processes have an impact on the use of motivation regulation strategies.

1.3. How does self-efficacy for motivation regulation affect effort and achievement?

Overall, previous research has mainly focused on self-efficacy beliefs for academic achievement and/or for self-regulated learning while studies examining the specific impact of self-efficacy for motivation regulation are lacking. Some studies included self-efficacy beliefs for motivation regulation as components into measures for self-efficacy for self-regulated learning (Zimmerman et al., 1992) or used global

academic self-efficacy to predict motivation regulation (Wolters & Benzon, 2013; Wolters & Rosenthal, 2000). These procedures, however, resulted in a mismatch between predictor and criterion which makes it hard to disentangle the actual relationships. In order to examine the relations between self-efficacy beliefs and outcomes in a respective domain, Bandura (2006; see also Honicke & Broadbent, 2016) recommends to design self-efficacy scales domain-specifically for the construct which is to be predicted due to three reasons. First, not differentiating between domains of self-efficacy beliefs leads the global predictor to lose explanatory and predictive power – domain-specific assessment can therefore reflect the patterns and degrees of generalizability and specificity of self-efficacy as a predictor for various outcomes much better than a global measure. In support of this point, Klassen et al. (2008) found that only self-efficacy for self-regulated learning, but not general academic self-efficacy beliefs predicted procrastination. Second, using specific measures reduces ambiguities and uncertainties about what exactly is being measured. In this case, self-efficacy for self-regulated learning contains a large variety of behaviours aiming at improving one's learning process (reflecting the theoretical conceptualization of self-regulated learning as a multi-dimensional concept). As self-efficacy beliefs are highly dependent on the respective behaviours, people may hold different beliefs for planning their learning process as opposed to making studying more fun and interesting. Self-efficacy for motivation regulation only contains the latter, making it a more easily interpretable predictor. Third and most of all, it is practically relevant because interventions to be designed can address specific beliefs more easily than global ones.

Up until now, it has not been examined how specific self-efficacy beliefs for motivation regulation affect study-related outcomes, such as the use of motivation regulation strategies and effort or persistence (notable exception is Zimmerman et al., 1992) so that the mechanisms in which self-efficacy beliefs for self-regulation are related to learning outcomes remain unclear. We propose two possible mechanisms in this regard. First, the higher one's self-efficacy beliefs for motivation regulation are, the more likely one becomes to actually use motivation regulation strategies, which in turn enhances effort and persistence (so the effect of self-efficacy on effort expenditure is fully or partially mediated by the use of motivation regulation strategies). This mechanism is plausible because higher self-efficacy beliefs generally promote behaviour as well as the subsequent effects of this behaviour (Bandura, 1977, 1997; Bandura et al., 1996; Bandura et al., 2003). As Caprara et al., 2008, put it: “Self-regulatory skills will not contribute much if students cannot get themselves to apply them persistently in the face of difficulties, stressors, and competing attractions. Firm belief in one's self-regulatory efficacy provides the staying power.” (p. 526). That is, students will use motivational strategies particularly if they are confident that they can implement them in a meaningful and successful way. A lack of self-efficacy for motivation regulation, in turn, is supposed to result in a diminished, less frequent use of motivational strategies. For example, a student with low self-efficacy beliefs may try one regulation strategy when facing a motivational problem, but give up and not try another one if it does not work sufficiently. The mediation hypothesis is corroborated by studies from the related field of emotion regulation in which students with greater self-efficacy for emotion regulation were found to exert greater effort and persist longer in emotion regulation (Gutentag, Halperin, Porat, Bigman, & Tamir, 2017; Schmidt & DeShon, 2010).

Second, we expect that the higher one's self-efficacy beliefs for motivation regulation are, the more effectively motivation regulation strategies are used (thereby, self-efficacy moderates the effect of motivation regulation strategy use on effort expenditure). This mechanism seems plausible because self-efficacy beliefs “... influence the course of action people choose to pursue, how much effort they put forth in given endeavours, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and depression they experience in

coping with taxing environmental demands, and the level of accomplishments they realize" (Bandura, 1977, p. 3). This means that students who believe in their capabilities to regulate their motivation will be more dedicated, creative, and engaged when applying motivation regulation strategies. These higher self-efficacy beliefs may stem from more frequent regulatory successes in the past, for example, because they are more capable of applying the strategies in a qualitatively effective manner. Previous research has found higher strategy application quality to increase motivation regulation effectiveness beyond the frequency of strategy use (Engelschalk, Steuer, & Dresel, 2017). This more effective implementation of strategies represented by higher self-efficacy beliefs for motivation regulation may even compensate for a less frequent strategy application. The proposed mechanism is similar to the effects reported for cognitive abilities. Schwinger et al. (2009) found that more intelligent students benefitted more from using some, but not all, motivational regulation strategies in terms of increased effort management, which could be attributed to differences in quality of strategy application as well. The proposed mechanism is similar to the effects reported for cognitive abilities. Schwinger et al. (2009) found that more intelligent students benefitted more from using some, but not all, motivational regulation strategies in terms of increased effort management, which could be attributed to differences in quality of strategy application as well.

2. The present research

Across three studies with German university students all facing the demands of self-regulated learning at higher education institutions, we seek to examine the mechanism how self-efficacy beliefs for motivation regulation impact effort expenditure. Specifically, we investigate whether self-efficacy for motivation regulation is associated with a more frequent use of motivation regulation strategies which, in turn, are expected to be related to higher effort expenditure (mediation, Hypothesis 1), and whether higher self-efficacy strengthens the effect of motivation regulation strategy use on effort expenditure (moderation, Hypothesis 2). These two hypotheses, as well as the scale properties of a newly constructed scale specifically measuring self-efficacy for motivation regulation are examined in three independent samples in studies 1–3. Additionally, in study 2 we seek to investigate self-efficacy for motivation regulation in the broader context of self-regulated learning, thereby focusing on the relationships between self-efficacy for motivation regulation, the use of motivational regulation strategies, and effort expenditure, as well as subsequent academic achievement and well-being. As it was found in previous research that motivation regulation increased achievement indirectly via effort expenditure (Schwinger et al., 2009; Schwinger & Stiensmeier-Pelster, 2012), we expect self-efficacy for motivation regulation to affect academic achievement indirectly via motivational strategy use and/or effort expenditure (Hypothesis 3). Further, in line with previous findings, we hypothesize that self-efficacy for motivation regulation and motivation regulation strategy use enhance students' affective well-being both directly, as well as indirectly via effort expenditure as an adaptive studying strategy (Hypothesis 4). Finally, study 3 was designed to test the hypothesis that self-efficacy for motivation regulation shows incremental effects on the respective outcome variables beyond general measures of self-efficacy and self-efficacy for self-regulated learning (Hypothesis 5), as it has been shown in previous research that more global self-efficacy beliefs are inconsistently linked to motivation regulation. All three studies were cross-sectional, relatively brief survey studies. IRB approvals are not required for this type of study in Germany. The three studies complied with ethical standards of the institutional and national research committees, as well as the 1964 Helsinki declaration and its later amendments. None of the studies was funded by a third party.

2.1. Study 1

To date, scales assessing self-efficacy for self-regulated learning do not specifically focus on self-efficacy for motivation regulation, but only contain single items intermingled with other aspects of self-regulated learning (e.g., Zimmerman et al., 1992). The first study therefore focused on an initial test of a newly constructed German scale for self-efficacy for motivation regulation, as well as the mediation and moderation hypotheses (Hypotheses 1 and 2), that is, how the level of self-efficacy for motivation regulation influences the actual use of motivation regulation strategies and their effectiveness.

2.1.1. Sample and measurement instruments

All participants were informed about the study aims and procedure, data handling and storage, as well as their possibilities to withdraw their consent and participation at any point without disadvantages arising for them. Informed consent was obtained from all individual participants prior to participation. Of the $N = 146$ students who participated in this online survey administered in January 2016, 76.8% were women and 66% were studying in their first three semesters. Their average age was $M = 23.40$ years ($SD = 3.69$; $Min = 18$; $Max = 38$). Students were enrolled mainly in social science degrees (51.4%) and arts and humanities (30.1%), but also MINT- and teaching degrees (8.9%). 9.6% did not report their subject. The majority was enrolled at a middle sized German university (83.6), while 4.9% came from different universities across Germany and 11.6% did not report which institution they were from.

The use of motivation regulation strategies was measured with the Motivation Regulation Questionnaire by Schwinger et al. (2007). Using a 5-point Likert scale ("very rarely/never" to "very often"), the eight motivation regulation strategies "Enhancement of Situational Interest" (e.g., "I make learning more pleasant for me by trying to arrange it playfully."), "Enhancement of Personal Significance" (e.g., "I look for connections between the tasks and my life as such."), "Performance-Approach Self-Instruction" (e.g., "I call my attention to the fact of how important it is to obtain good grades."), "Performance-Avoidance Self-Instruction" (e.g., "I imagine that my classmates make fun of my poor performance."), "Mastery Self-Instruction" (e.g., "I persuade myself to work intensely for the sake of learning."), "Self-Consequating" (e.g., "I promise myself that, after work, I will do something that I like."), "Environmental Control" (e.g., "I make sure that distractions occur as seldom as possible."), and "Proximal Goal Setting" (e.g., "I approach work step-by-step in order to get the feeling that I proceed well.") with three to five items each were assessed. In the original study, good to satisfying internal consistencies were reported for the subscales ($\alpha = 0.68$ – 0.93 , Schwinger et al., 2007). In order to obtain a score for the overall frequency of motivation regulation strategy use, a sum score was computed across scales. Similar procedures have been used in previous studies (e.g., Engelschalk et al., 2017; Schwinger et al., 2009).

Effort expenditure was assessed with the respective scale from the LIST ("Lernstrategien im Studium": learning strategies of university students) questionnaire by Wild and Schiefele (1994). Eight items (e.g., "I also work through voluntary exercises and texts carefully.") were answered on a 5-point Likert scale from 1 (very rarely) to 5 (very often). For this scale, good internal consistencies were reported ($\alpha = 0.80$).

In order to construct an economic and precise measure of self-efficacy for motivation regulation, six items were developed according to the guide by Bandura (2006). The items contained statements about how strongly students believed they were able to implement any measures to increase or maintain their motivation instead of specific actions as assessed in the motivation regulation strategy questionnaire because the variety of such behaviours is too large to cover them in an economic and valid instrument (cf. Schwinger et al., 2007; Wolters, 1998, 2003). Two of these items were inverted. Students could rate their degree of approval to these statements on a 5-point scale („not at all true" to „exactly true"). All items were originally developed and

Table 1
Self-efficacy for motivation regulation scale.

Item no.	Items
1	Even for rather boring tasks in my studies I can almost always motivate myself. [Selbst für eher langweilige Aufgaben im Studium kann ich mich fast immer gut motivieren.]
2	When I don't feel like studying, I usually find a way to make the work more interesting. [Wenn ich keine Lust auf mein Studium habe, finde ich meistens einen Weg, die Arbeit interessanter zu machen.]
3	I can only with difficulty motivate myself for studying. [Ich kann mich nur schwer zum Lernen motivieren.]
4	Even I don't see the point in some tasks, I am often successful in finding enough reasons for studying nonetheless. [Auch wenn ich in manchen Aufgaben keinen Sinn erkennen kann, gelingt es mir häufig genügend Gründe zu finden, warum ich trotzdem lernen sollte.]
5	If I don't feel like learning, I can't think of anything I could change about that. [Wenn ich keine Lust habe zu lernen, fällt mir nichts ein, was ich dagegen unternehmen könnte.]
6	Even in difficult learning phases I know exactly what I have to do to work fully motivated for a long time. [Auch in schwierigen Lernphasen weiß ich genau, was ich tun muss, um über längere Zeit voll motiviert zu bleiben.]

Note. Items 3 and 5 inverted. Item 5 deleted after confirmatory factor analysis in Study 1. The original German items are displayed in brackets. To translate the scales into English, we followed the suggestions by Brislin (1970). One bilingual translated the scales into English and one bilingual translated them back into German. Only three minor differences occurred, based on which three items were reworded slightly. The rephrased items were once again translated back to German by a bilingual.

administered in German and can be found alongside their English translations in Table 1.

2.1.2. Statistical analyses

All analyses were conducted with Mplus 7.4 (Muthén & Muthén, 1998-2015). In order to explore the factorial structure of the new self-efficacy scale, confirmatory factor analyses were computed with the six self-efficacy for motivation regulation items. Two possible models were compared: in Model 1_1, all items were loading on one latent factor. In Model 1_2, the items were split into two correlated latent factor one accounting for the two inverted items, the other for the four non-inverted items. Model fit was assessed with various indices, namely χ^2 -statistics, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Confirmatory Fit Index (CFI), and Tucker-Lewis-Index (TLI). An RMSEA and SRMR of ≤ 0.05 and a TLI and CFI of ≥ 0.95 indicate a good, an RMSEA and SRMR of ≤ 0.08 and a CFI and TLI of ≥ 0.90 indicate an acceptable model fit (Jackson, Gillaspay Jr, & Purc-Stephenson, 2009).

The mediation proposed in Hypothesis 1 was assessed with a path model with self-efficacy for motivation regulation as an independent variable, the sum score of all motivation regulation strategies as a mediator and effort expenditure as dependent variable (see Fig. 1). The significance of the mediation effects was tested using the bootstrapping method with 10,000 bootstrapping samples (Shrout & Bolger, 2002). The moderation suggested in Hypothesis 2 was tested in a multiple regression with effort expenditure again as the dependent variable, while the sum score of motivation regulation strategies, self-efficacy for

motivation regulation, as well as their interaction served as predictors.

2.1.3. Results

Results of confirmatory factor analyses inspecting the newly constructed self-efficacy for motivation regulation scale showed a poor fit for the single factor model (Model 1_1), while the two factor model (Model 1_2) could not be estimated due to negative residual variances. Detailed item inspections of Model 1_1 identified item 5 as problematic due to a very low factor loading ($\lambda = 0.44$), so this item was deleted from the unidimensional model (Model 1_3) which resulted in a better overall model fit and factor loadings between 0.59 and 0.80 (see ESM 1 for detailed factor analysis results). The resulting five-item scale showed an acceptable internal consistency ($\omega = 0.83$, McDonald, 1999, see Table 2 for all scale means, intercorrelations and reliabilities). The final scale was significantly correlated with the sum of motivation regulation strategies ($r = 0.46$, $p < .001$). Correlations with the individual motivation regulation strategies were significant, ranging in size between $r = 0.18$ and $r = 0.42$, except for performance avoidance self-instruction ($r = 0.12$, $p = .200$). Self-efficacy for motivation regulation was also correlated with effort expenditure at $r = 0.68$, $p < .001$.

Results of mediation analyses testing Hypothesis 1 are displayed in Fig. 1. The three direct effects were significant and positive, whereby the direct effect of motivation regulation strategy use on effort expenditure was smaller than the direct effect of self-efficacy for motivation regulation ($\beta = 0.31$ vs. $\beta = 0.54$). The indirect effect of self-efficacy via motivation regulation on effort expenditure was significant

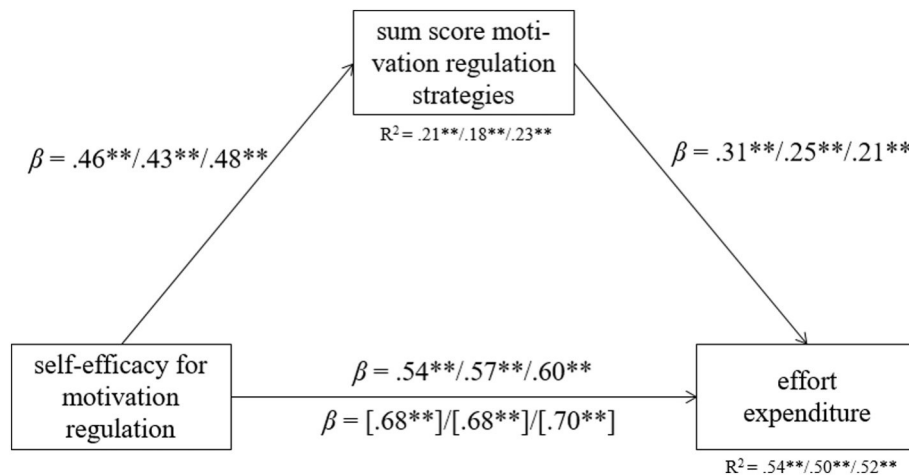


Fig. 1. Results from Mediation Analyses of Studies 1–3. Results for study 1/study 2/study 3 respectively. [] = total effect; standardized coefficients are reported. * $p < .05$; ** $p < .01$.

Table 2
Scale means, standard deviations, intercorrelations and reliabilities of Study 1.

Scale	M (SD)	ω	1	2	3	4	5	6	7	8	9	10
1) Situational Interest	2.33 (0.74)	0.82	1									
2) Personal Significance	3.24 (0.97)	0.89	0.37**	1								
3) Perf.-Approach SI	3.45 (0.93)	0.88	0.11	0.22**	1							
4) Perf.-Avoidance SI	2.45 (0.97)	0.80	0.23**	0.25**	0.57**	1						
5) Mastery SI	2.87 (0.84)	0.80	0.34**	0.51**	0.51*	0.39**	1					
6) Self-Consequating	3.61 (0.96)	0.91	0.21*	0.12	0.12	-0.03	0.17	1				
7) Environ. Control	3.34 (0.81)	0.76	0.07	0.08	0.19*	0.12	0.15	0.27**	1			
8) Prox. Goal Setting	3.33 (0.90)	0.81	0.24**	0.28**	0.04	0.13	0.19*	0.43**	0.32**	1		
9) MR Global Score	3.07 (0.52)	0.87	0.54**	0.55**	0.68**	0.59**	0.73**	0.48**	0.42**	0.52**	1	
10) SE for MR	2.87 (0.72)	0.82	0.24**	0.42**	0.28**	0.12	0.41**	0.18	0.18*	0.19*	0.46**	1
11) Effort	3.39 (0.68)	0.82	0.19*	0.36**	0.38**	0.16	0.45**	0.29**	0.33**	0.20*	0.55**	0.68**

Note. * $p < .05$; ** $p < .01$. Sit. Interest = Enhancement of Situational Interest; Pers. Significance = Enhancement of Personal Significance; Perf.-Approach SI = Performance Approach Self-Instruction; Perf.-Avoidance SI = Performance Avoidance Self-Instruction; Mastery SI = Mastery Self-Instruction; Environ. Control = Environmental Control; Prox. Goal Setting = Proximal Goal Setting; MR Global Score = Motivation Regulation global score; SE for MR = Self-Efficacy for Motivation Regulation. ω = McDonald's omega.

and positive ($\beta = 0.14$, 95% CI [0.06 to 0.22], $p = .001$), showing a partial mediation of self-efficacy for motivation regulation on effort expenditure. In addition to the direct influence of self-efficacy beliefs on effort expenditure, higher self-efficacy beliefs for motivation regulation thus go along with a more frequent use of motivation regulation strategies, which in turn enhances effort expenditure. Overall, a significant amount of variance was explained ($R^2 = 0.54$, $p < .001$).

Table 3 reports the results of multiple regression analyses examining the moderation Hypothesis (no. 2). Both self-efficacy for motivation regulation ($\beta = 0.37$) and the sum score of motivation regulation strategies ($\beta = 0.21$) were significant in predicting effort expenditure. The interaction term of the two predictors was not significant ($\beta = 0.01$, 95% CI [-0.09 to 0.11], $p = .805$) – thus, the effect of motivation regulation strategy use does not seem to depend on the level of self-efficacy for motivation regulation. Overall, a substantial amount of variance of effort was explained by the three terms ($R^2 = 0.535$, $p < .001$).

2.2. Study 2

In Study 2, we sought to replicate the effects of self-efficacy and motivation regulation on effort expenditure found in Study 1 (Hypotheses 1 and 2). Moreover, the effects of self-efficacy beliefs, motivation regulation, and effort expenditure on actual achievement (Hypothesis 3) and well-being (Hypotheses 4) were explored. We expected the statistical effect of self-efficacy for motivation regulation on grades to be smaller than on effort because achievement resembles a more distal outcome to the very specific conviction of self-efficacy for motivation regulation, while the latter is directly relevant for motivation regulation and thus, effort expenditure. Since achievement is determined by many factors (Hattie, 2009) among which effort is a strong, but not the only factor, both these aspects (e.g. applying adequate study skills) and the respective self-efficacy beliefs are also predictive of achievement. This leaves a smaller amount of variance to be explained

by self-efficacy for motivation regulation and thus, smaller effect sizes. With respect to well-being, we expected both self-efficacy for motivation regulation and motivation regulation strategy use to be associated with higher levels of affective well-being. Finally, we hypothesized a chain of indirect effects from self-efficacy to motivational strategy use to effort expenditure to academic achievement and well-being, respectively.

2.2.1. Sample and measurement instruments

As in study 1, all participants gave their written consent after receiving information about the study. $N = 588$ students (69.4% women) participated in an online survey. Their average age was $M = 22.95$ years ($SD = 3.92$; Min = 18; Max = 49) and 55.6% were in the first three semesters of their studies, 27% in the fourth to seventh. 85.6% were enrolled at one middle sized German university, 13.9% came from different universities across Germany and 0.5% did not state their institution. Again, the majority was enrolled in social science degrees (43.3%) closely followed by arts and humanities (22.9%) and MINT degrees (22.8%). Further, 10.4% were enrolled in teaching degrees and 0.7% did not report their course. Data were collected in October and November of 2016 as part of a larger project and used in part in Authors (2017). However, since the focus here is on different constructs (self-efficacy for motivation regulation), it provides a substantial own contribution.

Motivation regulation strategy use, self-efficacy for motivation regulation and effort expenditure were assessed as in Study 1. Additionally, positive affect during studying was assessed with the PANAS (Positive and Negative Affect Schedule, German version by Krohne, Egloff, Kohlmann, & Tausch, 1996). Students were asked how intensely they had felt ten different positive affects during studying in the past two weeks, such as “excitement” or “determination”, on a scale from 1 (“not at all”) to 5 (“very much”). The scale's internal consistency has been found to be good (Cronbach's $\alpha = 0.87$, Krohne et al., 1996). In order to assess achievement, students were asked to report their last

Table 3
Results of multiple regression of Studies 1–3.

	Study 1			Study 2			Study 3		
	β (SE)	p	95% CI	β (SE)	p	95% CI	β (SE)	p	95% CI
SE	0.37 (0.047)	< 0.001	0.28, 0.46	0.40 (0.026)	< 0.001	0.35, 0.45	0.48 (0.029)	< 0.001	0.43, 0.54
MR	0.21 (0.070)	0.001	0.09, 0.33	0.16 (0.027)	< 0.001	0.11, 0.21	0.16 (0.030)	< 0.001	0.10, 0.22
SE x MR	0.01 (0.051)	0.81	-0.09, 0.11	-0.03 (0.019)	0.07	-0.07, 0.00	-0.06 (0.020)	0.020	-0.10, -0.02

Note. SE = self-efficacy for motivation regulation; MR = sum score of motivation regulation strategies; SExMR = interaction term of self-efficacy and sum score. CI = confidence interval.

Table 4
Scale means, standard deviations, intercorrelations and reliabilities of Study 2.

Scale	M (SD)	ω	1	2	3	4	5	6	7	8	9	10	11	12
1) Sit. Interest	2.69 (0.94)	0.89	1											
2) Pers. Significance	3.17 (0.98)	0.87	0.50**	1										
3) Perf.-Approach SI	3.60 (0.98)	0.90	0.15**	0.14**	1									
4) Perf.-Avoidance SI	2.23 (1.05)	0.81	0.21**	0.16**	0.48**	1								
5) Mastery SI	3.15 (0.89)	0.78	0.34**	0.29**	0.57**	0.34**	1							
6) Self-Consequating	3.81 (1.00)	0.92	0.26**	0.09	0.36**	0.12**	0.33**	1						
7) Environ. Control	3.43 (0.86)	0.75	0.17**	0.15**	0.26**	0.09*	0.36**	0.36**	1					
8) Prox. Goal Setting	3.58 (0.86)	0.79	0.36**	0.18**	0.33**	0.13**	0.38**	0.46**	0.44**	1				
9) MR Global Score	3.22 (0.59)	0.90	0.63**	0.49**	0.71**	0.53**	0.74**	0.62**	0.52**	0.63**	1			
10) SE for MR	3.05 (0.80)	0.85	0.23**	0.16**	0.29**	0.04	0.45**	0.26**	0.34**	0.43**	0.43**	1		
11) Effort	3.55 (0.68)	0.82	0.15**	0.07	0.45**	0.12**	0.51**	0.33**	0.39**	0.45**	0.50**	0.67**	1	
12) Positive Affect	3.14 (0.70)	0.87	0.32**	0.37**	0.23**	0.05	0.44**	0.17**	0.23**	0.28**	0.42**	0.50**	0.44**	1
14) Achievement	11.0 (2.6)	-	0.02	0.03	0.03	-0.08	0.01	0.11*	0.04	0.12**	0.06	0.22**	0.23**	-0.23**

Note. Sit. Interest = Enhancement of Situational Interest; Pers. Significance = Enhancement of Personal Significance; Perf.-Approach SI = Performance Approach Self-Instruction; Perf.-Avoidance SI = Performance Avoidance Self-Instruction; Mastery SI = Mastery Self-Instruction; Environ. Control = Environmental Control; Prox. Goal Setting = Proximal Goal Setting; MR Global Score = Motivation Regulation global score; SE for MR = Self-Efficacy for Motivation Regulation. ω = McDonald's omega. Achievement scores range from 1 (very bad) to 15 (very good).

* $p < .05$;
** $p < .01$.

two exam grades which were then averaged for further analyses. Analyses resembled those in Study 1, whereby additional path models were computed in order to test the effects of self-efficacy for motivation regulation on strategy use, effort, grades, and well-being.

2.2.2. Results

Scale means, intercorrelations, and reliabilities are displayed in Table 4. Again, analyses examining the validity and reliability of the new self-efficacy for motivation regulation scale are reported first. The general factor model omitting item 5 again showed a good fit to the data (see ESM 1). Item loadings ranged from 0.65 to 0.78. The final scale showed a good reliability (McDonald's $\omega = 0.85$). Self-efficacy for motivation regulation was significantly correlated with motivation regulation strategy use ($r = 0.43, p < .001$). Correlations with the individual motivation regulation strategies were all significant, ranging from $r = 0.16$ to $r = 0.45$, except for the correlation of performance avoidance self-instruction, which was not significant ($r = 0.04, p = .423$). Self-efficacy for motivation regulation was correlated with effort expenditure ($r = 0.67, p < .001$) and grades ($r = 0.22, p < .001$), and with positive affect ($r = 0.50, p < .001$).

Results of the mediation path model (Hypothesis 1) resembled those of Study 1 (see Fig. 1). The indirect effect was again significant ($\beta = 0.11, 95\% CI [0.07, 0.15], p < .001$) and a significant amount of variance in effort expenditure was explained ($R^2 = 0.50, p < .001$). As in Study 1, moderation analyses (Hypothesis 2) revealed significant direct effects of self-efficacy for motivation regulation ($\beta = 0.40$; see Table 4) and the sum of motivational strategy use ($\beta = 0.16$) on effort expenditure. Again, however, their interaction did not significantly predict effort expenditure ($\beta = -0.03, 95\% CI [-0.07, 0.00], p = .070$). The three terms explained a similar amount of variance of effort expenditure as in Study 1 ($R^2 = 0.53, p < .001$).

Path analyses with respect to academic achievement showed significant direct effects of self-efficacy for motivation regulation on grades, effort expenditure, and the use of motivation regulation strategies (see Fig. 2, Hypothesis 3). Motivation regulation strategy use was significantly positively related to effort expenditure, but not directly related to grades. Further, all proposed indirect effects were significant: the indirect effect of self-efficacy for motivation regulation on effort expenditure via the sum of motivation regulation strategies was $\beta = 0.11$ (95% CI [0.07, 0.15], $p < .001$). The effect of self-efficacy on grades was mediated by effort expenditure ($\beta = 0.10, 95\% CI [0.01, 0.18], p = .027$). The indirect effect of motivation regulation strategy use on grades via effort expenditure was $\beta = 0.04$ (95% CI [0.01, 0.09], $p = .032$).

With respect to positive affect during learning (Hypothesis 4), extended analyses showed all direct relations to be significant and positive (see Fig. 3). Self-efficacy for motivation regulation indirectly predicted both effort expenditure via motivation regulation strategy use ($\beta = 0.11, 95\% CI [0.07, 0.15], p < .001$) and positive affect via effort expenditure ($\beta = 0.07, 95\% CI [0.00, 0.14], p = .046$). Effort expenditure did not mediate the effect of motivation regulation strategy use on positive affect ($\beta = 0.03, 95\% CI [0.00, 0.06], p = .057$).

2.3. Study 3

The third study aimed at exploring the extent to which self-efficacy for motivation regulation can be distinguished from general academic self-efficacy and self-efficacy for self-regulated learning. Moreover, their joint impact on the use of motivational strategies, effort, and achievement was also examined in order to replicate the findings from Studies 1 and 2 (Hypotheses 1 and 2). Further, general self-efficacy beliefs were expected to impact self-efficacy for self-regulated learning and self-efficacy for motivation regulation, but not motivation regulation strategy use or achievement because of low predictor-criterion-specificity (cf. Wolters & Rosenthal, 2000). Instead, we expected the two more specific self-efficacy beliefs to explain motivation regulation strategy use and thereby, effort expenditure and grades (Hypothesis 5).

2.3.1. Sample and measurement instruments

As in the previous studies, informed consent was obtained from all participants prior to participation. $N = 531$ students (68.6% women) participated in an online-survey. Their average age was $M = 24.19$ years ($SD = 3.86$; min = 18; Max = 49). 37% of participants were studying in their first three semesters, while another 20% were in their fourth to sixth semester. All students were enrolled at a large German university. Out of these, 32% were enrolled in arts and humanities courses, 32.8% in MINT courses, 11.3% in social sciences and 22.2 in teaching degrees, while 1.7% did not report their course. The data used in this study overlap to a small extent with a study by Authors (2017). Specifically, we used partially the same data from the sample analyzed in Study 3 in the present work, which has also been investigated in Study 1 in the article of Authors (2017).¹ However, the current results represent a substantial contribution on its own since we focus here on the effects of a more specific self-efficacy construct (self-efficacy for motivation regulation) which has not been examined in

¹ These data were collected in January 2013, as part of a larger project.

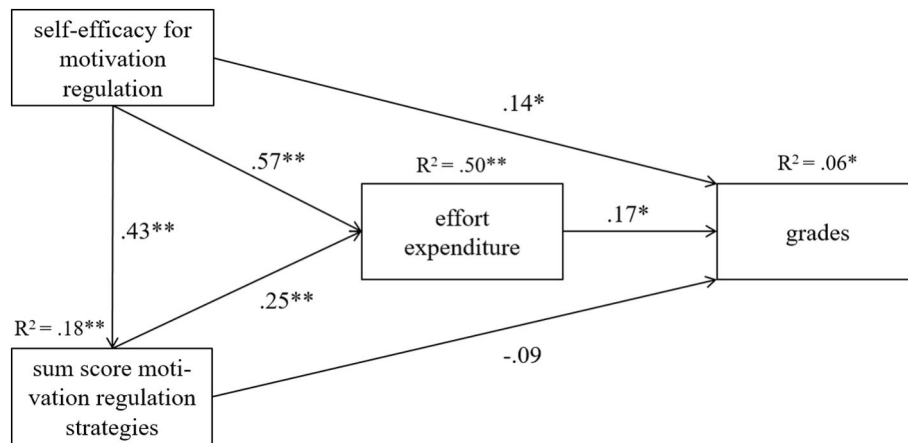


Fig. 2. Results from Path Analyses with Respect to Grades (Study 2).

Path model for mediated effects of self-efficacy for motivation regulation on exam grades; standardized coefficients are reported. * $p < .05$; ** $p < .01$.

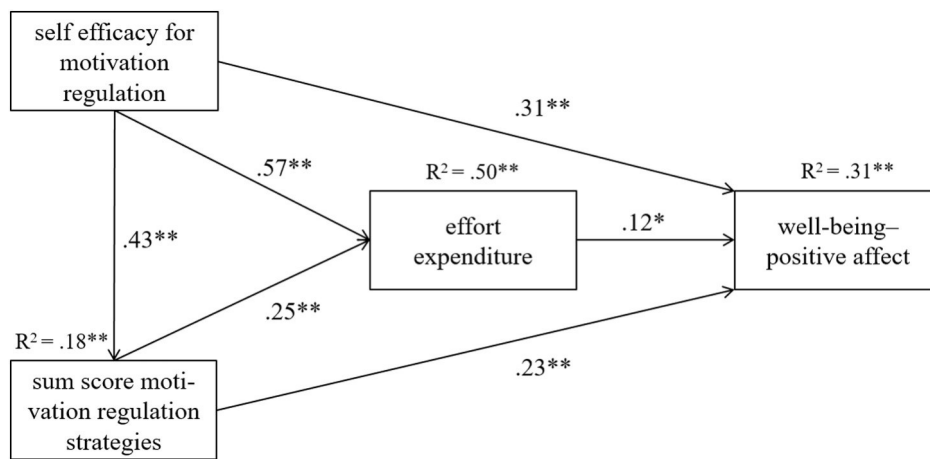


Fig. 3. Results from Path Analyses with Respect to Well-Being (Study 2).

Path model for mediated effects of self-efficacy for motivation regulation on well-being - positive affect; standardized coefficients are reported. * $p < .05$; ** $p < .01$.

Authors (2017).

Strategies for motivation regulation, effort expenditure, and self-efficacy for motivation regulation were assessed as in Studies 1 and 2. The last three received self-reported grades were averaged and used as achievement indicators. Additionally, general academic self-efficacy was assessed with ten items by Schwarzer and Jerusalem (1999; e.g. “I can find a solution for every problem in my studies.”). The scale showed a good internal consistency ($\omega = 0.90$). Further, self-efficacy for self-regulated learning was assessed with eleven items by Zimmerman et al. (1992) (e.g. „How well can you plan your studying time for university?“). This scale showed an acceptable internal consistency ($\omega = 0.79$).

2.3.2. Statistical analyses

In order to assess the construct validity of the new self-efficacy for motivation regulation scale, we conducted confirmatory factor analyses with all three self-efficacy measures. Analyses regarding the mediation and moderation hypotheses were computed as in the first two studies. Additionally, we specified a path model to disentangle the differential impact of the various self-efficacy measures on overall motivation regulation strategy use, effort, and achievement.

2.3.3. Results

Confirmatory factor analyses testing whether the three proposed and established scales indeed represented distinguishable factors

resulted in a poor model fit (see ESM 2). We therefore conducted additional exploratory factor analyses to examine which items belonged to which factor. Results indicated one factor for general academic self-efficacy, one factor for self-efficacy for motivation regulation with the items of the newly constructed scale and a dispersion of the items of the self-efficacy for self-regulated learning scale across this and two additional factors (see ESM 2 for detailed results and fit indices). The three subscales of this scale were labelled “planning and organizing”, “learning strategies”, and “motivation”.

Scale means, intercorrelations, and reliabilities are displayed in Table 5. Self-efficacy for motivation regulation and general academic self-efficacy again showed good internal consistencies with McDonald’s $\omega = 0.84$ and 0.90 , respectively. Reliabilities for the self-efficacy for self-regulated learning subscales “planning and organizing” and “motivation” were acceptable ($\omega = 0.79$ and 0.74), whereas the “learning strategies” subscale was low ($\omega = 0.55$).

All self-efficacy scales were significantly and positively correlated with each other. Correlations of self-efficacy for motivation regulation and the three self-efficacy for self-regulated learning factors varied, whereby the strongest associations were found for the “motivation” ($r = 0.71, p < .001$) and the “planning and organizing” $r = 0.60, p < .001$) subscales. Correlations with the “learning strategies” subscale was much lower ($r = 0.28, p < .001$), which needs to be interpreted with caution due to the low reliability of this subscale. As expected, self-efficacy for motivation regulation was also moderately

Table 5
Scale means, standard deviations, intercorrelations and reliabilities of Study 3.

Scale	M (SD)	ω	1	2	3	4	5	6	7	8	9	10	11	11/1	11/2	11/3	12	13
1) Sit. Interest	2.20 (0.86)	0.85	1															
2) Pers. Signif.	3.01 (1.17)	0.88	0.49**	1														
3) Perf.-Appr. SI	3.48 (1.07)	0.91	0.05	0.07	1													
4) Perf.-Avoid. SI	2.43 (0.98)	0.72	0.05	0.03	0.54**	1												
5) Mastery SI	2.70 (0.91)	0.78	0.33**	0.30**	0.36**	0.22**	1											
6) Self-Conseq.	3.82 (1.07)	0.91	0.17**	0.14**	0.26**	0.15**	0.23**	1										
7) Env. Control	3.18 (0.97)	0.78	0.28**	0.17**	0.16**	0.12**	0.32**	0.27**	1									
8) Proximal GS	3.31 (1.02)	0.82	0.35**	0.35**	0.27**	0.19**	0.05	0.32**	0.28**	1								
9) MR Global	2.98 (0.56)	0.89	0.59**	0.52**	0.62**	0.47**	0.67**	0.58**	0.55**	0.60**	1							
10) SE for MR	2.57 (0.84)	0.84	0.37**	0.29**	0.24**	0.03	0.50**	0.21**	0.23**	0.41**	0.51**	1						
11) SE for SRL	3.50 (0.67)	0.65	0.19**	0.22**	0.20**	0.03	0.32**	0.25**	0.27**	0.28**	0.38**	0.54**	1					
11/1) SE SRL 1	3.42 (0.91)	0.79	0.15**	0.13**	0.19**	-0.02	0.33**	0.26**	0.28**	0.32**	0.36**	0.60**	0.77**	1				
11/2) SE SRL 2	2.84 (0.80)	0.74	0.23**	0.17**	0.19**	0.01	0.47**	0.24**	0.39**	0.35**	0.43**	0.71**	0.59**	0.62**	1			
11/3) SE SRL 3	3.56 (0.79)	0.55	0.15**	0.22**	0.13**	0.06	0.20**	0.15**	0.16**	0.14**	0.26**	0.28**	0.83**	0.29**	0.39**	1		
12) Academic SE	3.32 (0.71)	0.90	0.14**	0.17**	0.03	-0.13**	0.16	0.07	0.14**	0.20**	0.17**	0.38**	0.41**	0.33**	0.28**	0.32**	1	
13) Effort	3.27 (0.79)	0.85	0.22**	0.15**	0.34**	0.02	0.49**	0.27**	0.30**	0.43**	0.50**	0.69**	0.53**	0.63**	0.71**	0.24**	0.29**	1
14) Achievement	2.00 (0.65)	-	0.12*	0.03	0.21**	0.07	0.16**	0.08	0.03	0.09	0.19**	0.28**	0.27**	0.20**	0.21**	0.22**	0.24**	0.29**

Note. Sit. Interest = Enhancement of Situational Interest; Pers. Signif. = Enhancement of Personal Significance; Perf.-Appr. SI = Performance Approach Self-Instruction; Perf.-Avoid. SI = Performance Avoidance Self-Instruction; Mastery SI = Mastery Self-Instruction; Self-Conseq. = Self-Consequating; Env. Control = Environmental Control; Proximal GS = Proximal Goal Setting; MR Global = Motivation Regulation global score; SE for MR = Self-Efficacy for Motivation Regulation; SE for SRL = Self-efficacy for self-regulated learning without motivation regulation items (SE SRL 2); SE for SRL 1 = self-efficacy for planning and organizing; SE for SRL 2 = self-efficacy for motivation regulation in self-regulated learning; SE for SRL 3 = self-efficacy for learning strategies; Academic SE = Academic Self-Efficacy. ω = McDonald's omega. Grades range from 1 (very good) to 6 (very bad), but correlation signs were inverted for avoiding misunderstanding.

* $p < .05$;
** $p < .01$.

correlated with general academic self-efficacy ($r = 0.38, p < .001$). Further descriptive analyses revealed significant correlations of self-efficacy for motivation regulation with the sum of motivation regulation strategies ($r = 0.51, p < .001$), as well as effort expenditure ($r = 0.69, p < .001$) and actual achievement ($r = 0.28, p < .001$). Also, correlations with the individual motivational regulation strategies were significant and ranged from $r = 0.21$ to $r = 0.50$, except for performance-avoidance self-instruction ($r = 0.03; p = .573$). The “motivation” subscale of the self-efficacy for self-regulated learning subscale showed similar relations to effort expenditure, achievement, and motivation regulation strategies. Overall, this points towards a high convergent and discriminant validity of the self-efficacy for motivation regulation scale.

Results of mediation analyses examining hypothesis 1 are displayed in Fig. 1. Again, path coefficients resembled those of Studies 1 and 2: the indirect effect was significant ($\beta = 0.09, 95\% \text{ CI } [0.06, 0.13], p < .001$) and a significant amount of variance was explained ($R^2 = 0.52, p < .001$). However, moderation analyses testing Hypothesis 2 came to different results than in Studies 1 and 2 (see Table 4). Besides significant direct effects of self-efficacy for motivation regulation ($\beta = 0.48, 95\% \text{ CI } [0.43 \text{ to } 0.54], p < .001$) and motivation regulation strategy use ($\beta = 0.16, 95\% \text{ CI } [0.10 \text{ to } 0.22], p < .001$), their interaction became significant in predicting effort expenditure ($\beta = -0.06, 95\% \text{ CI } [-0.10 \text{ to } -0.02], p = .003$). This interaction effect was analyzed in more detail by computing simple slope analyses (Aiken & West, 1991). Simple slopes were significant for students with both low (i.e. 1 SD below the mean; $t[526] = 6.495, p < .001$) and high self-efficacy for motivation regulation (i.e. 1 SD above the mean, $t[526] = 3.545, p < .001$), whereby the slope for those low in self-efficacy for motivation regulation was slightly steeper (see Fig. 4). The negative interaction effect means that for learners low in self-efficacy for motivation regulation, the use of motivation regulation strategies leads to a stronger increase in effort expenditure than for students high in self-efficacy (although they, due to the significant main effect of self-efficacy, still display less effort than students high in self-efficacy). Overall, a substantial amount of variance in effort expenditure was explained by these three predictors ($R^2 = 0.53, p < .001$).

For the path model assessing the differential impact of the three self-

efficacy constructs (Hypothesis 5), self-efficacy for self-regulated learning was not used in its original form due to the factor analytic findings. Instead, to obtain more conceptual clarity, the four “motivation-related” items were excluded to avoid unnecessary conceptual overlap. Also, since the self-efficacy for self-regulated learning scale was used as a single factor in previous research, too, we decided to summarize the two correlated factors “learning strategies” and “planning and organizing” into one factor. With respect to model parsimony, the path from global self-efficacy to motivation regulation strategy use was removed from the final model which showed a good fit to the data ($\chi^2 [6] = 21.614; \text{CFI} = 0.983; \text{RMSEA} = 0.070; \text{SRMR} = 0.045$). All direct effects were significant and positive (see Fig. 4). In addition, all four indirect effects of self-efficacy on effort expenditure were significant and positive. The strongest indirect effect was from self-efficacy for self-regulated learning via self-efficacy for motivation regulation ($\beta = 0.23, 95\% \text{ CI } [0.19 \text{ to } 0.28], p < .001$), whereas the effect of self-efficacy for self-regulated learning via motivation regulation strategy use was significant, but small ($\beta = 0.03, 95\% \text{ CI } [0.01 \text{ to } 0.05], p = .003$). Self-efficacy for motivation regulation indirectly predicted effort expenditure via motivation regulation strategy use ($\beta = 0.07, 95\% \text{ CI } [0.04 \text{ to } 0.10], p < .001$). General self-efficacy indirectly predicted effort expenditure via self-efficacy for motivation regulation ($\beta = 0.11, 95\% \text{ CI } [0.06 \text{ to } 0.15], p < .001$).

3. General discussion

The aim of the present studies was to explore the role of self-efficacy for motivation regulation in the context of self-regulated learning. To this end, two possible mechanisms of influence of self-efficacy beliefs on motivation regulation strategy use and effort (moderation vs. mediation) were examined, and the effects of self-efficacy for motivation regulation were tested in relation to achievement and well-being.

How Does Self-efficacy for Motivation Regulation Relate to Motivation Regulation Strategy Use and Effort Expenditure?

In all three studies, Hypothesis 1 received some support: both self-efficacy for motivation regulation and motivation regulation strategy use significantly and positively predicted effort expenditure directly. Self-efficacy for motivation regulation also directly predicted

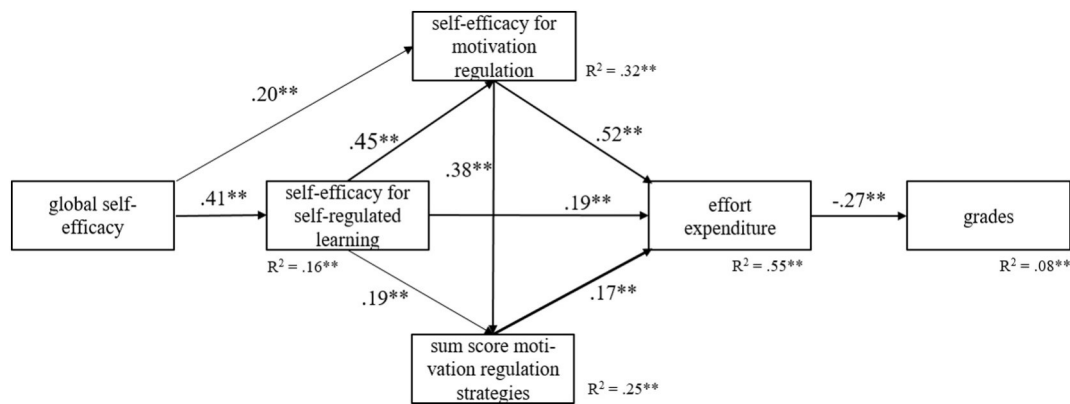


Fig. 4. Results from Path Analyses (Study 3).

$\chi^2[6] = 21.614$; $p = .001$; CFI = 0.983; TLI = 0.957; RMSEA = 0.070; SRMR = 0.044. Self-efficacy for motivation regulation did not contain the four self-efficacy for motivation regulation items from the original scale for conceptual clarity. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

motivation regulation strategy use. This effect is in line with theoretical assumptions of models for self-regulation of motivation proposing individual dispositions such as meta-motivational knowledge and beliefs to be significant predictors of strategy use (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012). Additionally, self-efficacy for motivation regulation also indirectly predicted effort expenditure via an increased use of motivation regulation strategies, providing support for the assumed mediation effect in Hypothesis 1. This indirect effect, however, was much weaker than the direct paths of self-efficacy for motivation regulation and strategy use on effort. Overall, students who feel more confident about being able to regulate their motivation in difficult situations seem to be willing to put more effort into studying. Additionally, their self-efficacy enhances their use of motivation regulation strategies which further increases effort expenditure.

Hypothesis 2 stated that self-efficacy could serve as a moderator between motivation regulation strategy use and effort. Students with higher self-efficacy for motivation regulation were expected to use motivation regulation strategies more effectively, i.e. in a more dedicated and creative way, compared to less self-efficacious students. However, results from moderation analyses were not in line with our predictions. The interaction term (motivation regulation strategy use \times self-efficacy) was not significant in Studies 1 and 2, thereby not supporting the hypothesis that more efficacious students use motivation regulation strategies more effectively. In Study 3, the interaction was significant, but small and in the opposite direction. According to this moderation, learners low in self-efficacy for motivation regulation show a stronger increase in effort if they use more motivational strategies compared to students high in self-efficacy. This finding seems contrary to the expected association that students with higher self-efficacy for motivation regulation should apply motivation regulation strategies more effectively – at a second glance, however, students who believe they can regulate their motivation effectively if necessary may be equally (or even more) successful in regulating their motivation even if they use less regulatory strategies. In contrast, students with low expectations of success for motivation regulation may have to try harder and apply more strategies to increase effort, for example because they do not use them as effectively. In favour of this interpretation is the fact that self-efficacy for motivation regulation alone is a stronger (direct) predictor of effort than motivation regulation strategy use both in moderation and mediation analyses. Altogether, however, findings from the moderation analyses were not consistent and had low effect sizes, so we need to treat it cautiously. Further studies may examine the presumed psychological mechanisms of such moderation effects in more detail.

Two additional points worth noting appeared. First, direct effects of motivation regulation strategy use on effort were rather moderate. Although in this study effects for self-efficacy for motivation regulation

were controlled for, associations were similar to those found by Schwinger and Stiensmeier-Pelster (2012). Higher associations were found by Schwinger et al. (2009) with $\beta = 0.58$. Given the finding of this study that self-efficacy for motivation regulation contributes separately to effort expenditure and may therefore take away variance previously explained by motivation regulation, consequently attenuating the effect, this effect still appears to be in line with previous research. Second and potentially in line with this first point, self-efficacy for motivation regulation predicted effort more strongly than actual motivation regulation strategy use across studies and analyses. Therefore, the mere knowledge of being able to regulate one's motivation in the face of difficulties was enough to display more effort independently of actual regulation strategy use. Similar effects were found by Klassen et al. (2008), where self-efficacy for self-regulated learning was associated more strongly with procrastination (delaying activities, thus decreasing effort) than with the use of learning strategies. This could mean that enhancing students' self-efficacy belief, their subjective conviction of being capable of regulating themselves, could be a means of supporting both increased self-regulation and effort expenditure. This may be a rather efficient way of training self-regulation as opposed to training several motivation regulation strategies. On the other hand, one major source of self-efficacy beliefs are previous mastery experiences (e.g. Bandura, 1997; Usher & Pajares, 2006). Therefore, the high associations between self-efficacy beliefs for motivation regulation and effort and achievement here could also be the result of reciprocal causality. Students who often manage to increase and keep up their effort and thus achieve well are also more likely to have high self-efficacy beliefs for motivation regulation. Unfortunately, due to the cross-sectional nature of designs in this study, we were not able to test this hypothesis of reverse causality. Another explanation for this association may refer to the level of specificity at which self-efficacy for motivation regulation was assessed. Since we chose a level specifically aiming at effort expenditure and not at the single behaviours and motivation regulation strategies, higher associations with global effort instead of specific behaviours may be the result of more matching levels of specificity of predictor and criterion (Bandura, 2006; Honicke & Broadbent, 2016; Klassen et al., 2008).

3.1. How does self-efficacy for motivation regulation relate to achievement and well-being?

In addition to the mechanisms of self-efficacy for motivation regulation in predicting motivation regulation and effort, its role in the broader context of self-regulated learning, specifically with respect to academic achievement and positive affect was examined. In line with Hypotheses 3 and 4 and previous research, higher self-efficacy for motivation regulation was associated with higher grades (cf. Bandura

et al., 1996; Schwinger & Stiensmeier-Pelster, 2012; Zimmerman et al., 1992), as well as more positive affect (cf. Bandura, 1977; Bandura et al., 2003; Grunschel et al., 2016). The association between self-efficacy and positive affect was apparently higher than the one with grades, implying a stronger relevance for affective outcomes than for achievement. Furthermore, self-efficacy also indirectly influenced effort, grades, and positive affect: for one, higher self-efficacy beliefs were associated with more motivation regulation strategy use, which in turn predicted effort. Second, with respect to grades, effort mediated the effect of both motivation regulation strategy use and self-efficacy. Schwinger and Stiensmeier-Pelster (2012) and Schwinger et al. (2009) also found a significant indirect effect of similar size of motivation regulation via effort on grades, Honicke and Broadbent (2016) also reported that effort regulation may serve as a mediator between self-efficacy beliefs and performance. Thus, results found here are in line with previous studies showing that both motivation regulation and self-efficacy are important precursors of students' effort expenditure and subsequent achievement.

In addition to positive affect and achievement, the interplay of self-efficacy for motivation regulation with related self-efficacy facets, in this case general academic self-efficacy and self-efficacy for self-regulated learning, as well as actual motivation regulation, effort and grades was examined. Interestingly, factor analyses with the self-efficacy for self-regulated learning scale by Zimmerman et al. (1992) showed that the scale contained three sub-scales, namely "planning and organizing", "learning strategies", and "motivation regulation". On one hand, this is surprising given previous studies finding a unidimensional structure for this scale (e.g., Caprara et al., 2008), but it is also in line with conceptualizations of self-regulated learning as a multidimensional construct containing cognitive, metacognitive, motivational/affective and environmental aspects (e.g., Pintrich, 2000). Manifest correlations between the three self-efficacy constructs revealed interesting relations: while the correlation between self-efficacy for motivation regulation and the self-regulated learning composite scale of "planning and organizing" and "learning strategies" was moderate, correlations between the two and general academic self-efficacy was lower (small to moderate). When their associations were examined in path analysis, general academic self-efficacy showed only a small impact on self-efficacy for motivation regulation and a medium impact on self-efficacy for self-regulated learning. However, the latter strongly predicted self-efficacy for motivation regulation. This seems in line with the interpretation that these beliefs vary in their degree of specificity (Bandura, 2006) and, since motivation regulation represents a component of self-regulated learning (Boekaerts, 1996; Pintrich, 2000; Wolters, 2003; Zimmerman, 2000), the strong association is adequate. Also in line with this interpretation is the finding that self-efficacy for motivation regulation more strongly predicted motivation regulation strategy use than self-efficacy for self-regulated learning as the less specific conviction. These results are in line with previous findings in the domain of self-regulated learning that self-efficacy beliefs assessed at the level of the respective behaviour to be examined serve as a much more valid predictor of this behaviour (Klassen et al., 2008; Usher & Pajares, 2006). Further, it provides evidence that self-regulated learning should be examined as the multidimensional concept it has been conceptualized as, as opposed to a global behaviour.

Effort was predicted by self-efficacy for motivation regulation, self-efficacy for self-regulated learning, and motivation regulation strategy use, but surprisingly, the latter was the weakest predictor out of the three. Apparently, self-efficacy beliefs are stronger predictors of effort expenditure than actual motivation regulation. Again, this may be due to the paradox that people with higher self-efficacy for motivation regulation also do not experience motivational problems as severely as people lower in self-efficacy for motivation regulation and therefore do not have to use as many motivation regulation strategies, but already show high levels of effort. Further, as already mentioned, the mere knowledge of being able to rely on one's ability to regulate one's

motivation may also help to overcome motivational problems and increase effort. This interpretation is supported by the size of indirect effects: out of these four, the strongest was for self-efficacy for self-regulated learning via self-efficacy for motivation regulation on effort, whereas the two self-efficacy beliefs via motivation regulation were much lower. Interestingly, the indirect effect of general academic self-efficacy via self-efficacy for motivation regulation on effort was small and significant, too, supporting the interpretation that self-efficacy beliefs specific for certain outcomes or behaviours being more strongly associated with the respective outcomes. However, these interpretations are also preliminary and should be subjected to further research.

3.2. Summary and practical implications

Across three studies, a reliable, valid, and economic scale for the assessment of self-efficacy for motivation regulation was developed to more specifically examine self-efficacy beliefs as an individual disposition influencing the process of self-regulated learning. This scale may be used in the future for more specific predictions of motivation regulation processes. Significant direct relations between self-efficacy beliefs and motivation regulation strategy use provide support for theoretically implied meta-motivational systems underlying the use of motivation regulation strategies (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012). This implies that it may not be enough to simply educate students about motivation regulation strategies they can use: subjective beliefs and expectations promoting or prohibiting the use of these strategies also need to be taken into account when promoting self-regulation of motivation. Self-efficacy for motivation regulation as a more specific cognition may therefore be both more malleable and easier to target in training programs aiming at increasing self-regulation skills. For instance, teachers could help their students acquire motivation regulation strategies, thereby enabling them to enhance effort expenditure. In addition, teachers could support students in reflecting on which strategies they are able to apply successfully, thereby enhancing their self-efficacy for motivation regulation (for similar procedures to enhance self-efficacy see Krans, Brown, & Moulds, 2018), strategy use and effort expenditure. Regarding the mechanisms through which self-efficacy for motivation regulation influences effort, results point towards a facilitating effect on the frequency with which motivation regulation strategies are used, which in turn enhances students' effort; as opposed to a moderating role between motivation regulation strategy use and effort expenditure, enhancing the effectiveness of strategy use. Furthermore, self-efficacy for motivation regulation was more closely related to positive affect than to grades, indicating a stronger role within the motivational-affective components of self-regulated learning and thus being more indirectly linked to actual achievement.

4. Limitations and implications for future research

Some limitations with regard to the present studies need to be noted. Since only cross-sectional data were used, effects cannot be interpreted causally. Alternative relations are still possible. For example, as stated above, the strong associations between self-efficacy for motivation regulation, effort, and grades may rather reflect the result of the fact that people who have more past successes of effort expenditure and achievement may hold develop higher self-efficacy beliefs for motivation regulation. Therefore, the findings of this study should be replicated with more adequate (experimental and longitudinal) designs examining. Also, the exact interplay of self-efficacy for motivation regulation and quality of strategy application in increasing effort need to be addressed because in the present study, application quality was merely a proposed mechanism behind the effect of increased self-efficacy. Additionally, the dimensionality and (hierarchical) structure of general and more specific self-efficacy beliefs in the domain of self-regulation deserve further attention in order to gain both conceptual

clarity and an understanding of their interplay, especially in the light of potential trainings and interventions at a cognitive level. Two additional points refer to the samples assessed. Since only university students participated in these three studies, the generalizability to other samples and contexts is questionable, especially in the light of evidence suggesting that motivation regulation may be rather context specific (Dresel et al., 2015; Engelschalk et al., 2015). Also, the three samples contained more women than men. While gender differences regarding motivation have long been known (e.g. Spinath, Eckert, & Steinmayr, 2014), findings for gender differences in self-regulated learning are more mixed (e.g. Klassen et al., 2009; Virtanen & Nevgi, 2010). Therefore, future research should aim at disentangling potential effects of gender in motivation regulation processes. Further, since self-regulated learning is also context- and content-specific process (Dresel et al., 2015), future studies should take factors such as the course enrolled or prior achievement into account beyond individual aspects such as gender. For example, the new self-efficacy for motivation regulation scale could be adapted to different contexts, for example, to event-specific self-efficacy. Depending on the cause of the motivational problem (e.g. low expectation of success due to high task difficulty or low personal value due a very boring task, see Engelschalk et al., 2015), self-efficacy beliefs for motivation regulation may vary and could therefore be assessed more precisely with regard to the cause of the motivational problem. Regarding the level of analysis, self-efficacy for motivation regulation was more strongly related to effort expenditure than motivation regulation strategy use. This may have occurred due to fact that self-efficacy beliefs were assessed with respect to behaviours aiming at effort expenditure as opposed to strategy use. This level of analysis of self-efficacy beliefs for motivation regulation may still be too broad for the use of distinct motivation regulation strategies as mirrored in the rather small correlations with most motivation regulation strategies. Assessing self-efficacy beliefs at the level of these strategies or even more specific behaviours may therefore yield valuable results with respect to motivation regulation. Last, multiple regression approaches here assume that constructs were free from measurement error. Future research should therefore re-examine this using latent variable approaches (e.g. Brown, 2015).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.lindif.2020.101890>.

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Electronic Supplementary Materials**Trautner & Schwinger (2020)****ESM1. Factor analyses of the new self-efficacy for motivation regulation scale (Studies 1 and 2)**

All analyses were conducted with Mplus 7.4 (Muthén & Muthén, 1998-2015). In order to explore the factorial structure of the new self-efficacy scale, confirmatory factor analyses were computed. Two possible models were compared: in Model 1_1, all items were loading on one latent factor. In Model 1_2, a second, correlated latent factor was added accounting for the two inverted items. Model fit was assessed with various indices, namely χ^2 -statistics, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Confirmatory Fit Index (CFI), and Tucker-Lewis-Index (TLI). An RMSEA and SRMR of $\leq .05$ and a TLI and CFI of $\geq .95$ indicate a good, an RMSEA and SRMR of $\leq .08$ and a CFI and TLI of $\geq .90$ indicate an acceptable model fit (Jackson, Gillaspay, & Purc-Stephenson, 2009). Detailed item inspections identified item 5 as problematic, so this item was deleted from the model (Model 1_3). For Study 2, models 2_1, 2_2, and 2_3 were computed accordingly.

Table 1*Confirmatory Factor Analyses Self-efficacy for Motivation Regulation Scale (Studies 1 and 2)*

<i>Model</i>	χ^2 [<i>df</i>]	<i>p</i>	<i>CFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>SRMR</i>
<i>Study 1</i>						
Model 1_1	61.616 [9]	<.001	0.813	0.689	0.217	0.088
Model 1_2	*	*	*	*	*	*
Model 1_3	9.309 [5]	.097	0.980	0.960	0.083	0.031
<i>Study 2</i>						
Model 2_1	33.710 [9]	<.001	0.977	0.962	0.074	0.026
Model 2_2	32.812 [8]	<.001	0.977	0.957	0.078	0.026
Model 2_3	17.740 [5]	<.001	0.985	0.971	0.071	0.020

Note. CFI = Confirmatory Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual. *model estimation failed due to negative residual variances.

ESM 2. Factor analyses of self-efficacy constructs in Study 3

Confirmatory factor analyses for the three self-efficacy constructs indicated a poor fit for Model 3_1 which separated the three theoretically proposed self-efficacy factors (see Table 2). In order to explore the reason for the misfit of the three scales, post-hoc analyses were computed: models including only one of the factors revealed a good model fit only for self-efficacy for motivation regulation (Model 3_2). General self-efficacy showed a model fit slightly below acceptable levels (Model 3_3). Especially self-efficacy for self-regulated learning showed a poor fit (Model 3_4). Since this scale comprised items tapping into different areas of self-regulated learning, an exploratory factor analysis (principal component analysis) with promax rotation was conducted with all self-efficacy items. Sampling adequacy was excellent as indicated by the Kaiser-Meyer-Olkin criterion of .919. Bartlett's test of Sphericity was significant ($p < .001$), indicating sufficient item intercorrelations for performing this analysis. Both the eigenvalue and scree plot criterion suggested a four-factor solution which accounted for 54.79% of the total variance. Factor loadings of all items on the four factors are displayed in Table 3. The general academic self-efficacy items loaded on the first factor. The second factor contained the five self-efficacy for motivation regulation items, as well as four items (items 2, 3, 9 and 10) of the self-efficacy for self-regulated learning scale. These items were related to motivational aspects of self-regulated learning, thus yielding an interpretable solution. The third factor contained four items related to learning strategies, such as note taking and remembering study content and was therefore labelled "self-efficacy for learning strategies", while the fourth factor included three items related to planning and organizing university work and studying and thus named "self-efficacy for planning and organizing".

In order to establish factorial validity for the three subscales of the original self-efficacy for self-regulated learning scale, the three factors found were again tested in confirmatory factor analyses (without the "motivation" and general academic self-efficacy

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items, Model 3_5), which resulted in a good model fit. For the purpose of further assessing conceptual validity of the self-efficacy for motivation regulation scale, it was included in a model with general academic self-efficacy (Model 3_6), resulting in an acceptable model fit, and with the three self-efficacy for self-regulated learning factors (Model 3_7), yielding a good model fit.

Table 2

Confirmatory Factor Analyses Self-efficacy for Motivation Regulation, Self-Efficacy for Self-Regulated Learning and General Academic Self-Efficacy Scales (Study 3)

		<i>Study 3</i>				
Model 3_1	1172.636 [296]	<.001	0.851	0.837	0.075	0.072
Model 3_2	8.952 [5]	<.001	0.996	0.991	0.039	0.014
Model 3_3	292.187 [35]	<.001	0.899	0.870	0.118	0.048
Model 3_4	340.705 [44]	<.001	0.815	0.769	0.113	0.071
Model 3_5	159.596 [41]	<.001	0.926	0.901	0.074	0.052
Model 3_6	413.233 [89]	<.001	0.909	0.893	0.083	0.049
Model 3_7	237.471 [100]	<.001	0.955	0.946	0.051	0.043

Note. CFI = Confirmatory Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual. *model estimation failed due to negative residual variances.

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Table 3

Results from Exploratory Factor Analyses for Self-Efficacy for Self-Regulated Learning, Self-Efficacy for Motivation Regulation and General Academic Self-Efficacy

Items	1	2	3	4
General self-efficacy				
When difficulties arise in my studies I find ways to succeed.	.618			
I always succeed in solving difficult problems in my studies when I make an effort to do so.	.618			
It is not difficult for me in my studies to realize my intentions and goals.	.570			
In unexpected situations during my studies, I always know how I should behave.	.715			
I believe that I get along well even with surprising events in my studies,	.777			
I am relaxed about difficulties in my studies because I can always trust my abilities.	.831			
Whatever happens in my studies, I'll get along with it.	.818			
I can find a solution for every problem in my studies.	.775			
When a new thing comes up in my studies, I know how to handle it.	.752			
When a problem comes up to me during my studies, I usually have several ideas on how to solve it.	.629			
Self-efficacy for self-regulated learning: How well can you...				
finish work assignments by deadlines?				.678
study when there are other interesting things to do?		.592		
concentrate on study contents?		.519	.333	
take class notes of class instruction?			.699	
use the university library to get information for a class assignment?			.620	

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plan your university work?				.658
organize your university work?				.657
remember information presented in a class or literature?		.637		-.398
arrange a place to study without distractions?	.332			
motivate yourself to do work for university?	.696			
participate in class discussions?		.657		
Self-efficacy for motivation regulation				
Even for rather boring tasks in my studies I can almost always motivate myself.	.756			
When I don't feel like studying, I usually find a way to make my work more interesting.	.725			
I can hardly motivate myself for studying.	.753			
Even I don't see the point in some tasks, I am often successful in finding enough reasons for doing it still.	.761			
Even in difficult learning phases I know exactly what I have to do to work fully motivated for a long time.	.746			
Eigenvalue	8.038	3.565	1.536	1.107
% variance explained	30.91	13.71	5.91	4.26

Note. Principal component analysis with promax rotation; Kaiser-Meyer-Olkin criterion = .919. Loadings < .30 are not displayed. Bold = highest loading of the respective item.

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Figure 1. Simple Slope Analysis for the Interaction Effect of Motivation Regulation Strategy Use and Self-Efficacy for Motivation Regulation on Effort Expenditure.

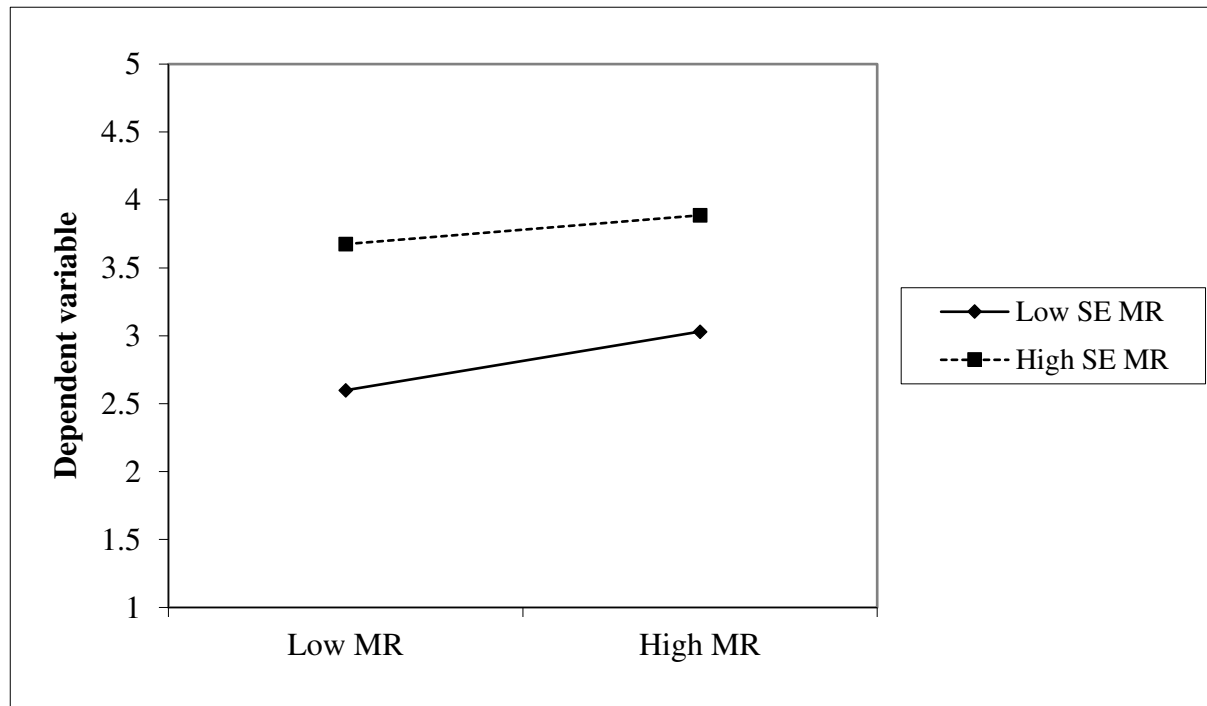


Figure 4. MR = motivation regulation strategy use; SE MR = self-efficacy for motivation regulation. Simple slopes are reported for self-efficacy for motivation regulation and motivation regulation strategy use both +1SD (high) and -1SD (low) around the means.

A2. Manuskript 2

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To Regulate or Not to Regulate? - The Impact of Implicit Theories about Motivation for
Studying on Effective Motivation Regulation

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Abstract

Implicit theories about the malleability of various personal attributes have been linked to successful self-regulation in several domains (e.g., abilities, Dweck, 1999, and emotions, Tamir et al., 2007). The current study extends these findings to achievement motivation in the context of self-regulated learning. Two surveys ($N = 376$ and $N = 365$) revealed an overall tendency of university students to believe that both intrinsic and extrinsic aspects of their motivation are malleable. Stronger incremental theories about motivation were associated with increased motivation regulation strategy use and effort expenditure via stronger self-efficacy for motivation regulation beyond implicit theories about other domains. This indicates the value of a domain-specific consideration of the impact of implicit theories and individual dispositions on the motivation regulation process. Both implicit theories about motivation and self-efficacy beliefs for motivation regulation may therefore represent target variables in trainings of motivation regulation.

Keywords: implicit theories about motivation; self-efficacy for motivation regulation; motivation regulation; self-regulated learning

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of interest

The authors declare no conflicts of interest.

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To Regulate or Not to Regulate? - The Impact of Implicit Theories about Motivation for Studying on Effective Motivation Regulation

Motivation is a crucial predictor of learning, academic achievement (Scherrer & Preckel, 2019; Authors, 2019) and well-being during studying (Ryan & Deci, 2000; Smit et al., 2017). However, motivational problems and deficits such as decreases in studying motivation over time, procrastination, and attrition are prevalent among university students (Dresel & Grassinger, 2013; Grunschel et al., 2016; Heublein et al., 2010; Klingsieck, 2013). To remedy motivational deficits during learning, learners can self-regulate their motivation for studying by implementing actions, thoughts, and behaviors to “initiate, maintain, or supplement their willingness to start, to provide work toward, or to complete a particular activity or goal (i.e., their level of motivation)” (Wolters, 2003, p. 190).

The process of motivation regulation depends on individual factors (e.g., prior knowledge, cognitive abilities, Authors, 2012). Individual beliefs specific to motivation regulation in learning and achievement contexts such as self-efficacy for motivation regulation have been found to increase motivation regulation strategy use, effort expenditure for studying, and thereby academic achievement and well-being beyond less specific aspects of self-efficacy, such as self-efficacy for self-regulated learning and general academic self-efficacy (Authors, 2020). Another belief often linked to self-regulation in various domains refers to implicit theories about personal attributes or states, such as abilities or emotions (e.g., Dweck, 1999; Tamir et al., 2007). Learners holding beliefs that an attribute (e.g., ability) is malleable through personal efforts (incremental theory) are more likely to use adaptive self-regulatory strategies, persevere longer when facing difficulties, and show higher levels of well-being as opposed to people believing that these attributes cannot be changed (entity theory, Burnette et al., 2013; De Castella et al., 2013; Dweck, 1999; Tamir et al., 2007). To our knowledge, however, there are no studies to date examining implicit theories in the more specific domain of motivation and its regulation in the learning and achievement context

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besides implicit theories about situational interest (Thoman et al., 2020). The present research seeks to close this gap by examining how implicit theories about intrinsic and extrinsic aspects of motivation for studying affect motivation regulation, well-being and achievement. A better understanding of the interplay of individual beliefs and self-regulatory behavior regarding learning and achievement motivation may provide important insights into why attempts to regulate motivation for studying in university contexts may or may not occur and succeed. This may in turn inform individualized trainings and interventions for motivation regulation and self-regulated learning in higher education.

1.1 Motivation Regulation in Academic Contexts

To regulate their motivation, learners use a variety of strategies targeting various aspects of motivation and underlying processes (e.g., Authors, 2007). Goal based strategies highlight learners' goals to either continue studying to learn as much as they can (mastery-self-talk), outperform others (performance approach self-talk) or avoid looking incompetent in front of others (performance avoidance self-talk). Interest-based strategies enhance learners' situational interest (e.g., by turning a task into a game) or personal significance of a task or material to be studied (e.g., by highlighting connections between the task content and their lives). Further, several behaviors aim at environmental control, e.g., choosing studying environments devoid of distractions. Self-consequating (promising oneself rewards for finishing a task) is often used in combination with proximal goal setting (splitting large and difficult tasks into smaller, more attainable goals).

Motivation regulation strategy use is important in the context of self-regulated learning because it leads to increased effort expenditure for studying, achievement (e.g., Authors, 2009; Authors, 2012), and experiencing pleasure in learning activities (Smit et al., 2017). Simultaneously, low levels of motivation regulation are associated with dropout intentions (Bäulke et al., 2018) and procrastination (Bäulke et al., 2018; Grunschel et al., 2016).

1.2 Individual Dispositions and Beliefs Influence Motivation Regulation

Motivation regulation depends on individual factors, such as knowledge of, beliefs about and attitudes toward motivation and its regulation (Dresel et al., 2015; Miele & Scholer, 2018; Authors, 2012). A more precise knowledge of motivation regulation strategies and their implementation is related to more effective motivation regulation in achievement contexts, effort for studying, reduced academic procrastination and dropout intentions (e.g., Baulke et al., 2018; Dresel et al., 2015; Miele & Scholer, 2018; Scholer et al., 2018; Steuer et al., 2019). Individual dispositions for motivation regulation also include more stable and less malleable dispositions, e.g., cognitive abilities, personality traits, and motivational beliefs (Authors, 2012). However, cognitive abilities (Authors, 2009), conscientiousness (Authors, 2017), and motivational beliefs (such as task self-efficacy and task value, Wolters & Rosenthal, 2000; Wolters & Benzoni, 2013) are only weakly and inconsistently linked to motivation regulation strategy use. This may be because the factors examined are a) global dispositions not very specific for motivation regulation in the learning and achievement domain and b) rather stable and not easily modifiable, resulting in little predictive utility for this specific self-regulatory process. Additionally, the precise causal mechanisms in which they affect motivation regulation are not clear (Miele & Scholer, 2018; Authors, 2012).

In contrast, individual dispositions specific to learning and achievement motivation regulation are more useful predictors of motivation regulation. For example, self-efficacy for motivation regulation, subjective beliefs about one's ability to increase and maintain motivation for studying even in the face of boring or difficult tasks, are associated with a more frequent motivation regulation strategy use, higher effort expenditure, and indirectly higher achievement and well-being (Authors, 2020). Importantly, self-efficacy for motivation regulation predicted these variables beyond more general academic self-efficacy beliefs, indicating specific dispositions to be more useful to predict motivation regulation than more global dispositions (Baranik et al., 2010).

1.3 The Role of Implicit Theories in Self-Regulation

In the broader self-regulation context, implicit theories about personal attributes and experiences play an important role (e.g., Burnette et al., 2013; Molden & Dweck, 2006). Whether people choose to regulate specific aspects of their behavior and experiences also depends on the meaning they ascribe to a situation due to the beliefs they hold about the world (Molden & Dweck, 2006). One frequently examined dimension of these “lay theories” is whether people view attributes as fixed and unchangeable (entity theory) or dynamic and malleable through personal efforts (incremental theory, Dweck, 1999; Dweck & Leggett, 1988).

Implicit theories (e.g., about abilities) impact self-regulatory behavior in many ways, for example, by influencing perceptions and attributions of failure and inducing more or less adaptive goal setting, regulatory strategy use, and monitoring (Burnette et al., 2013; Dweck, 1999; Dweck et al., 1995; Dweck & Leggett, 1988; Molden & Dweck, 2006). Generally, incremental theories are associated with more adaptive patterns of self-regulation which in turn were partly associated with achievement (Burnette et al., 2013). Incremental theories impact achievement further by triggering other adaptive beliefs, e.g., self-efficacy beliefs in one’s ability to cope in challenging situations, which are related to more adaptive goal setting and higher achievement (Taberner & Wood, 1999).

Implicit theories are domain-specific and can be held about more transient states, too, such as emotions (Ford et al., 2018; Tamir et al., 2007). Entity theories about emotions are associated with higher perceived intensity of emotions, lower well-being and psychological health, and increased psychological distress, anxiety and depression (e.g., De Castella et al., 2013; Ford et al., 2018; Tamir et al., 2007). This may be due to implicit theories’ effects on self-regulation: people believing emotions to be malleable select more adaptive emotion regulation strategies (e.g., De Castella et al., 2013; Ford et al, 2018; Kneeland et al., 2016; Tamir et al., 2007) and use them more effectively (Gutentag et al., 2017). Furthermore, entity

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theories about emotions are associated with lower self-efficacy for emotion regulation and explain negative emotional experiences through and beyond the latter (Tamir et al., 2007).

This adaptive pattern for incremental and maladaptive pattern for entity theories is well established also for implicit theories about certain aspects of motivation.

1.4 Implicit Theories about Motivation and Self-Regulated Learning

Motivation for learning and achievement is not a unitary construct. It can take several forms and has thus been described by a diverse set of theories each explaining specific aspects of motivation-related behaviours and experiences (e.g. Bandura, 1997; Ryan & Deci, 2020; Sansone & Thoman, 2005; Wigfield & Eccles, 2020). Therefore, implicit theories about motivation examined to date also reflect various aspects of motivational experiences. For example, Spinath and Schöne (2003) found that incremental theories about effort invested in academic work as a behavioural manifestation of motivation for studying were associated with mastery goal orientations and higher achievement, indicating that achievement may depend to some degree on malleability beliefs about motivation and engagement.

Furthermore, incremental theories about self-regulated learning abilities (as opposed to incremental theories about intelligence) are associated with a more frequent use of learning strategies (Hertel & Karlen, 2020). Tapping into dispositional experiences of interest, O’Keefe et al. (2018) found that people holding stronger beliefs that one’s core interests (“passions”) are fixed and limited expected motivation to come without effort for activities within their interest domains. The stronger people’s entity theories about interest were, the more interest they lost when difficulties occurred during activities pursuing their interests. Thoman et al. (2020) reported that implicit theories about experiencing situational interest led to more use of interest regulation strategies.

These results indicate that implicit theories specific to some aspects of motivation are also associated with adaptive self-regulation, self-efficacy beliefs for self-regulation and coping. Besides experiences of interest (Sansone & Thoman, 2005), one prominent

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experience of motivation for studying refers to the distinction of intrinsic, autonomous vs. extrinsic, controlled motivation, is self-determination theory (Ryan & Deci, 2000). Self-determination theory describes intrinsic motivation as an activated state and intention towards action due to the task itself being experienced as enjoyable and pleasant. Extrinsic motivation, in turn, refers to a continuum of motivational experiences all based to some degree on external pressures, such as rewards and punishments upon task (non)completion or the feeling that one ought to do the task for external benefits (e.g. utility for one's future life). Both intrinsic and extrinsic motivation are important predictors of achievement and well-being in academic contexts (Ryan & Deci, 2020; Schneider & Preckel, 2017). With respect to regulating one's studying motivation, as explained above, some strategies aim explicitly at enhancing rather intrinsic aspects of motivation (e.g. situational interest), while others focus on rather extrinsic aspects of motivation (e.g. self-consequating, c.f. Authors, 2009). However, to date, it is not clear which strategies learners choose when and why. Since they perceive intrinsic and extrinsic motivation as different motivational states and have strategies at hand to regulate them accordingly (both enhancing a motivational experience and changing its quality), it seems important to distinguish implicit theories about motivation with respect to intrinsic and extrinsic experiences. Further, it seems plausible that holding incremental theories about one motivational experience (e.g., believing that extrinsic motivation is malleable) may increase the likelihood of choosing strategies aiming at rather extrinsic motivational aspects (e.g., self-consequating) more frequently. Despite the wide reach of self-determination theory and the broad implications of intrinsic vs. extrinsic motivation, to date, no study has examined whether learners hold differentiable implicit theories about these two motivational experiences for studying and whether they go along with different choices of motivation regulation strategies.

1.5 General vs. Personal Implicit Theories

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Implicit theories can be held regarding an attribute in general and one's personal attribute ("you can change your" vs. "I can change my ability", de Castella & Byrne, 2015; de Castella et al., 2013; Spinath, 1998). General and personal theories are strongly correlated (de Castella & Byrne, 2015), but students on average endorse entity theories for people in general more strongly than for themselves (de Castella & Byrne, 2015). Further, personal implicit theories predicted outcomes beyond general theories, indicating that personal theories are a more precise predictor of well-being and behavior. However, it has not yet been investigated whether personal and general theories learners hold about their motivation to study can be differentiated from each other, as well as from self-efficacy for motivation regulation.

1.6 The Present Study

Overall, it has frequently been shown that incremental as opposed to fixed theories are associated with higher well-being and achievement through more frequent and adaptive self-regulatory strategy use and self-efficacy beliefs (Burnette et al., 2013; Tamir et al., 2007; Thoman et al., 2020). With respect to self-regulation of learners' motivation for studying, it has also been suggested that individual beliefs about motivation for studying have an impact on actual motivation, effort for studying and thereby academic achievement by enhancing self-regulation of motivation (e.g., Authors, 2012; Authors, 2020). Especially given the criticism on individual factors influencing the process of motivation regulation examined so far regarding a) their stability, b) relative lack of specificity for motivation regulation, and c) unclear theoretical effects on the process of motivation regulation, a thorough understanding of how individual, but explicitly malleable (e.g., Kneeland et al., 2016; Yeager et al., 2019) dispositions (i.e., implicit theories about motivation) influence motivation regulation can be helpful to design more effective training programmes for self-regulated learning in higher education addressing such convictions. However, so far, implicit theories about the malleability of one's studying motivation beyond the more narrow experience of situational

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(Thoman et al., 2020) and dispositional interest (O’Keefe et al., 2018) have not yet been examined.

Therefore, the present study examines how implicit theories about motivation to study affect the process of motivation regulation. To this end, two studies were conducted. Study 1 hypothesized that learners holding stronger incremental theories of their studying motivation should use motivation regulation strategies more often, thereby, but not directly, displaying more effort expenditure (hypothesis 1). Also, we expected these relations to be partially mediated by higher self-efficacy for motivation regulation (hypothesis 2). Further, it was expected that incremental beliefs about intrinsic motivation for studying are associated with a more frequent use of strategies aiming at enhancing intrinsic aspects of motivation for studying, such as enhancement of situational interest (e.g., turning a task into a game). Similarly, incremental theories about rather extrinsic motivation for studying were expected to be related to a more frequent use of strategies highlighting extrinsic aspects of one’s motivation (e.g., enhancement of personal significance and self-consequating, hypothesis 3). Finally, we hypothesized implicit theories about motivation for studying to predict motivation regulation strategy use, self-efficacy for motivation regulation, and effort for studying beyond less domain-specific implicit theories about intelligence, emotions, and dispositional interest (hypothesis 4).

Study 2 replicated hypotheses 1 to 3 and additionally examined whether personal and general implicit theories about motivation for studying are separable from each other and from self-efficacy beliefs for motivation regulation as a closely related construct (hypothesis 5). Finally, we expected personal implicit theories about motivation for studying to be more strongly associated with self-efficacy for motivation regulation and motivation regulation strategy use than their general counterpart (hypothesis 5).

2. Study 1

2.1 Sample and Measures

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$N = 376$ university students voluntarily participated in this online survey. On average, participants were $M = 22.9$ years old ($SD = 3.62$; Min = 18, Max = 44) and on average in their fourth semester ($M = 4.33$, $SD = 3.58$). 41.5% were enrolled for psychology, 15.4% for arts and humanities degrees, 12.8% for MINT degrees, 8% social science and economic/law degrees each, 6.6% teaching degrees, 5.9% medicine and 1% others. 92% were enrolled at a mid-sized German university. Participants had the opportunity to receive course credit for their participation and win vouchers after completion. First, they gave their informed consent and subsequently answered several questionnaires. An IRB approval is not required for this type of study in Germany. The study was conducted in accordance with ethical guidelines and principles of national and international committees and the 1964 Helsinki declaration and its amendments.

2.1.1 Implicit theories about motivation for studying.

Since there was no scale investigating implicit theories about motivation for studying specifically, items on implicit theories on intelligence (Dweck, 1999) and emotion (Tamir et al., 2007) were adapted to various aspects of motivational experience in the learning context. Since motivation is a broad term used to describe various experiences in everyday language, items were designed to reflect motivational value of studying and the material to be studied according to expectancy value theory (Wigfield & Eccles, 2020). Four items referred to the (non)malleability of intrinsic and joyful aspects of studying activities and content, while another four tapped into their (non)malleability of motivational value due to rather extrinsic aspects, such as personal significance and utility of studying and content. Two items of each subscale were formulated to describe incremental and two for entity beliefs. Sample items for this and the scales described in the following can be obtained from Table 1.

2.1.2 Self-efficacy for motivation regulation.

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Self-efficacy for motivation regulation in learning contexts was assessed with a five-item scale by the Authors (2020). This scale has shown good internal consistencies for this scale (McDonald's $\omega = .83$ to $.85$, Authors, 2020).

2.1.3 Motivation regulation.

Eight motivation regulation strategies frequently used in learning and achievement contexts were assessed using the motivation regulation questionnaire by the Authors (2007). Participants reported how often (from 1 “never/very rarely” to 5 “very often”) they used the strategies “Enhancement of Situational Interest”, “Enhancement of Personal Significance”, “Performance-Approach Self-Instruction”, „Performance-Avoidance Self-Instruction“, “Mastery Self-Instruction“, „Self-Consequating“, „Environmental Control“, and „Proximal Goal Setting“ in the academic context on three to five items per strategy (overall 30 items). All scales showed good internal consistencies ($\alpha = .60$ to $.91$, Authors, 2007) in previous studies. Besides the single scale scores, all items were averaged to an overall motivation regulation score.

2.1.4 Effort expenditure for studying.

Effort for studying was measured with a scale consisting of eight items by Wild and Schiefele (1994). Participants indicated how often (from “very rarely” to “very often”) they showed respective effort-related behaviours, e.g. working until they thoroughly comprehend a topic or studying even late at night if necessary. The scale showed acceptable internal consistencies in previous studies ($\alpha = .74$, Wild & Schiefele, 1994; $\alpha = .79$, Authors, 2007).

2.1.5 Implicit theories about effort, intelligence, emotions, and dispositional interest.

Implicit theories about effort were assessed with the “malleability of effort” subscale of the SE-SÜBELLKO (Spinath & Schöne, 2003). Three statements were presented as semantic differentials, e.g., “...cannot be changed / can be changed”. The scale showed acceptable reliability in student samples of $\alpha = .64$ to $.66$. Implicit theories about intelligence were assessed with the widely used six-item scale by Dweck et al., (1995) in their German

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version by Spinath (1998). Three items represented incremental and entity beliefs each. The overall scale thus reflected incremental beliefs about intelligence. The overall Cronbach's Alpha was good ($\alpha = .88$; Spinath, 1998). Implicit theories about dispositional interest were assessed with four items by O'Keefe et al. (2018). Cronbach's Alpha was reported to be good ($\alpha = .77$ to $.85$, O'Keefe et al., 2018). Implicit theories about emotions were assessed with four items by Tamir et al. (2007, $\alpha = .75$).

For implicit theory scales, entity items were later recoded in order to obtain a scale reflecting incremental views.

2.2 Statistical Analyses

As a preliminary step, to confirm the factorial structure of the implicit theories about motivation scale, the sample was randomly split into two halves ($n = 188$ each). With the first half, exploratory factor analysis with Promax rotation was conducted to determine the adequate number of sub-dimensions. The second half was used to replicate this factorial structure in confirmatory factor analyses to compare this structure with a single factor model containing all eight items (model 1), and a model separating intrinsic and extrinsic items on one factor each (model 2).

To test the relations between implicit theories, self-efficacy, motivation regulation, and effort expenditure (hypotheses 1 and 2), path models were specified (see Figure 1). For each model, four indirect paths were specified. Motivation regulation was predicted by implicit theories via self-efficacy for motivation regulation. Effort expenditure was also predicted by implicit theories in three ways, for one via motivation regulation strategy use, secondly via self-efficacy for motivation regulation and thirdly via self-efficacy and motivation regulation strategy use. Three additional models included one other implicit theory (about intelligence, dispositional interest, and emotion, Figures 2-4). The robust maximum likelihood estimator (MLR) was used.

2.3 Results

2.3.1 Factorial validity and psychometric properties of the implicit theories about motivation scale.

Sampling adequacy was good (Kaiser-Meyer-Olkin criterion of .757) and item intercorrelations were sufficient (Bartlett's test of sphericity: $p < .001$). Both the eigenvalue and scree plot suggested a four-factor solution which accounted for 49.87% of the total variance. The four intrinsic and extrinsic items formed one factor each without cross-loadings on other factors. Subsequently, confirmatory factor analyses with the second half of the data revealed that model 2 with two factors separating intrinsic vs. rather extrinsic aspects as supported by principal component analysis and theoretical considerations fitted the data better than a single factor model (model 1, Table 2), but still below acceptable. However, one item per scale showed a factor loading of $\lambda < .50$. These two items were excluded, resulting in a good model fit (model 3). The final scales showed acceptable reliabilities ($\omega_{intrinsic} = .63$ and $\omega_{extrinsic} = .65$, Table 3).

Students on average tended to hold incremental as opposed to entity beliefs ($M_{intrinsic} = 3.77$, $M_{extrinsic} = 3.27$, Table 3) about motivation. Both scales correlated moderately ($r = .38$) and with few exceptions showed similar patterns of correlations with motivation regulation strategies, self-efficacy for motivation regulation, and other implicit theories.

2.3.2 Implicit theories and the regulatory process (hypotheses 1 and 2).

Incremental theories about intrinsic motivation significantly were directly associated with more frequent motivation regulation strategy use, but not indirectly via self-efficacy for motivation regulation (Figure 1). Further, it showed a significant direct negative relation with effort expenditure. The indirect path on effort via motivation regulation was significant, whereas all other indirect paths including the total indirect relation with effort were not significant (Table 4). In turn, incremental theories about extrinsic motivation were not directly related to motivation regulation strategy use nor effort expenditure, but to self-efficacy for motivation regulation. Thus, the indirect path on strategy use via self-efficacy was significant,

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as were all indirect paths on effort, resulting in a total indirect association of $\beta = .14$ (95% [CI .05, .23]).

2.3.3 Relations between incremental theories about intrinsic vs. extrinsic motivation on respective strategies (hypothesis 3).

There were no direct associations between implicit theories about extrinsic motivation and were all eight strategies (ESM Figures 1-8), resulting in nonsignificant indirect paths on effort expenditure via the respective strategies (ESM Table 1). Stronger implicit theories about extrinsic motivation were, however, related to stronger self-efficacy for motivation regulation, which was in turn positively related to a more frequent use of all strategies except performance avoidance self-talk. Therefore, incremental theories about extrinsic motivation were indirectly significantly related to the use of all strategies except performance avoidance self-talk. Due to small or even non-significant associations between these strategies and effort, the indirect relation between implicit theories about extrinsic motivation on effort via self-efficacy and strategy use was only significant for three strategies (ESM Table 1).

Implicit theories about intrinsic motivation were only related significantly to enhancement of personal significance ($\beta = .20$), enhancement of situational interest ($\beta = .21$), and environmental control ($\beta = .19$). Since the first two strategies were not significantly associated with effort expenditure, there was only one significant indirect path from implicit theories about intrinsic motivation on effort via environmental control ($\beta = .03$, 95% CI [.01, .05]). Due to nonsignificant relations to self-efficacy for motivation regulation, there were also no indirect associations from incremental theories about intrinsic motivation on strategy use and effort.

2.3.4 Relations between implicit theories about motivation and motivation regulation beyond other implicit theories (hypothesis 4).

Implicit theories about dispositional interest were not significantly associated with self-efficacy for motivation regulation nor effort expenditure, but with a more frequent use of

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motivation regulation strategies (Figure 2). Consequently, the indirect path on effort was significant ($\beta = .04$, 95% CI [.01, .07]). Neither implicit theories about emotion nor intelligence were associated with any aspect of the motivation regulation process (Figures 3 and 4).

3. Study 2

3.1 Sample and Measures.

After excluding three participants due to conspicuous response patterns, the final sample of this online survey comprised $N = 365$ university students. They mainly came from a midsized German university (92.9%) and were $M = 22.75$ years old ($SD = 4.07$, Min = 18, Max = 58). 80.5% were women and 52.1% were enrolled for psychology, 32.6% for arts and humanities degrees, 25.7% for STEM-degrees, 20.6% for social science, law or economics degrees and 10.9% for medicine. 9.7% studied teaching degrees and 0.6% other subjects. Participants could gain course credit for study participation and win one out of two vouchers. After giving their informed consent, they answered several questionnaires.

Implicit theories about motivation to study, self-efficacy for motivation regulation, motivation regulation strategy use, and effort expenditure were assessed as in Study 1 (Table 1). To obtain a measure for personal implicit theories about motivation, items from the existing general scale were adapted to a personal perspective with as little changes as possible to obtain parallel measures. For this, study, too, an IRB approval was not required for this type of study in Germany. It was conducted in line with ethical guidelines and principles of national and international committees and the 1964 Helsinki declaration and its amendments.

3.2 Statistical Analyses.

To assess the factorial structure of general and personal implicit theories about motivation, confirmatory factor models were computed. Model 1 reflected four factors (personal vs. general implicit theories about intrinsic vs. extrinsic motivation). Model 2 contained one factor for all items. Model 3 consisted of two factors (implicit theories about

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intrinsic vs. extrinsic motivation, without separating general and personal theory). Model 4 additionally excluded as the same items as in Study 1 due to low factor loadings. In all models, residual correlations were allowed between parallel items of the general vs. self-theory scales. To test the differential relations of personal vs. general theories to motivation regulation, stepwise hierarchical regressions were computed to predict self-efficacy for motivation regulation, motivation regulation strategy use, and effort expenditure. Finally, path models from Study 1 were replicated.

3.3 Results

3.3.1 Factorial structure and psychometric properties of general vs. personal implicit theories about motivation.

Model 1 separating personal vs. general theories about implicit theories about extrinsic and intrinsic motivation showed a model fit just below acceptable (Table 2) and linear dependencies between general and personal latent factors ($r_{intrinsic} = .95$, $r_{extrinsic} = .97$). Neither the single (model 2) nor the two factor model separating implicit theories about intrinsic and extrinsic motivation containing personal and general items (model 3) fitted the data well. Since the same two items as in Study 1 showed low factor loadings, they were again excluded, resulting in an acceptable fit (model 4). Model 5 separating implicit theories about intrinsic and extrinsic motivation and self-efficacy for motivation regulation on different factors each also showed an acceptable model fit. Since personal and general implicit theories about motivation did not appear to be distinguishable constructs, hierarchical regressions assessing their differential impact were not computed.

The two scales measuring implicit theories about intrinsic and extrinsic motivation containing both personal and general items showed acceptable to good reliabilities (MacDonald's $\omega = .79$ and $.82$). On average, students endorsed rather incremental theories about both types of motivation (Table 5).

3.3.2 Implicit theories and the regulatory process (hypotheses 1 and 2).

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Implicit theories about intrinsic motivation did not show any significant direct or indirect associations with self-efficacy for motivation regulation, motivation regulation strategy use, and effort expenditure (Figure 5). However, implicit theories about extrinsic motivation showed significant direct positive relations to both self-efficacy for motivation regulation and motivation regulation strategy use, but not to effort expenditure. Since both strategy use and self-efficacy for motivation regulation were directly associated with effort expenditure, all indirect paths from implicit theories about extrinsic motivation to effort were significant with a total indirect association of ($\beta = .26$, 95% CI [.16, .35], Table 4).

3.3.3 Relations between incremental theories about extrinsic vs. intrinsic motivation on respective strategies (hypothesis 3).

Implicit theories about extrinsic motivation were positively and directly related to enhancement of situational interest ($\beta = .28$), environmental control ($\beta = .18$), and proximal goal setting ($\beta = .16$). Further, they were directly and significantly associated with higher self-efficacy for motivation regulation, which was in turn associated with a higher frequency of use of all strategies except performance-avoidance self-talk. Since not all strategies were significantly related to effort expenditure, the indirect relations of implicit theories about extrinsic motivation on effort via self-efficacy and the individual motivation regulation strategies were significant only via enhancement of situational interest ($\beta = .04$, 95% CI [.01, .08]), proximal goal setting ($\beta = .03$, 95% CI [.00, .06]), and mastery self-talk ($\beta = .05$, 95% CI [.00, .09]) as mediators. The total indirect associations of implicit theories about extrinsic motivation on effort were all significant and positive ($\beta = .18$ to .24).

Implicit theories about intrinsic motivation only showed a direct positive association with mastery self-talk ($\beta = .14$) and a negative direct association with proximal goal setting ($\beta = -.17$, ESM Figures 9-16). The indirect path of implicit theories about intrinsic motivation on effort via mastery self-talk was significant ($\beta = .05$, 95% CI [.00, .09], ESM Table 2). The same held for the mediation via proximal goal setting, however, this relation was negative (β

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= -.03, 95% CI [-.06, -.00]). The total indirect association of implicit theories about intrinsic motivation on effort was not significant via proximal goal setting ($\beta = .04$, 95% CI [-.05, .12]). Despite the lack of direct associations, the total indirect association of implicit theories about intrinsic motivation on effort was significant in the model including enhancement of personal significance ($\beta = .08$, 95% CI [.00, .15]). Since implicit theories about intrinsic motivation were not related to self-efficacy for motivation regulation, there were no indirect effects on strategy use.

4. Discussion

The aims of the present study were to examine whether and how implicit theories and their relations to self-regulation generalize to the domain of learning and achievement motivation and university students' self-regulation of their motivation for studying. Specifically, it was investigated whether and how the belief that intrinsic and extrinsic aspects of motivation to study are malleable is related to the process of motivation regulation and regulatory effectiveness and may thus inform future trainings and interventions for self-regulated learning.

4.1 Assessment and Prevalence of Implicit Theories about Motivation

Both studies consistently found the intended two factors representing implicit theories about intrinsic (e.g., feelings of joy and interest in learning) and extrinsic (e.g., attainment and utility value of studying) aspects of one's motivation to study indicating high factorial validity of the newly constructed scale. Learners more strongly endorsing incremental theories of intrinsic aspects of their motivation for studying also tended to hold extrinsic aspects of motivation to be malleable as indicated by moderate to strong correlation between the two. The overall scales' reliabilities were acceptable to good given the broad scope of the construct at hand. Convergent and discriminant validity were reflected in moderate correlations with implicit theories about effort for studying and small to moderate correlations with self-efficacy beliefs for motivation regulation and implicit theories about abilities and emotions.

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Implicit theories about motivation, however, were not correlated with implicit theories about more dispositional, individual interest as another aspect of one's motivation. Despite the usually moderate to strong correlations between situational and individual (dispositional) interest (e.g., Linnenbrink-García et al., 2010), beliefs about the malleability of these two experiences may be unrelated given the different origins learners attribute them to. According to the Four-Phase Model of Interest Development (Hidi & Renninger, 2006), situational interest arises from environmental stimuli inducing positive affective-motivational reactions. In contrast, individual, dispositional interests are conceptualized as the product of prolonged and repeated engagement with a topic and thus reflects both a state of interest as well as a disposition to reengage with the topic of interest. This disposition is characterized by positive feelings and attitudes toward the subject and higher personal valuing of it. This difference in emergence of interest (situationally triggered and maintained vs. lying within the person as a more stable disposition) may lead to different perceptions of their malleability and thus to the lack of relation found here. .

In line with previous studies on implicit theories about emotions as a more transient personal experience (Schroder et al., 2016; Tamir et al., 2007), students tended to hold incremental theories about motivation for studying. Interestingly, Thoman et al. (2020, study 3) found that students tended to hold fixed as opposed to malleable theories about experiencing interest, indicating that students appraise aspects of their environment to be more malleable than their intrinsic experience of interest (although a direct comparison cannot be made in this study).

4.2 Relations of Implicit Theories about Motivation with Motivation Regulation Strategy Use and Effort Expenditure

In accordance with hypothesis 1, learners holding incremental theories about their motivation to study were more likely to use motivation regulation strategies more often, which in turn was indirectly associated with students' willingness to exert effort. However,

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Study 1 found these direct and indirect relations only for implicit theories about intrinsic motivation, while implicit theories about extrinsic motivation were not related to strategy use, whereas Study 2 only found incremental theories about extrinsic motivation to be associated with a more frequent strategy use. Generally, both incremental theories about motivation were not directly related to stronger effort expenditure for studying in both studies except for incremental theories about intrinsic motivation, which were associated with decreased effort expenditure in Study 1. This lack of direct associations with regulatory outcomes mirrors findings of implicit theories in other domains, such as implicit theories about intelligence or emotion (e.g., Burnette et al., 2013; Dweck et al., 1995; Tamir et al., 2007). Similarly, Kneeland et al. (2016) found people holding incremental theories about emotions to use an adaptive emotion regulation strategy more often than people holding fixed beliefs, but no differences in emotion regulation success. Further, the relation between implicit theories and self-regulation may not be as direct as previously proposed as self-efficacy for motivation regulation emerged as an important mediator.

4.3 Self-efficacy as a Mediator between Implicit Theories and Self-Regulation

In both studies, incremental theories about extrinsic motivation for studying were related to stronger self-efficacy beliefs for motivation regulation. That is, learners who believe that extrinsic motivation for studying is malleable have significantly more confidence in their own abilities to motivate themselves to study. There is a robust theoretical rationale for the link between incremental theories and self-efficacy beliefs (Dweck, 2002; Dweck & Leggett, 1988; Wood & Bandura, 1989) and the association has also been found in other fields (e.g., intelligence (Diseth et al., 2014; emotions, Tamir et al., 2007, and group-management abilities, Taberero & Wood, 1999). Also, the findings reported here were consistent across the two studies. Taken together, this supports the hypothesis that the belief in malleability of motivation for studying determines a higher self-efficacy to cope with motivational challenges

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during learning. Given the cross-sectional designs, however, the assumption of causality must of course be verified in studies with more appropriate designs.

Interestingly, relations were not significant for incremental theories about intrinsic motivation for studying. Changing aspects beyond one's personal experience of intrinsic motivation for studying, such as one's environment (e.g., the material to be studied) or highlighting features of the learning material to make it appear more relevant to oneself, appear to be easier to change than one's affective experiences. Extrinsic motivation regulation strategies such as self-consequating and environmental control are implemented behaviorally. This may be psychologically easier to apply than intrinsic strategies, which require a stronger ability for introspection and autosuggestion – possibly, there may again be differences depending on learners' cognitive abilities (Authors, 2009). This view is also supported by the finding that learners implement rather behavioural strategies more often and more successfully than interest enhancement strategies (e.g., Authors, 2017).

Notably, in the present studies, there were also indirect associations of implicit theories about extrinsic motivation for studying and self-efficacy for motivation regulation on both strategy use and effort expenditure for studying. Therefore, in partial accordance with hypothesis 2, learners who more strongly believe that extrinsic, but not intrinsic motivation is malleable also more strongly believe in their ability to regulate their motivation for studying, and thus use motivation regulation strategies more often and show more effort in studying. This pattern, however, was more nuanced at the level of individual strategies.

4.4 Implicit Theories about Intrinsic vs. Extrinsic Motivation and Intrinsic vs. Extrinsic Regulatory Strategies

In contrast to our expectation (hypothesis 3), relations between implicit theories about motivation for studying, motivation regulation and effort differed both between the type of theories (implicit theories about extrinsic vs. intrinsic motivation) and specific strategies. Study 1 revealed that in line with the association with overall strategy use, implicit theories

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about extrinsic motivation for studying were not associated with an increased use of any of the individual strategies, whereas in Study 2, they were related to a more frequent use of three strategies (enhancement of situational interest, proximal goal setting, and environmental control). In both studies, implicit theories about intrinsic motivation were directly related to the use of some, but not all strategies, namely enhancement of personal significance, enhancement of situational interest, and environmental control in Study 1, but mastery self-talk and proximal goal setting (although the latter negatively) in Study 2. These findings are surprising in three regards. First, direct associations were only present with some, but not all strategies. This, however, is in line with findings from other domains of implicit theories (e.g., Kneeland et al., 2016). Second, there were relations with different strategies in the two studies and there was no consistent pattern in associations between implicit theories about intrinsic vs. extrinsic motivation. Since the two studies are not directly comparable due to the inclusion of items on personal implicit theories in Study 2, these findings should be examined further in future research. It may, however, also indicate that in general, strategies may be used more frequently by learners who believe both intrinsic and extrinsic motivation is malleable, but the selection of specific strategies only weakly depends on learners' beliefs about the malleability of their motivation for studying. Rather, strategies may be selected depending on situational and task demands, the specific motivational problem, or regulatory aims (cf. Engelschalk et al., 2015). This question can more adequately be addressed by analysing motivation regulation processes in a specific learning episode as opposed to aggregated across learning situations.

Third, this pattern implies that incremental theories about motivation for studying are only inconsistently directly linked to individual motivation regulation strategies and thus indirectly to effort expenditure for studying. However, in all these effects it was controlled for the impact of self-efficacy beliefs about motivation regulation as an important facilitator for actually implementing strategies. At the level of individual motivation regulation strategies,

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too, self-efficacy for motivation regulation evolved as significant mediator between implicit theories about extrinsic motivation and motivation regulation and effort. The extended indirect effect on to effort invested into studying was only significant via some strategies, most likely due to the weak or missing effects of the remaining strategies on effort, which is in line with previous findings (Authors, 2017; Authors, 2012). Since implicit theories about intrinsic motivation for studying were not related to self-efficacy for motivation regulation, there were no indirect effects in both studies.

Overall, contrary to hypothesis 3, implicit theories about motivation for studying were not consistently and directly associated with specific motivation regulation strategies.

However, especially implicit theories about extrinsic motivation showed a consistent indirect relation to effort invested into studying via self-efficacy for motivation regulation.

Apparently, especially learners believing that the utility and personal relevance a task has to them is malleable also showed higher confidence in their ability to regulate their motivation and thus used strategies more often, leading to enhanced effort expenditure for studying. In line with previous research (Authors, 2020), the belief in one's ability to effectively regulate one's motivation for studying seems crucial for effective motivation regulation and learners holding incremental theories about motivation are more likely to sustain high self-efficacy beliefs (cf. Wood & Bandura, 1989, Taberero & Wood, 1999).

4.4 Delineation to Implicit Theories about Other Dispositions

In line with hypothesis 3, implicit theories about motivation alone predicted self-efficacy for motivation regulation, strategy use, and effort expenditure for studying; implicit theories about intelligence and emotions were not related to any variables of the motivation regulation process. Implicit theories about dispositional interests were related to motivation regulation strategy use, but not to effort or self-efficacy for motivation regulation. This is in line with theoretical suggestions and findings that self-regulation plays a crucial role in dispositional interest development besides environmental aspects triggering situational

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interest (Linnenbrink-García et al., 2010, O’Keefe et al., 2018, Sansone & Thoman, 2005).

Overall, the findings support the idea that to understand and promote motivation regulation in learning and achievement contexts, individual beliefs specific to the domain of motivation for studying are more useful than rather global dispositions and beliefs (Baranik et al., 2010).

4.5 Personal vs. General Implicit Theories about Motivation for Studying

Personal and general implicit theories about motivation for studying were not separable in confirmatory factor analyses. This stands in contrast to hypothesis 4 and previous findings of two distinguishable constructs (e.g., de Castella & Byrne, 2015; de Castella et al., 2013). However, previous studies either did not report evidence of factorial validity (e.g., factor analyses, de Castella et al., 2013) or no results of models separating the proposed content factors as well as personal vs. general theories (de Castella & Byrne, 2015).

Potentially, this lack of differentiation reflects that in colloquial German, it is common to speak about personal experiences as “one’s experiences in general” as opposed to “I”-statements (e.g., “one cannot change how interesting a lecture is” vs. “I cannot change how interesting the lecture is”). Although the scales were presented separately and instructions explicitly pointed out this difference, they essentially might have meant the same for participants. Future research may therefore highlight these differences more strongly in the items and instructions both visually and linguistically.

4.6 Summary and Practical Implications

In sum, implicit theories about motivation for studying are associated with more adaptive motivational self-regulation and effort for studying beyond implicit theories about other attributes and experiences. However, they are associated with these mainly indirectly via stronger self-efficacy beliefs for regulating one’s motivation in boring or difficult learning situations. This implies that implicit theories about motivation are a useful cognition to be targeted in interventions alongside self-efficacy beliefs and regulatory strategies. Further, a domain-specific consideration of these lay theories seems more promising to explain

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interindividual differences in motivation regulatory behaviour and success in learning and achievement contexts.

4.7 Limitations and Further Research

Longitudinal, experimental, and intervention studies examining the causal order of effects of implicit theories on the motivation regulation process are needed to support the present cross-sectional results. Additionally, behavioural measures of motivation regulation and effort expenditure in experiments may be more informative of actual regulatory behaviour and success as opposed to self-reported behaviour. Implicit theories about motivation may vary between specific facets of motivation beyond intrinsic and extrinsic aspects, such as perceived costs (Barron & Hulleman, 2015), and they may be domain-specific similar to implicit theories about emotions (e.g., about emotions in general about specific emotions, Schroder et al., 2016), and about interest (Thoman et al., 2020) and may thus not generalize easily. Moreover, the type of implicit theory learners hold may depend on attributions of the cause of motivational problems in specific situations (Authors, 2012). In line with this, Engelschalk et al. (2015) found that students reported higher regulatory success for motivational problems due to low success expectancies than due to low task value. This domain- and situation-specificity depending on attributional patterns should be examined in future research. Furthermore, the development of implicit theories in younger learners who are still developing differentiated attitudes toward learning (Wigfield & Eccles, 1992) can provide insights into how learners come to believe whether (or not) motivation is malleable. Finally, beyond strategy use, the process of self-regulation involves goal setting and monitoring (Burnette et al., 2013; Carver & Scheier, 1998). Similarly, outcomes of the motivation regulation process are broader than effort (e.g., achievement, Authors, 2009, well-being, Grunschel et al., 2016, and procrastination, Baulke et al., 2018). Future research should examine effects of implicit theories about motivation for studying on broader outcomes.

5. Conclusion

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In conclusion, the current study provides evidence that implicit theories are transferable to the domain of learning and achievement motivation. Incremental theories are associated with more motivation regulation strategy use, but they do so rather indirectly via enhancing self-efficacy beliefs for motivation regulation. Causal effects of individual and malleable dispositions more specific to motivation regulation and their effects on self-regulated learning should be more closely examined in future research and may provide a fruitful extension for individualized interventions promoting motivation regulation and self-regulated learning.

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IMPLICIT THEORIES ABOUT MOTIVATION

Table 1

Constructs and operationalisations for Studies 1 and 2

construct	origin	sample item	# items	scale [†]	studies
implicit theories about intrinsic motivation	self-constructed	“If you don't feel like studying, there is nothing you can do about it.”	4 [§]	1 (completely disagree) to 5 (fully agree)	1, 2
implicit theories about extrinsic motivation	self-constructed	“You cannot influence how useful the material you are studying is for your life.”	4 [§]	1 (completely disagree) to 5 (fully agree)	1, 2
personal implicit theories about motivation	self-constructed	“If I don't feel like studying, there is nothing I can do about it.” / “I cannot influence how useful the material I am studying is for your life.”	8 [§]	1 (completely disagree) to 5 (fully agree)	2
self-efficacy MR	Authors (2020)	“When I don't feel like studying, I usually find a way to make my work more interesting.”	5	1 (completely disagree) to 5 (fully agree)	1, 2
motivation regulation strategy use	Authors (2007)		30	1 (never/very rarely) to 5 (very often)	1, 2
mastery self-talk		“I persuade myself to keep studying to see how much I can probably learn.”	4		1, 2
performance-approach self-talk		“I make myself aware of the importance of getting good grades.”	5		1, 2
performance-avoidance self-talk		“I imagine my fellow students making fun of my poor performance.”	3		1, 2
enhancement of personal significance		“I look for connections between the task material and my life.”	3		1, 2
enhancement of situational interest		“I'm thinking of a way to make the work more entertaining.”	5		1, 2
environmental control		“Before I start working, I make an effort to eliminate all possible distractions.”	3		1, 2
proximal goal setting		“I tell myself that I can accomplish the tasks if I set subgoals.”	3		1, 2
self-consequating		“I set myself up for some kind of reward when I get the work done.”	4		1, 2

IMPLICIT THEORIES ABOUT MOTIVATION

effort	Wild & Schiefele (1994)	“If I have to, I even study late at night and on weekends.”	8	1 (never/very rarely) to 5 (very often)	1, 2
implicit theories about effort	Spinath & Schöne (2003)	“Everyone has a certain ability to put effort into something which”	4	1 (cannot be changed) to 5 (can be changed)	1
implicit theories about intelligence	Spinath (1998) [‡]	“No matter how much intelligence you have, you can always change it quite a bit.”	6	1 (completely disagree) to 5 (fully agree)	1
implicit theories about interest	O’Keefe et al. (2018)	“Even if you have very strong interests, they can change dramatically.”	4	1 (completely disagree) to 5 (fully agree)	1
implicit theories about emotions.	Tamir et al. (2007)	“If they want to, people can change the emotions that they have.”	4	1 (completely disagree) to 5 (fully agree)	1

Note. ‡ German version of Dweck et al. (1995) and Dweck (1999); § after factor analyses, one item from each the intrinsic and extrinsic scale were excluded due to low factor loadings, resulting in 3 items per subscale and overall 6 for personal theories accordingly.

IMPLICIT THEORIES ABOUT MOTIVATION

Table 2

Results from confirmatory factor analyses.

<i>Model</i>	χ^2 [df]; <i>p</i>	<i>CFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>SRMR</i>
<i>Study 1</i>					
1 one factor IT motivation	55.376 [20]; <i>p</i> < .001	0.851	0.792	0.097	0.059
2 intrinsic/extrinsic IT	35.677 [19]; <i>p</i> = .012	0.930	0.897	0.068	0.053
3 intrinsic/extrinsic IT, 6 items	36.453 [24]; <i>p</i> = .050	0.962	0.943	0.053	0.049
<i>Study 2</i>					
1 four factor model †	181.083 [90]; <i>p</i> < .001	0.947	0.929	0.053	0.049
2 one factor model	261.660 [96]; <i>p</i> < .001	0.903	0.879	0.069	0.060
3 intrinsic/extrinsic IT	203.232 [95]; <i>p</i> < .001	0.937	0.920	0.056	0.050
4 intrinsic/extrinsic IT, 12 items	100.715 [47]; <i>p</i> < .001	0.958	0.940	0.056	0.048
5 model 4 + self-efficacy MR	207.532 [110]; <i>p</i> < .001	0.953	0.942	0.049	0.050

Note. *CFI* = comparative fit index, *TLI* = Tucker Lewis Index, *RMSEA* = root mean square error of approximation, *SRMR* = Standardized Root Mean Square Residual. Bold indicates the best fitting model. Study 1: random subsample of *n* = 188 participants. Model 1 included all eight items on one factor, model 2 separated intrinsic and extrinsic items into two factors. Item 1 was deleted from the extrinsic scale due to a factor loading of $\lambda = .435$; Item 2 was deleted from the intrinsic scale due to a factor loading of $\lambda = .327$; resulting in model 3, separating the intrinsic and extrinsic factor without these two items. Study 2: *N* = 365 participants. †This model showed a linear dependency and latent correlations close to 1 for the personal and self-theory scales for both intrinsic (*r* = .95) and extrinsic (*r* = .97) motivation.

IMPLICIT THEORIES ABOUT MOTIVATION

Table 3

Descriptive Statistics for variables involved in further analyses form Study 1

	<i>M</i>	<i>SD</i>	ω	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)
1) IT-M intrinsic	3.77	0.68	.63	1																
2) IT-M extrinsic	3.27	0.81	.65	.38**	1															
3) IT-M overall	3.52	0.63	.71	.75**	.88**	1														
4) IT effort	4.24	0.65	.76	.35**	.27**	.35**	1													
5) self-efficacy MR	3.17	0.76	.80	.13*	.16**	.17**	.26**	1												
6) MR overall	3.50	0.48	.79	.18**	.20**	.23**	.31**	.43**	1											
7) mastery self-talk	3.46	0.81	.72	.12*	.16**	.17**	.20**	.42**	.59**	1										
8) perf.-approach ST	3.84	0.92	.89	-.04	.02	-.02	.16**	.23**	.58**	.35**	1									
9) perf-avoidance ST	2.52	1.10	.80	-.08	.01	-.03	.02	-.10	.34**	.18**	.37**	1								
10) pers. significance	3.75	0.91	.87	.28**	.23**	.29**	.30**	.21**	.42**	.23**	-.03	-.07	1							
11) sit. interest	3.03	0.90	.87	.25**	.17**	.24**	.15**	.19**	.55**	.21**	-.02	.03	.42**	1						
12) environ. control	3.61	0.81	.74	.24**	.19**	.26**	.26**	.28**	.49**	.21**	.17**	-.05	.19**	.21**	1					
13) prox. goal setting	3.77	0.86	.83	.11*	.06	.10	.21**	.28**	.48**	.16**	.16**	-.11*	.18**	.27**	.26**	1				
14) self-consequating	3.98	0.93	.92	.06	.05	.06	.21**	.27**	.58**	.18**	.33**	-.03	.08	.15**	.33**	.40**	1			
15) effort	3.69	0.66	.80	-.01	.13*	.08	.24**	.63**	.49**	.37**	.45**	.03	.12*	.12*	.30**	.36**	.29**	1		
16) IT intelligence	3.03	0.86	.87	.17**	.19**	.21**	.19**	.00	.10	.09	.11*	.01	.10	.05	.05	-.01	.03	.07	1	
17) IT interest	3.08	0.34	.83	.01	.00	.00	-.02	-.08	.13*	.09	.06	.18**	.11*	.04	.03	.02	.02	-.08	-.09	1
18) IT emotions.	3.57	0.89	.84	.21**	.22**	.25**	.32**	.07	.09	.02	-.05	-.09	.17**	.07	.13*	.13*	.11*	.05	.07	-.03

Note. IT-M = incremental theory about motivation; IT = incremental theory, MR = motivation regulation; ST = self-talk, perf. = performance, sit. interest = enhancement of situational interest; environ. control = environmental control; prox. goal setting = proximal goal setting; Spearman Correlations. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Table 4

Indirect Effects of Implicit Theories and Self-Efficacy for Motivation Regulation on Motivation Regulation and Effort Expenditure Study 1

Indirect effect	<i>Study 1</i>		<i>Study 2</i>	
	β	95% CI	β	95% CI
IPTM_I → SE MR → MR	.02	[-.03, .06]	.05	[-.01, .11]
IPTM_E → SE MR → MR	.06	[.02, .12]	.13	[.07, .20]
IPTM_I → MR → E	.03	[.00, .06]	-.00	[-.05, .05]
IPTM_E → MR → E	.03	[-.00, .05]	.07	[.01, .12]
IPTM_I → SE MR → E	.03	[-.04, .10]	.05	[-.01, .10]
IPTM_E → SE MR → E	.10	[.03, .17]	.13	[.07, .19]
IPTM_I → SE MR → MR → E	.01	[-.01, .02]	.02	[-.00, .04]
IPTM_E → SE MR → MR → E	.02	[.00, .03]	.06	[.03, .09]
IPTM_I → E total	.07	[-.02, .15]	.07	[-.02, .16]
IPTM_E → E total	.14	[.05, .23]	.26	[.16, .35]
SE MR → MR → E	.10	[.06, .14]	.18	[.12, .23]

Note. IPTM_I = implicit theories about intrinsic motivation; IPTM_E = implicit theories about extrinsic motivation; SE MR = self-efficacy for motivation regulation; MR = motivation regulation strategy use; E = effort expenditure; CI = confidence interval. Standardized coefficients are reported; estimator = robust maximum likelihood.

IMPLICIT THEORIES ABOUT MOTIVATION

Table 5

Descriptive Statistics for variables involved in further analyses for Study 2

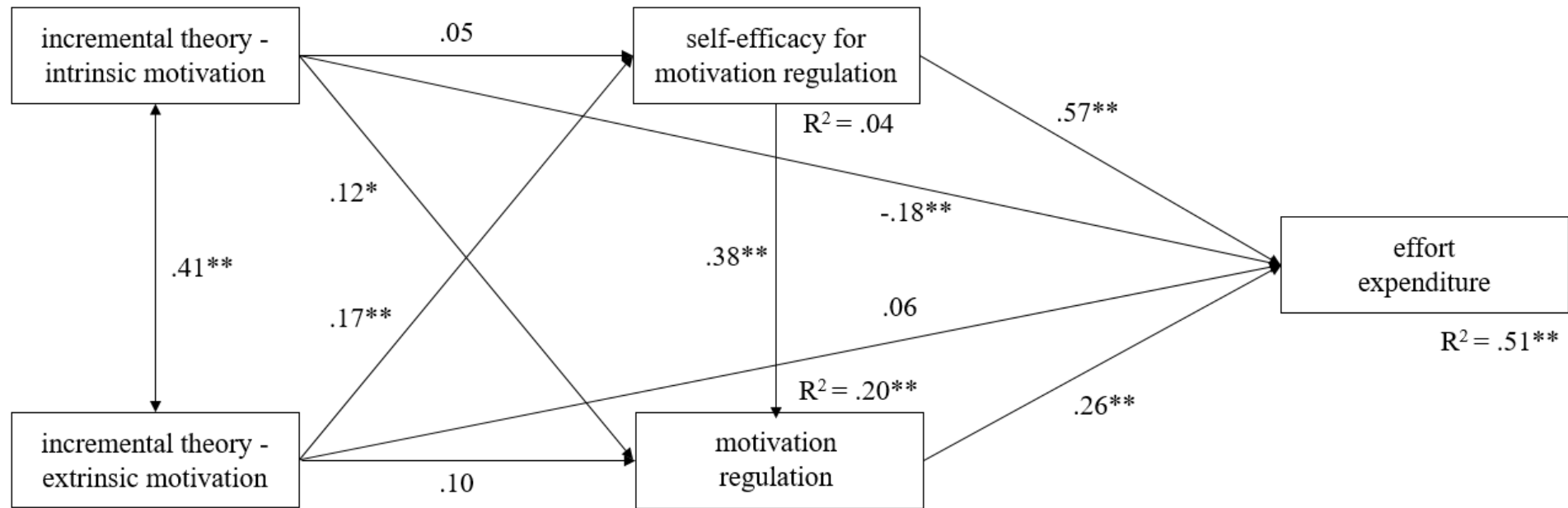
	<i>M</i>	<i>SD</i>	ω	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)
1) IT-M intrinsic	3.32	0.75	.79	1												
2) IT-M extrinsic	3.68	0.71	.82	.57**	1											
3) self-efficacy MR	3.11	0.55	.87	.30**	.38**	1										
4) MR overall	3.37	0.53	.89	.21**	.32**	.48**	1									
5) mastery self-talk	3.23	0.93	.84	.27**	.27**	.43**	.74**	1								
6) perf.-approach ST	3.86	0.88	.89	.02	.08	.25**	.58**	.36**	1							
7) perf-avoidance ST	2.45	1.08	.83	-.06	-.10	-.10	.28**	.06	.41**	1						
8) pers. significance	3.48	0.92	.87	.20**	.24**	.32**	.61**	.44**	.15**	-.02	1					
9) sit. interest	2.79	0.84	.88	.24**	.38**	.35**	.67**	.46**	.04	-.04	.51**	1				
10) environ. control	3.48	0.76	.78	.22**	.32**	.41**	.62**	.45**	.15**	-.08	.36**	.41**	1			
11) prox. goal setting	3.63	0.86	.86	.02	.20**	.37**	.61**	.32**	.13*	-.08	.31**	.47**	.43**	1		
12) self-consequating	3.92	0.91	.92	.09	.16**	.28**	.63**	.35**	.24**	-.05	.26**	.28**	.43**	.48**	1	
13) effort	3.76	0.69	.83	.19**	.29**	.61**	.62**	.54**	.47**	-.01	.30**	.36**	.47**	.40**	.37**	1

Note. IT-M = incremental theory about motivation; IT = incremental theory, MR = motivation regulation; ST = self-talk, perf. = performance, sit. interest = enhancement of situational interest; environ. control = environmental control; prox. goal setting = proximal goal setting; Spearman Correlations. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 1

Path model examining the relations between implicit theories, motivation regulation, and effort (Study 1)

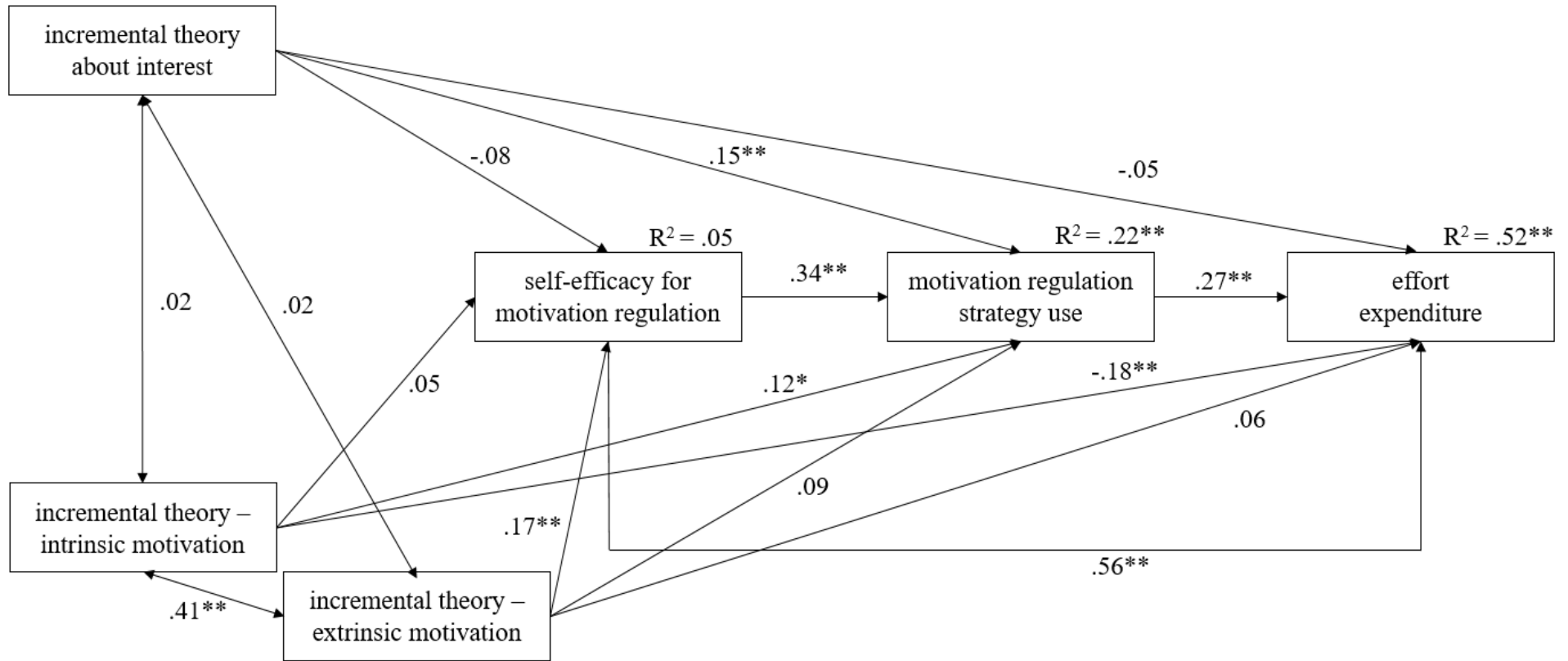


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 2

Path model examining the relations of implicit theories on motivation regulation and effort beyond implicit theories about interest (Study 1)

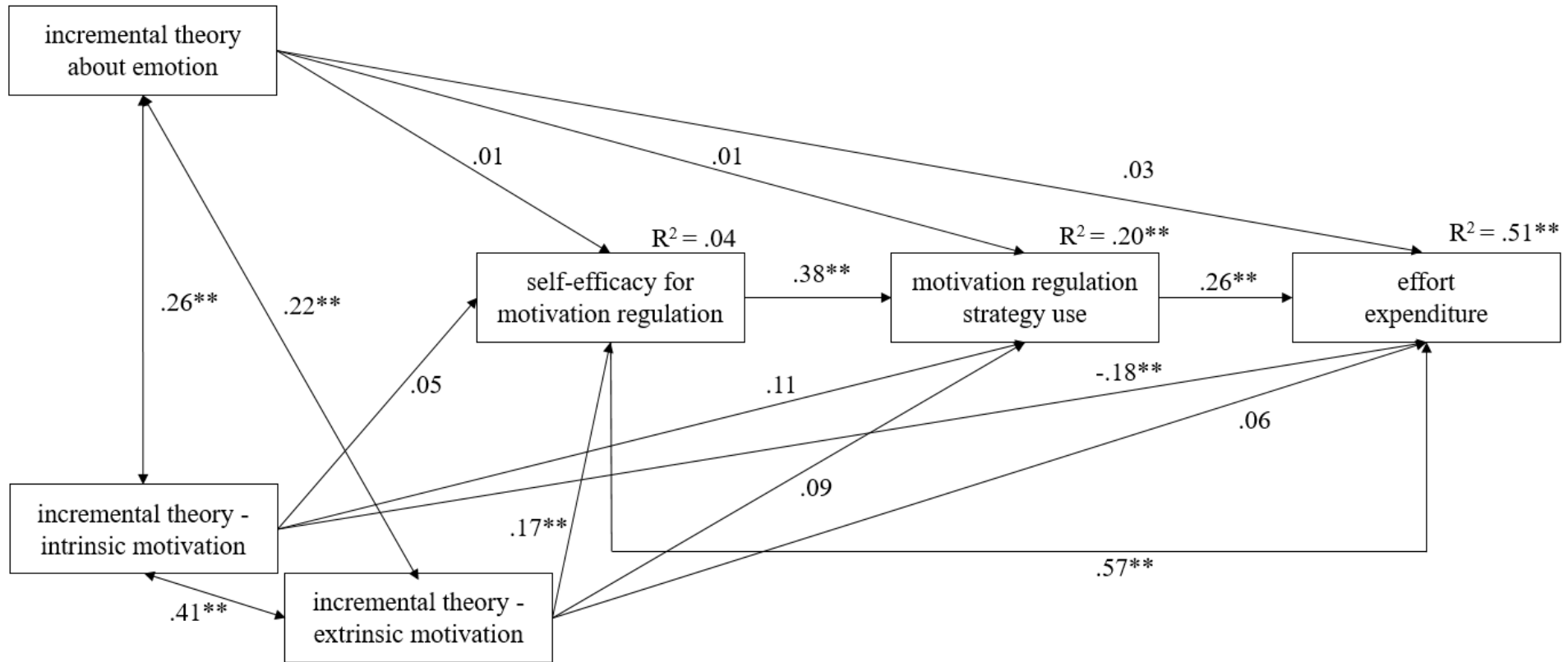


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 3

Path model examining the relations of implicit theories on motivation regulation and effort beyond implicit theories about emotion (Study 1)

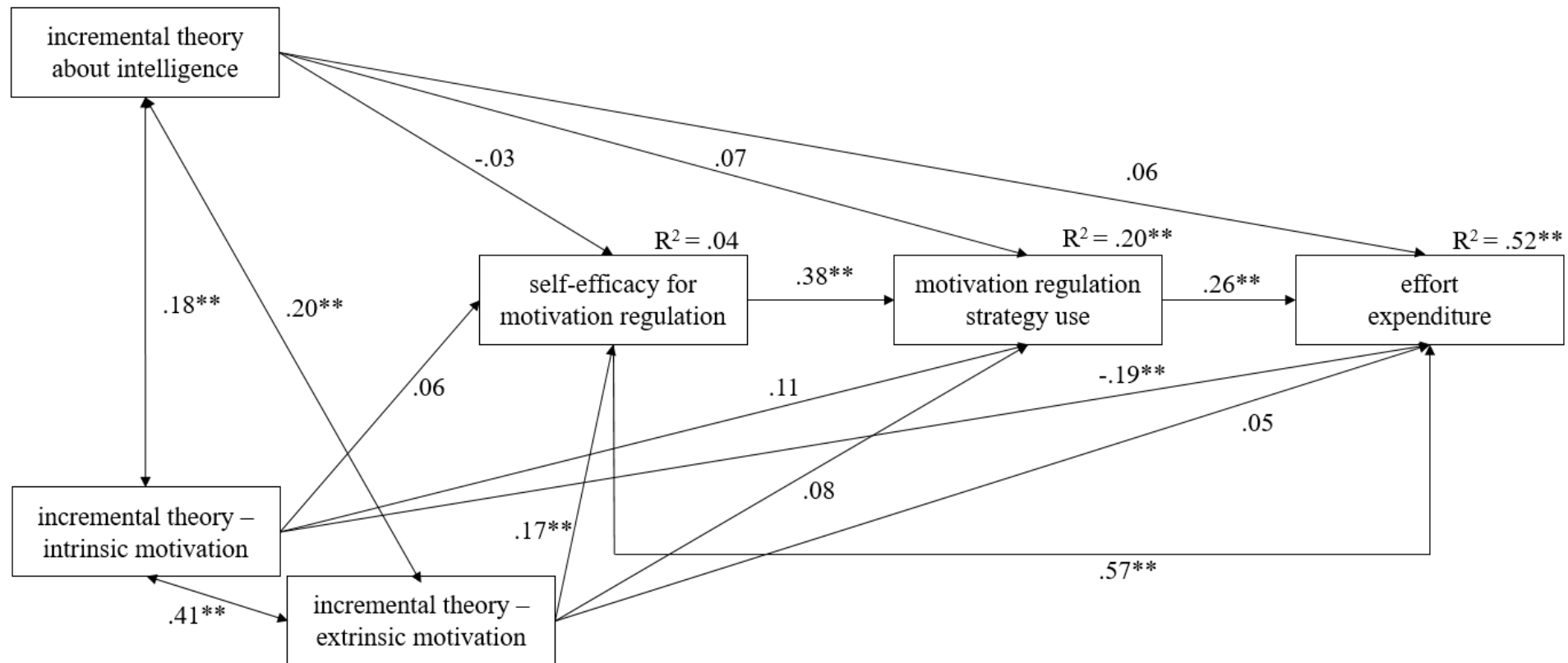


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 4

Path model examining the relations of implicit theories on motivation regulation and effort beyond implicit theories about intelligence (Study 1)

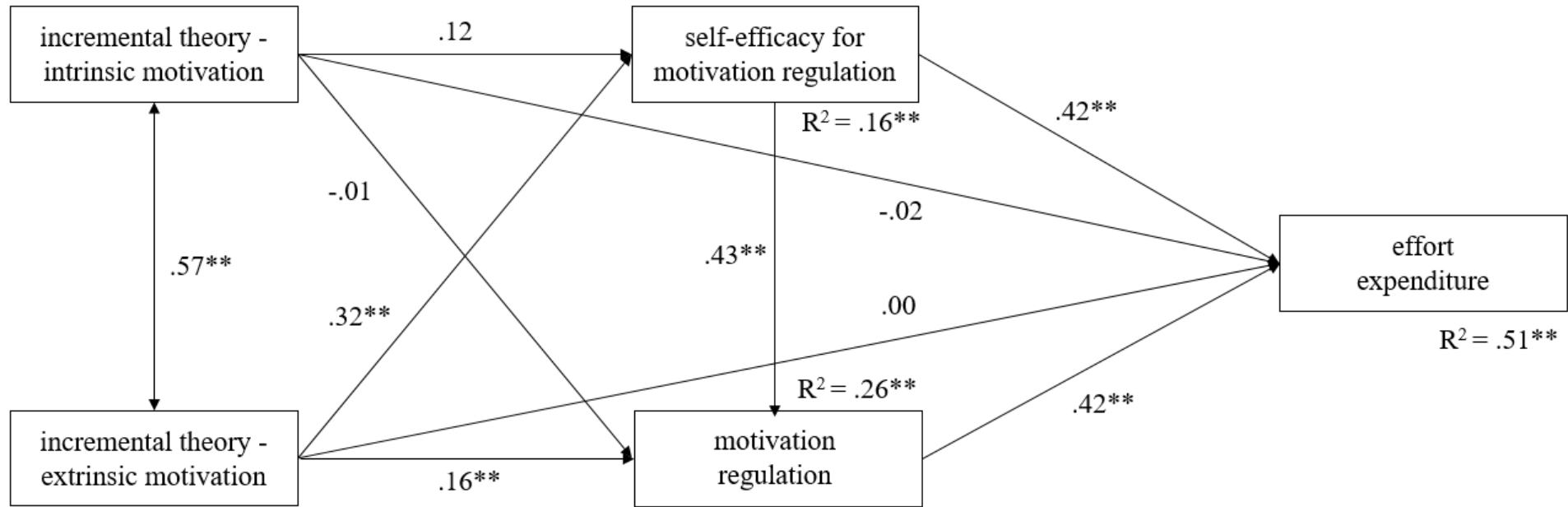


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 5

Path model examining the relations between implicit theories, motivation regulation, and effort (Study 2)



Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

Electronic Supplement Material

Content:

- pp. 2-3: ESM Table 1: Indirect effects of implicit theories and Self-Efficacy for Motivation Regulation on Motivation Regulation Strategies and Effort (Study 1)
- pp. 4-5: ESM Table 2: Indirect effects of implicit theories and Self-Efficacy for Motivation Regulation on Motivation Regulation Strategies and Effort (Study 2)
- pp. 6-13: ESM Figures 1-8: Path models containing specific motivation regulation strategies from Study 1
- pp. 14-21: ESM Figures 9-16: Path models specific motivation regulation strategies from Study 2

IMPLICIT THEORIES ABOUT MOTIVATION

Table 1

Indirect Effects of Implicit Theories and Self-Efficacy for Motivation Regulation on Motivation Regulation Strategies and Effort (Study 1)

Indirect effect	β	95% CI	β	95% CI	β	95% CI
	performance avoidance self-talk		environmental control		mastery self-talk	
IPTM_I → SE MR → MR	-.01	[-.02, .01]	.01	[-.02, .04]	.03	[-.02, .08]
IPTM_E → SE MR → MR	-.02	[-.03, .01]	.04	[.01, .08]	.07	[.02, .13]
IPTM_I → MR → E	-.01	[-.02, .00]	.03	[.01, .05]	.01	[-.01, .02]
IPTM_E → MR → E	.01	[-.00, .02]	.01	[-.01, .03]	.01	[-.01, .03]
IPTM_I → SE MR → E	.04	[-.04, .12]	.03	[-.04, .11]	.04	[-.03, .11]
IPTM_E → SE MR → E	.11	[.03, .20]	.11	[.03, .19]	.10	[.02, .18]
IPTM_I → SE MR → MR → E	.00	[-.00, .00]	.00	[-.00, .01]	.00	[-.00, .01]
IPTM_E → SE MR → MR → E	-.00	[-.00, .00]	.01	[.00, .01]	.01	[-.00, .02]
IPTM_I → E total	.03	[-.05, .11]	.07	[-.02, .15]	.05	[-.03, .02]
IPTM_E → E total	.12	[.03, .21]	.13	[.04, .21]	.12	[.03, .21]
SE MR → MR → E	-.01	[-.02, .00]	.04	[.01, .07]	.06	[.02, .10]
	pers. significance enhancement		self-consequating		performance approach self-talk	
IPTM_I → SE MR → MR	.01	[-.01, .03]	.01	[-.02, .04]	.01	[-.02, .05]
IPTM_E → SE MR → MR	.03	[.01, .06]	.04	[.00, .07]	.08	[.03, .14]
IPTM_I → MR → E	-.00	[-.02, .01]	.00	[-.01, .02]	-.02	[-.05, .02]
IPTM_E → MR → E	-.00	[-.01, .01]	.00	[-.01, .02]	.01	[-.02, .03]
IPTM_I → SE MR → E	.04	[-.04, .12]	.03	[-.04, .11]	.03	[-.04, .10]
IPTM_E → SE MR → E	.11	[.03, .20]	.11	[.02, .19]	.10	[.02, .15]
IPTM_I → SE MR → MR → E	.00	[-.00, .00]	.00	[-.00, .01]	.00	[-.00, .01]
IPTM_E → SE MR → MR → E	-.00	[-.00, .00]	.00	[-.00, .01]	.01	[.00, .02]
IPTM_I → E total	.03	[-.05, .11]	.04	[-.04, .12]	.04	[-.06, .10]
IPTM_E → E total	.11	[.03, .20]	.11	[.03, .20]	.12	[.03, .18]
SE MR → MR → E	-.00	[-.02, .01]	.03	[.00, .05]	.06	[.03, .09]

IMPLICIT THEORIES ABOUT MOTIVATION

	sit. interest enhancement		proximal goal setting	
IPTM_I → SE MR → MR	.01	[-.01, .03]	.01	[-.02, .05]
IPTM_E → SE MR → MR	.03	[.00, .06]	.05	[.01, .10]
IPTM_I → MR → E	.00	[-.01, .02]	.01	[-.01, .03]
IPTM_E → MR → E	.00	[-.00, .01]	-.01	[-.03, .01]
IPTM_I → SE MR → E	.03	[-.05, .11]	.03	[-.05, .10]
IPTM_E → SE MR → E	.09	[.03, .20]	.11	[.03, .19]
IPTM_I → SE MR → MR → E	.00	[-.00, .00]	.00	[-.00, .01]
IPTM_E → SE MR → MR → E	.00	[-.00, .00]	.01	[.00, .02]
IPTM_I → E total	.04	[-.04, .12]	.04	[-.04, .12]
IPTM_E → E total	.09	[.03, .20]	.11	[.02, .20]
SE MR → MR → E	.00	[-.01, .02]	.05	[.02, .09]

Note. IPTM_I = implicit theories about intrinsic motivation; IPTM_E = implicit theories about extrinsic motivation; SE MR = self-efficacy for motivation regulation; MR = motivation regulation strategy use; E = effort expenditure; CI = confidence interval. Standardized coefficients are reported; estimator = robust maximum likelihood.

IMPLICIT THEORIES ABOUT MOTIVATION

Table 2

Indirect Effects of Implicit Theories and Self-Efficacy for Motivation Regulation on Motivation Regulation Strategies and Effort (Study 2)

Indirect effect	β	95% CI	β	95% CI	β	95% CI
	performance avoidance self-talk		environmental control		mastery self-talk	
IPTM_I → SE MR → MR	-.01	[-.03, .01]	.04	[-.01, .09]	.04	[-.01, .09]
IPTM_E → SE MR → MR	-.02	[-.06, .02]	.11	[.05, .17]	.12	[.06, .18]
IPTM_I → MR → E	.00	[-.01, .01]	.00	[-.03, .03]	.05	[.00, .09]
IPTM_E → MR → E	-.00	[-.01, .01]	.05	[.01, .08]	.01	[-.03, .06]
IPTM_I → SE MR → E	.07	[-.01, .15]	.06	[-.01, .13]	.05	[-.01, .12]
IPTM_E → SE MR → E	.19	[.11, .27]	.16	[.09, .23]	.15	[.08, .21]
IPTM_I → SE MR → MR → E	-.00	[-.00, .00]	.01	[-.00, .02]	.02	[-.00, .03]
IPTM_E → SE MR → MR → E	-.00	[-.01, .00]	.03	[.01, .05]	.04	[.02, .06]
IPTM_I → E total	.07	[-.01, .15]	.07	[-.01, .16]	.12	[.03, .20]
IPTM_E → E total	.18	[.10, .27]	.24	[.14, .33]	.20	[.11, .29]
SE MR → MR → E	-.00	[-.01, .01]	.09	[.05, .13]	.13	[.08, .18]
	pers. significance enhancement		self-consequating		performance-approach self-talk	
IPTM_I → SE MR → MR	.03	[-.01, .07]	.03	[-.01, .07]	.03	[-.00, .07]
IPTM_E → SE MR → MR	.08	[.03, .14]	.09	[.03, .14]	.08	[.03, .14]
IPTM_I → MR → E	.01	[-.01, .02]	-.01	[-.04, .02]	.01	[-.07, .03]
IPTM_E → MR → E	.01	[-.01, .03]	.02	[-.01, .05]	-.02	[-.04, .05]
IPTM_I → SE MR → E	.07	[-.01, .14]	.06	[-.01, .13]	.16	[-.01, .13]
IPTM_E → SE MR → E	.18	[.10, .26]	.17	[.09, .25]	.06	[.09, .23]
IPTM_I → SE MR → MR → E	.00	[-.00, .01]	.01	[-.00, .02]	.03	[-.00, .02]
IPTM_E → SE MR → MR → E	.01	[.00, .02]	.02	[.00, .03]	.02	[.01, .05]
IPTM_I → E total	.08	[.00, .15]	.06	[-.03, .14]	.05	[-.04, .14]
IPTM_E → E total	.20	[.11, .28]	.21	[.11, .30]	.19	[.10, .29]
SE MR → MR → E	.03	[.00, .06]	.06	[.02, .09]	.09	[.04, .13]

IMPLICIT THEORIES ABOUT MOTIVATION

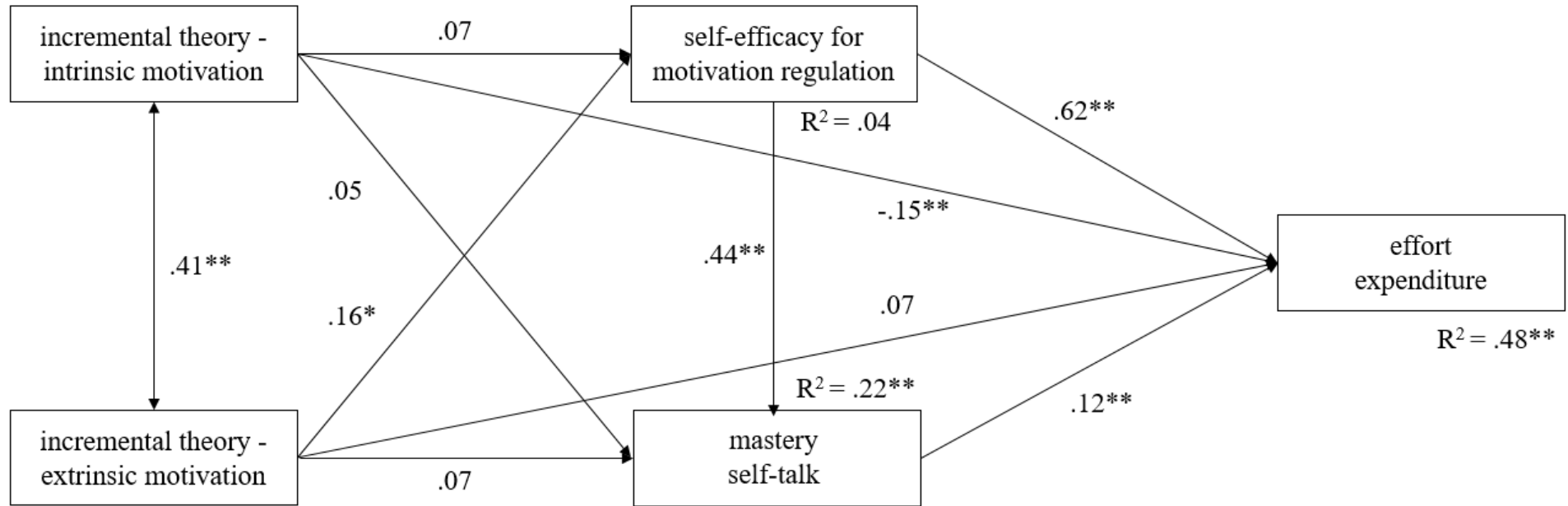
	sit. interest enhancement		proximal goal setting	
IPTM_I → SE MR → MR	.03	[-.01, .06]	.04	[-.01, .09]
IPTM_E → SE MR → MR	.08	[.03, .13]	.12	[.05, .18]
IPTM_I → MR → E	.00	[-.02, .02]	-.03	[-.06, -.00]
IPTM_E → MR → E	.04	[.01, .08]	.03	[.00, .06]
IPTM_I → SE MR → E	.06	[-.01, .14]	.06	[-.01, .13]
IPTM_E → SE MR → E	.18	[.10, .25]	.17	[.09, .24]
IPTM_I → SE MR → MR → E	.01	[-.00, .01]	.01	[-.00, .02]
IPTM_E → SE MR → MR → E	.01	[.00, .02]	.02	[.01, .04]
IPTM_I → E total	.07	[-.01, .15]	.04	[-.05, .12]
IPTM_E → E total	.23	[.15, .32]	.22	[.13, .31]
SE MR → MR → E	.04	[.01, .07]	.07	[.03, .11]

Note. IPTM_I = implicit theories about intrinsic motivation; IPTM_E = implicit theories about extrinsic motivation; SE MR = self-efficacy for motivation regulation; MR = motivation regulation strategy use; E = effort expenditure; CI = confidence interval. Standardized coefficients are reported; estimator = robust maximum likelihood.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 1

Path model with mastery self-talk (Study 1)

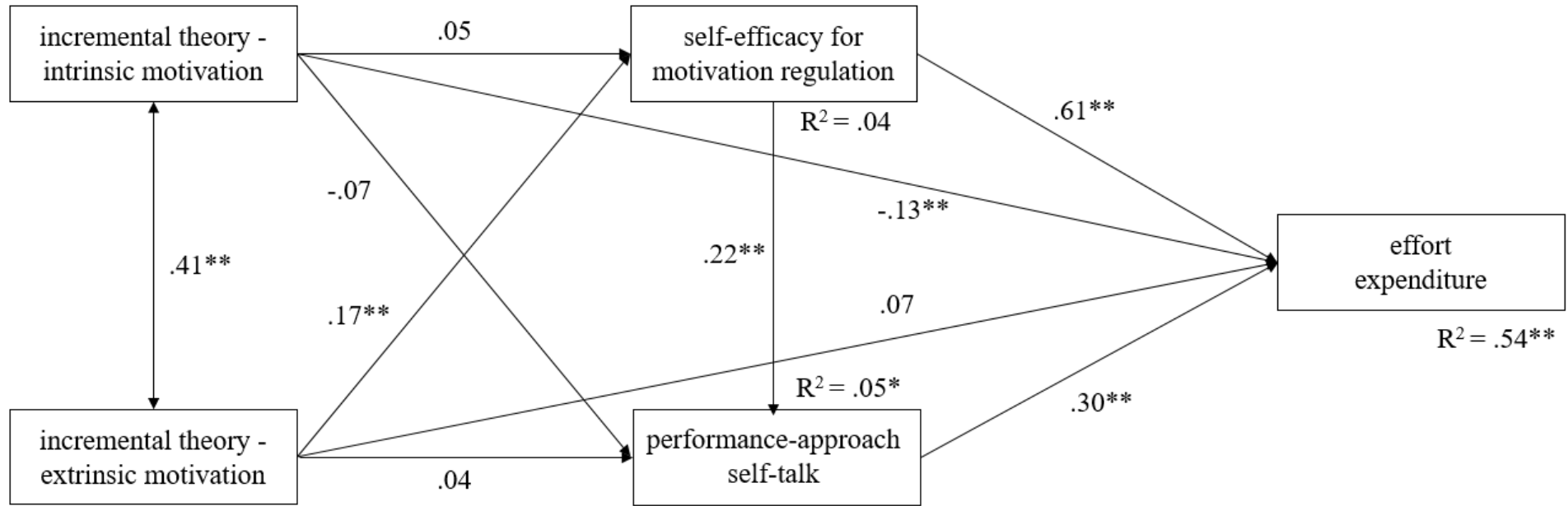


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 2

Path model with performance-approach self-talk (Study 1)

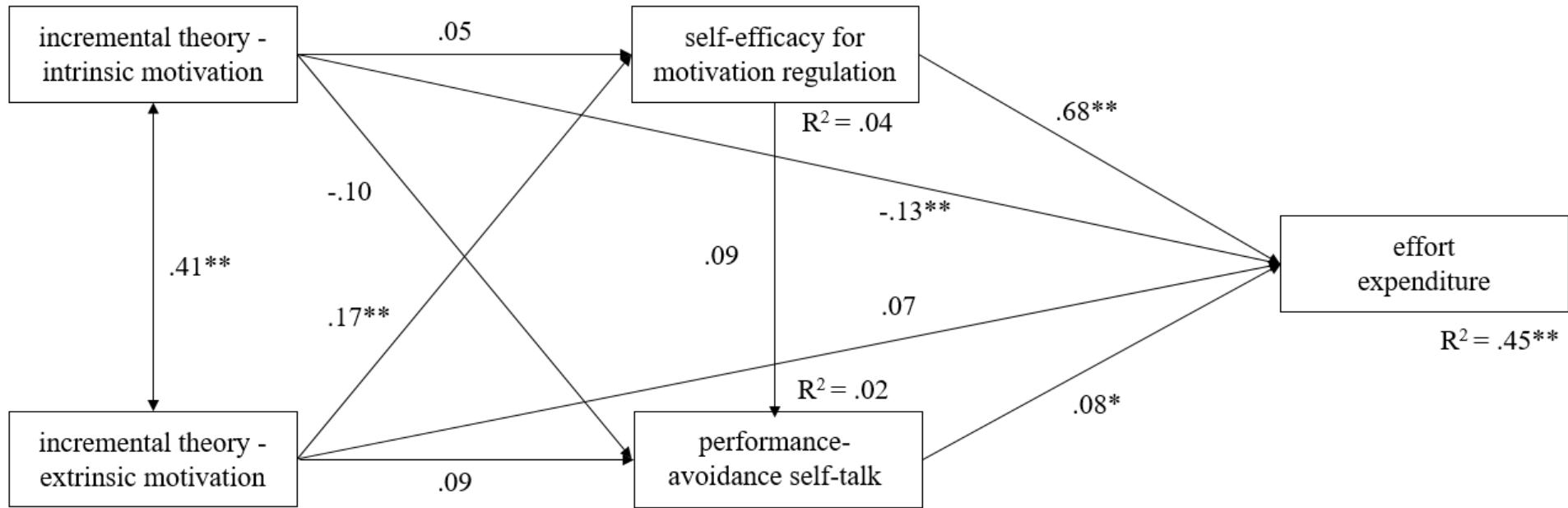


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 3

Path model with performance-avoidance self-talk (Study 1)

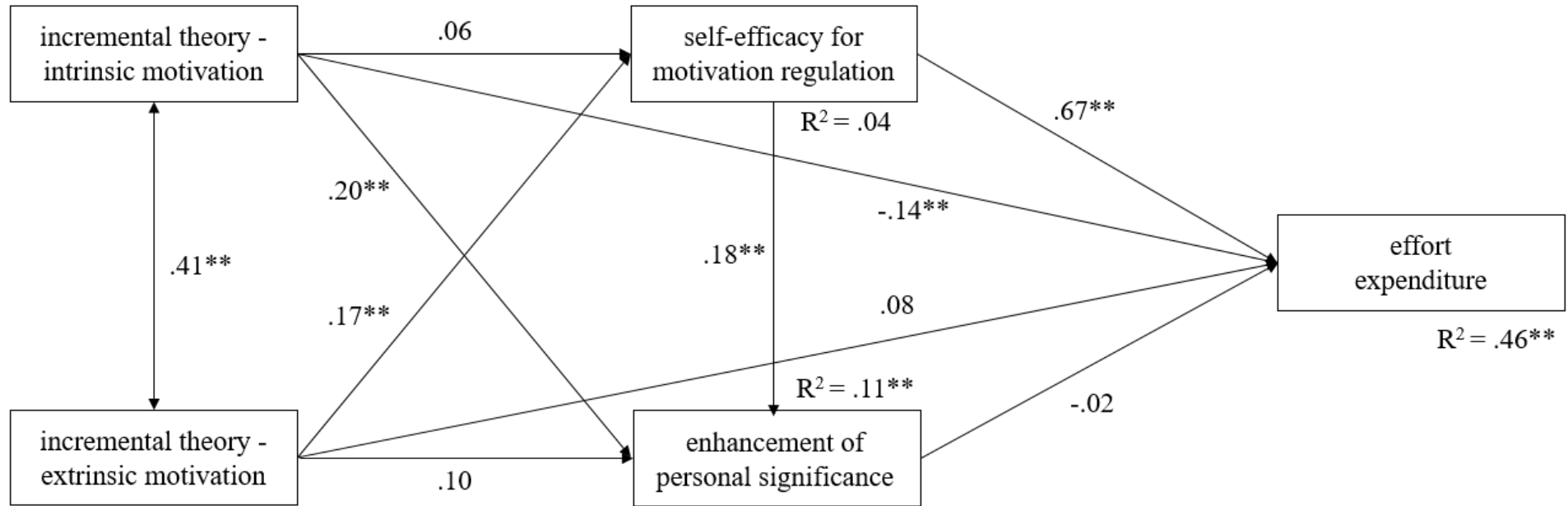


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 4

Path model with enhancement of personal significance (Study 1)

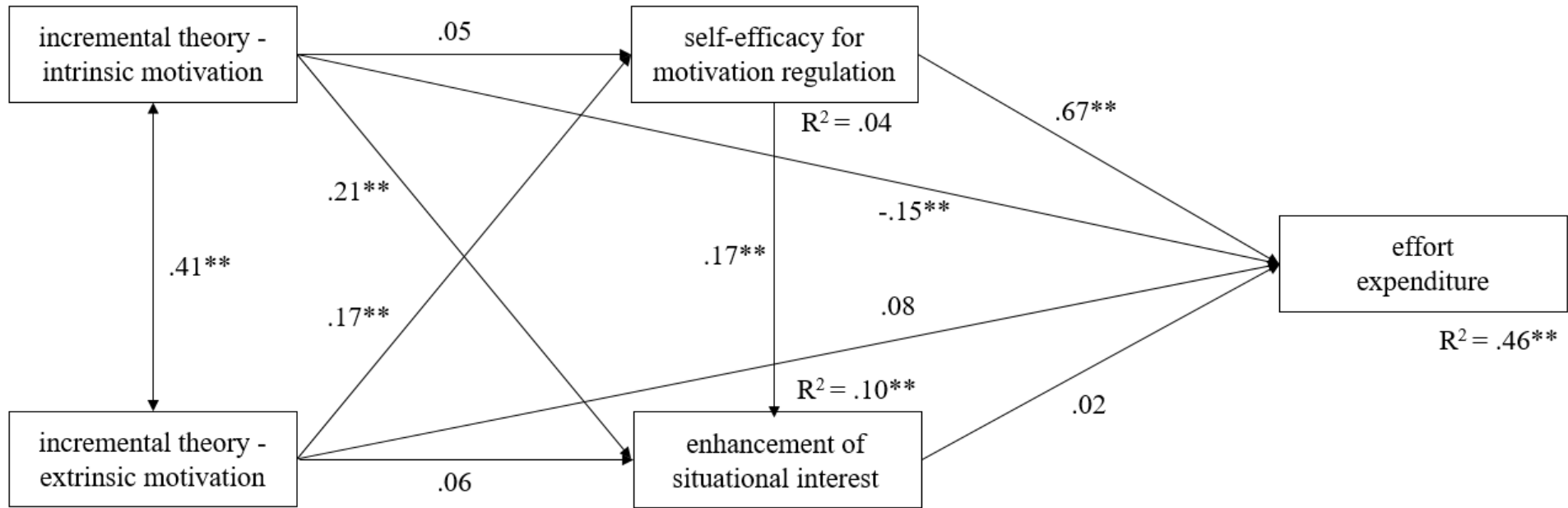


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 5

Path model with enhancement of situational interest (Study 1)

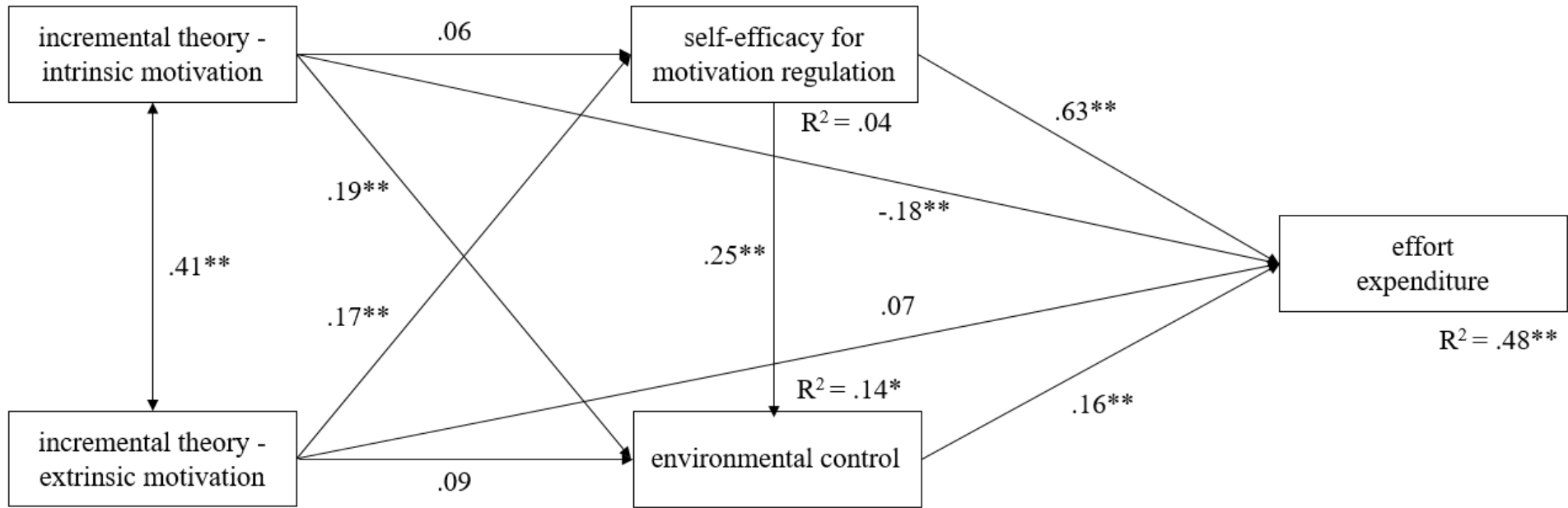


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 6

Path model with environmental control (Study 1)

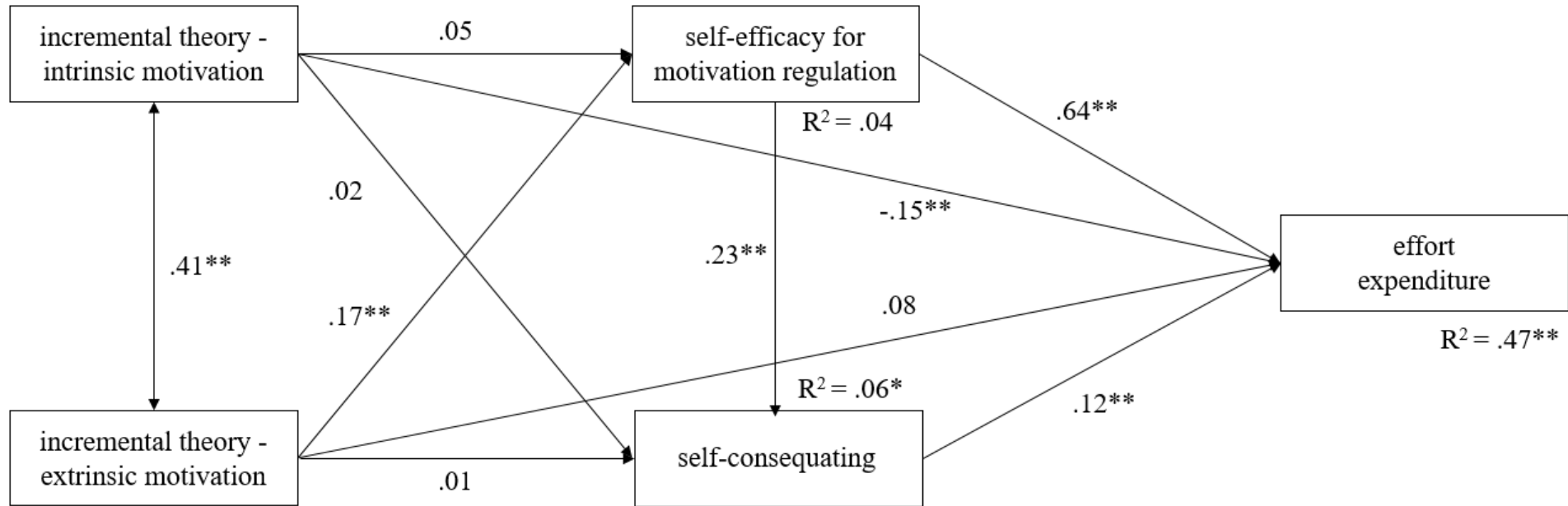


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 7

Path model with self-consequating (Study 1)

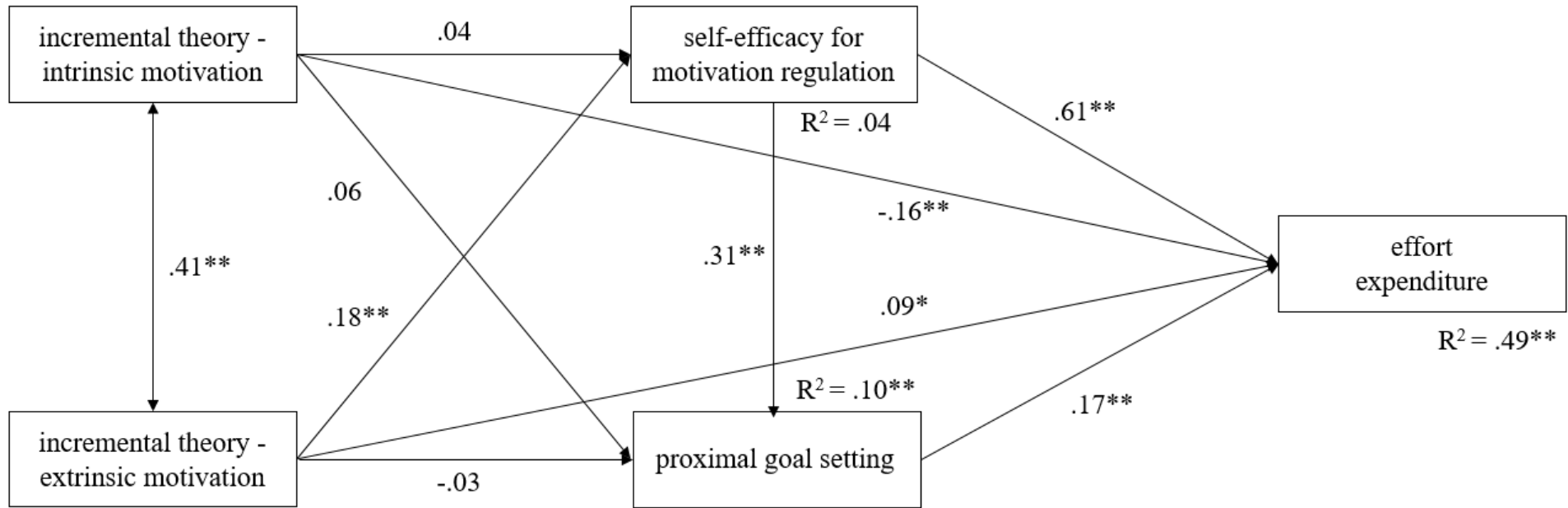


Note. Standardized coefficients are reported. Coefficients represent overall incremental theories/incremental theories about intrinsic motivation/incremental theories about extrinsic motivation. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 8

Path model with proximal goal setting (Study 1)

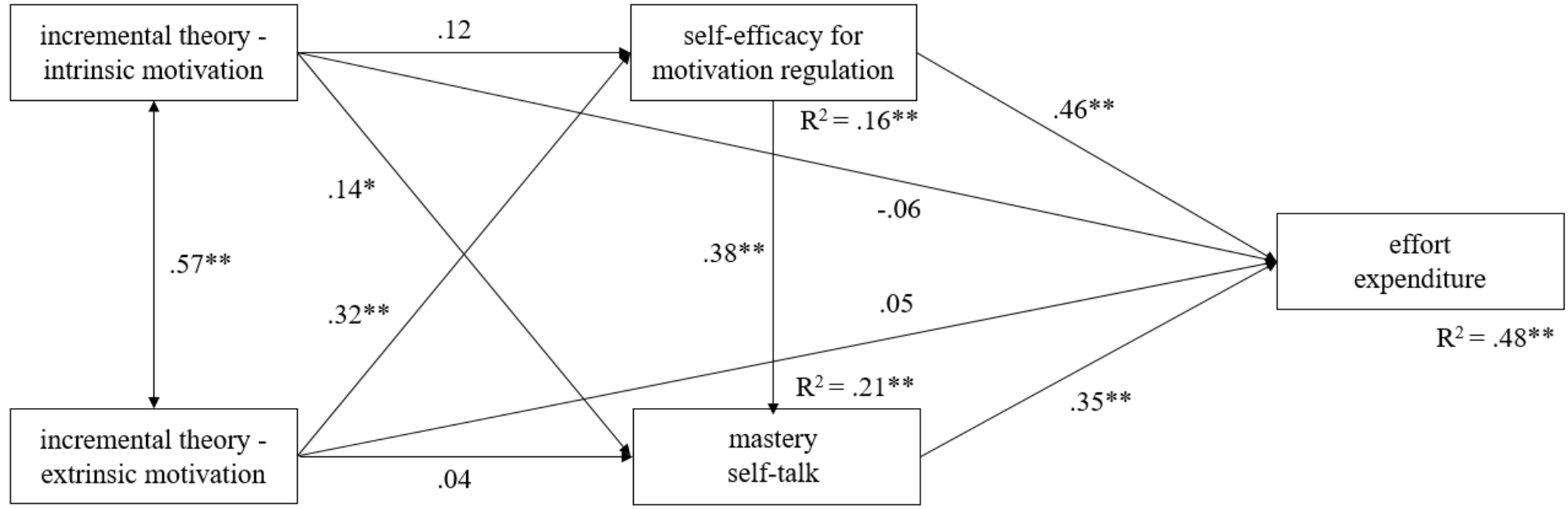


Note. Standardized coefficients are reported. Coefficients represent overall incremental theories/incremental theories about intrinsic motivation/incremental theories about extrinsic motivation. * $p < .05$; ** $p < .01$.

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Figure 9

Path model with mastery self-talk (Study 2)

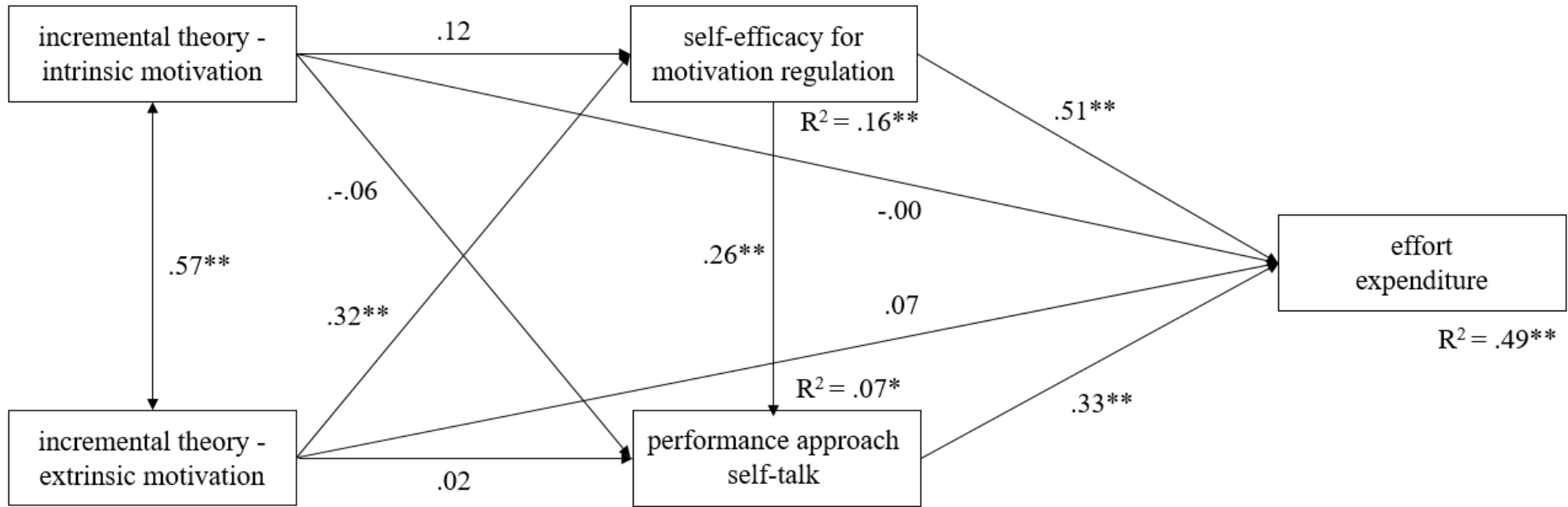


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 10

Path model with performance approach self-talk (Study 2)

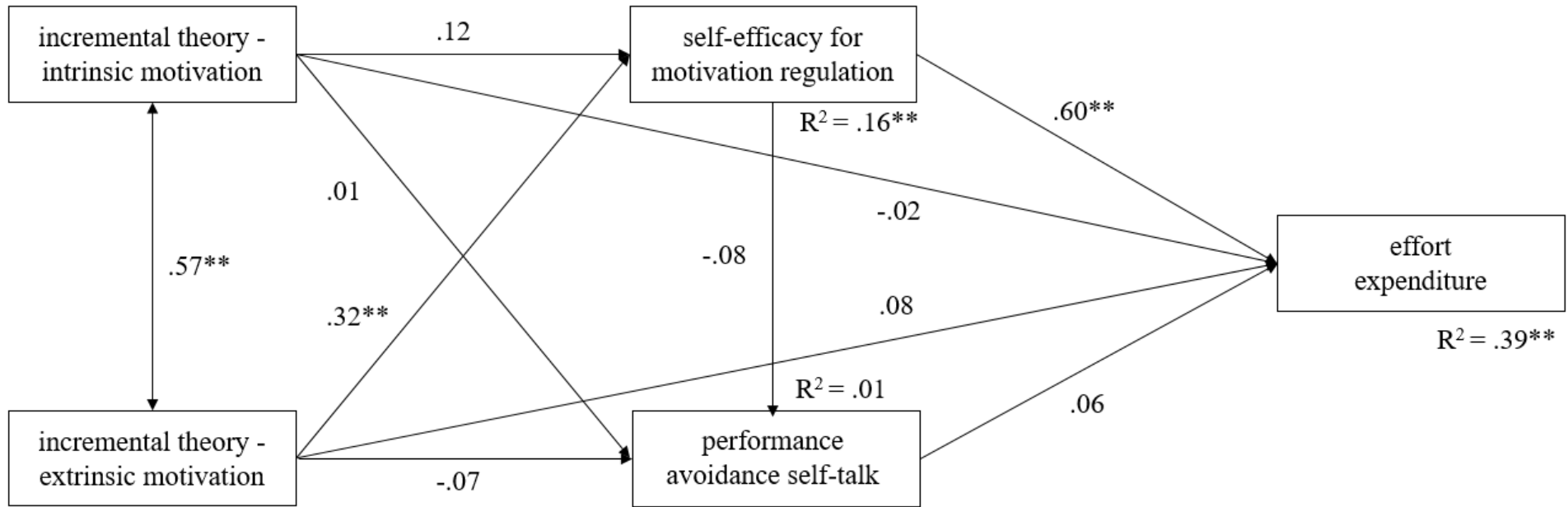


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

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Figure 11

Path model with performance avoidance self-talk (Study 2)

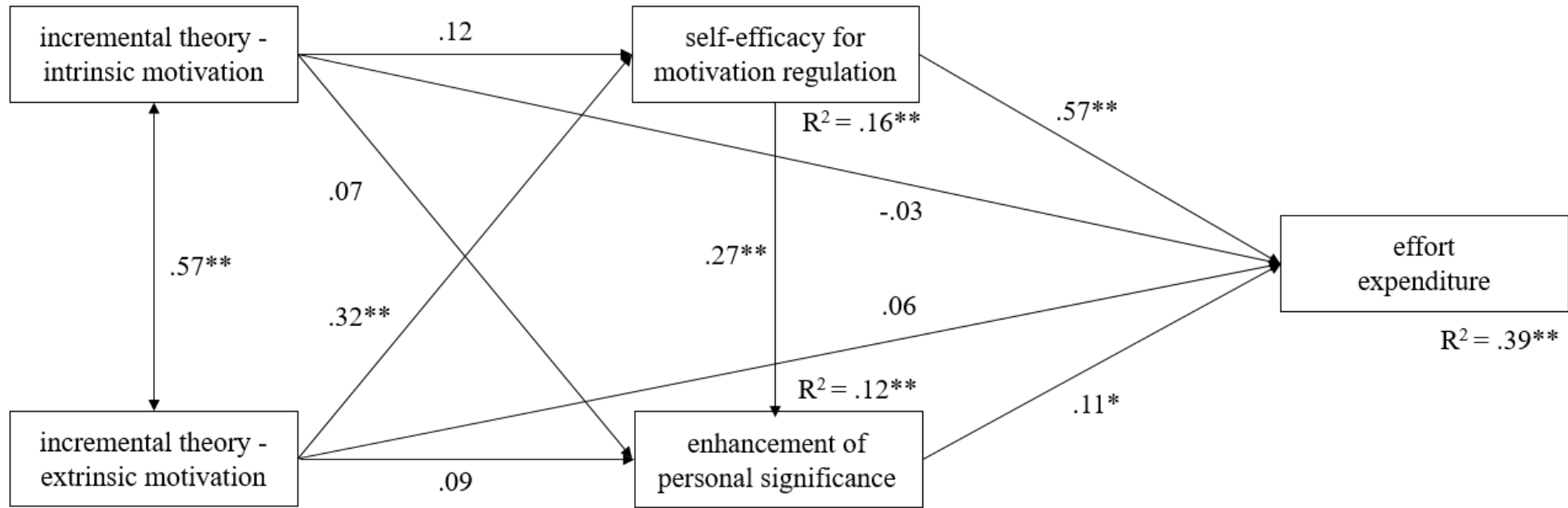


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

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Figure 12

Path model with enhancement of personal significance (Study 2)

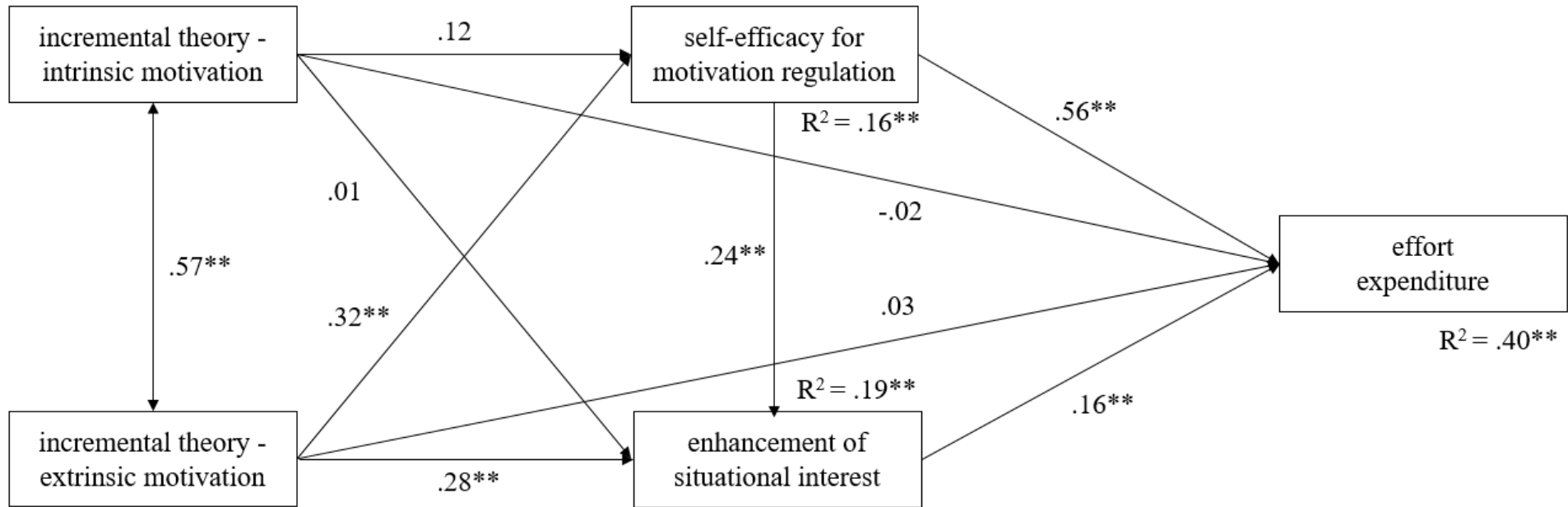


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

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Figure 13

Path model with enhancement of situational interest (Study 2)

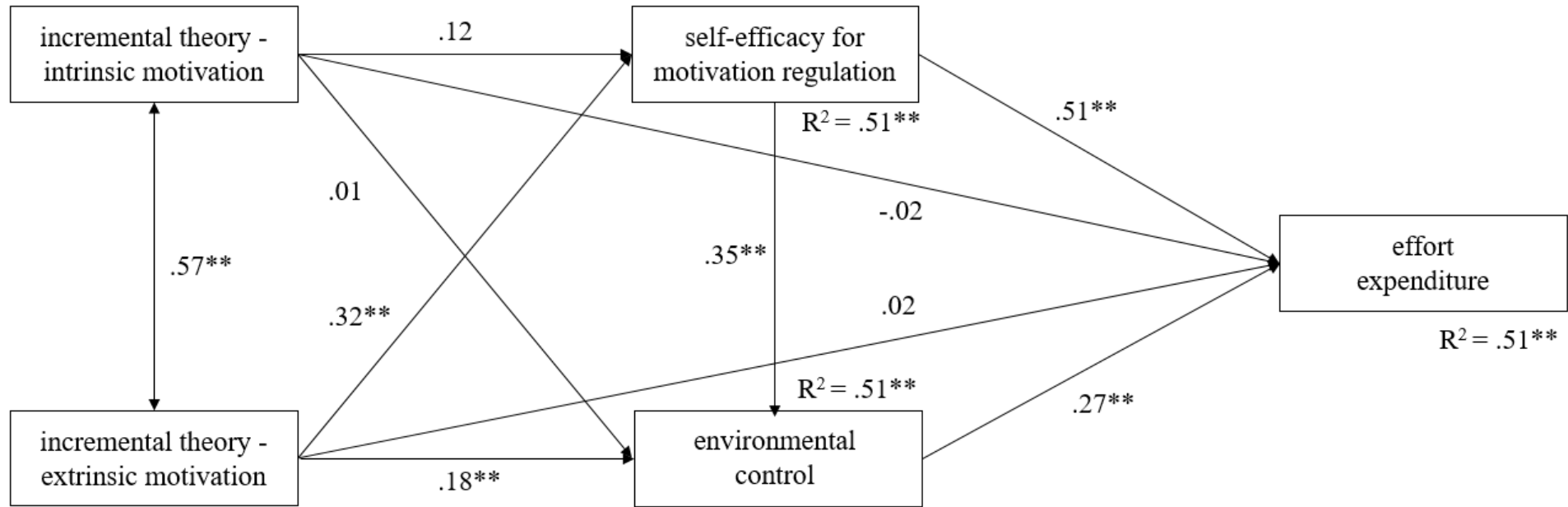


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 14

Path model with environmental control (Study 2)

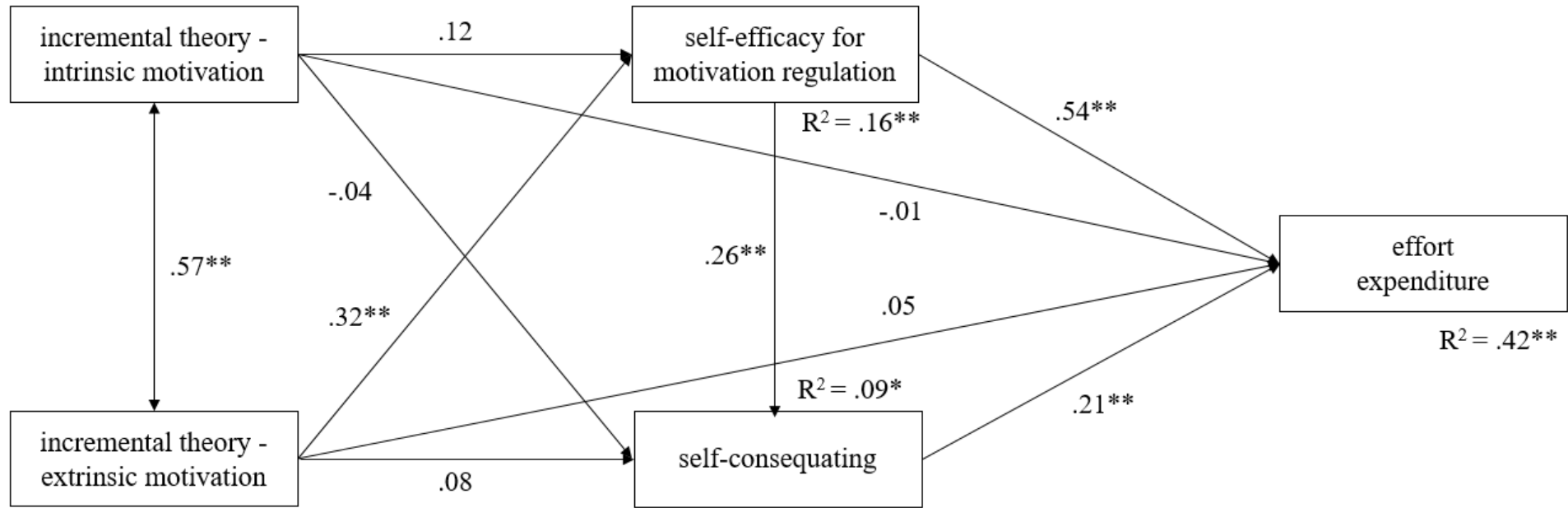


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 15

Path model with self-consequating (Study 2)

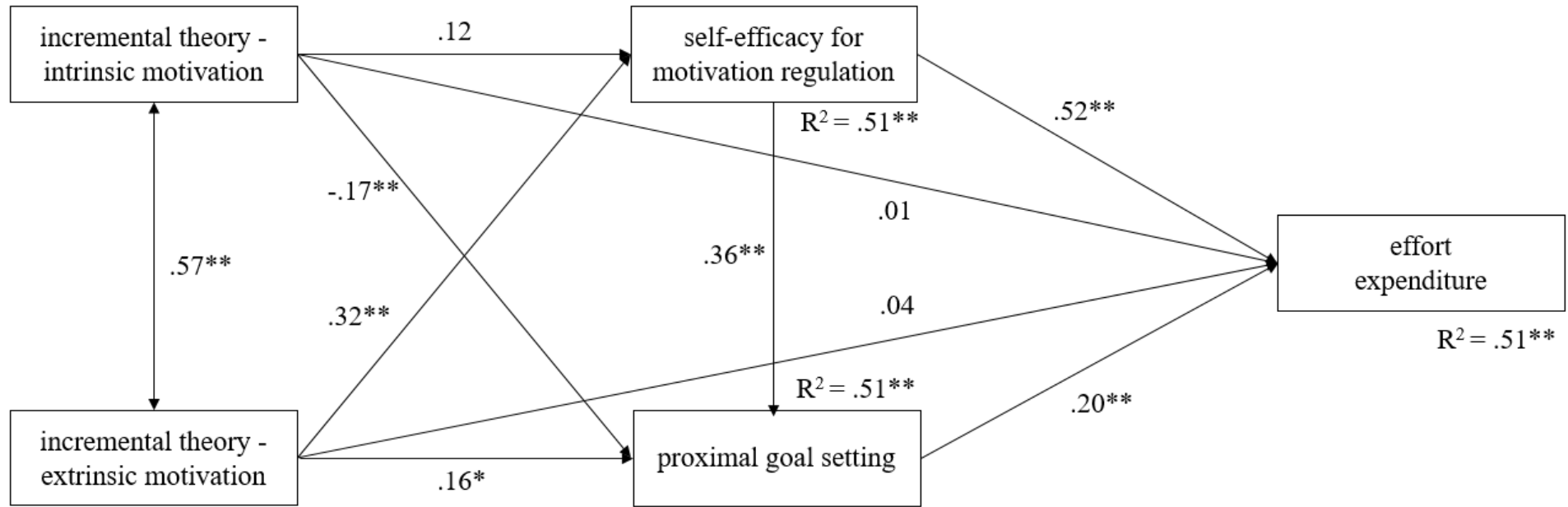


Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

IMPLICIT THEORIES ABOUT MOTIVATION

Figure 16

Path model with proximal goal setting (Study 2)



Note. Standardized coefficients are reported. * $p < .05$; ** $p < .01$.

A3. Manuskript 3

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Conceptual Fuzziness in Motivation Regulation Research and Assessment:

A Measurement Validation Study

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Abstract

Research on motivation regulation as learners' active thoughts and behaviors to alter their motivation for studying and with it, self-report questionnaires on various aspects of this process measuring e.g. self-regulatory behaviors and outcomes, have expanded over the past years. These scales aim at measuring conceptually closely related constructs, leading to an overlap in operationalisations and to restricted scale validity. The current study exemplarily examined whether theoretically implied motivation regulation constructs (motivational regulation, regulatory effectiveness, self-efficacy for motivation regulation-self-efficacy for self-regulated learning, and procrastination) can be empirically differentiated or which changes to their operationalisations are necessary to validly assess them. An expert survey on the scales' item content demonstrated that only few items measured the construct (and only the construct) it was specified to measure. Exploratory structural equation models in student data ($N = 365$) with the same scales revealed that after excluding eleven items not matching predefined constructs or not differentiating between latent factors, the items form the proposed five constructs. These were moderately to strongly correlated ($-.19 \leq r \leq .47$). Recommendations for future assessment of the motivation regulation process, such as using online, situation-specific measures, and directions for further scale validation are discussed.

Keywords: motivation regulation; self-efficacy; procrastination; construct validation; exploratory structural equation modelling

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1.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of interest

The authors declare no conflicts of interest.

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Conceptual Fuzziness in Motivation Regulation Research and Assessment: A Measurement Validation Study

Motivational regulation refers to learners' active thoughts and behaviors aimed at enhancing or maintaining their motivation to start or complete a task (Wolters, 2003). Due to the positive associations of motivation regulation with learning and achievement (e.g., Grunschel et al., 2016; Schwinger & Stiensmeier-Pelster, 2012), research on this topic has expanded over the past two decades accompanied by the creation of various measurement instruments of motivation regulation and conceptually close cognitions. Among the most frequently used tools in this regard are self-report questionnaires for both action-related aspects of motivation regulation (such as motivation regulation strategy application, Schwinger et al., 2007; Wolters & Won, 2018; or procrastination as motivation regulation failure, Bäumle et al., 2018) and motivational beliefs and assumptions related to motivation regulation, such as subjective regulatory effectiveness (Engelschalk et al., 2016), self-efficacy for motivation regulation (Trautner & Schwinger, 2020), or self-efficacy for self-regulated learning (Zimmerman et al., 1992).

While clear construct definitions guided the construction of many existing scales, their differentiation from other conceptually closely linked aspects of the motivation regulation process is often less precise. This conceptual fuzziness becomes obvious in very similar items of scales measuring different constructs. For example, the item "If what I am studying seems unimportant, I can still convince myself to stick with it." (Kim et al., 2018, p. 261) measuring motivation regulation appears similar to the item "Even for rather boring tasks in my studies I can almost always motivate myself." from the self-efficacy for motivation regulation scale (Trautner & Schwinger, 2020, p. 5). This raises concerns on how theoretically and empirically different or related these constructs are and whether the respective scales measure their respective construct (and only this construct, AERA, APA, & NCME, 2014, Flake et al., 2017; Moosbrugger & Kelava, 2020). This potential conceptual and measurement overlap can

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cause substantial problems in selecting appropriate measures, building measurement models for statistical inference, and interpreting results if predictor and criterion are confounded in their operationalisations. While this problem occurs in many areas of motivation regulation research, in the present study, we focus on five constructs and scales as representative examples for future analyses and measurement validation studies, namely motivation regulation strategy use (Kim et al., 2018), self-efficacy for motivation regulation (Trautner & Schwinger, 2020), self-efficacy for self-regulated learning (Zimmerman et al., 1992), regulatory success (Engelschalk et al., 2016), and procrastination framed as self-regulatory failure (Tuckman, 1991). The current study seeks to compare construct definitions of these scales and examine whether proposed scales match this definition and the scales' proposed measurement purpose (substantive validity). Further, we will empirically investigate whether the scales form separable empirical constructs (structural validity) and how strongly they are related to one another (convergent and discriminant validity) taking several methodological issues of conceptually close constructs into account. Suggestions on future changes to and use of the respective scales will be made.

Theoretical Background: Construct Definitions in Motivation Regulation Research

In the context of self-regulated learning, motivation regulation has gained attention since Wolters' (2003) seminal article on this topic. Motivation regulation refers to "activities through which individuals purposefully act to initiate, maintain, or supplement their willingness to start, to provide work toward, or to complete a particular activity or goal (i.e., their level of motivation). This form of regulation is achieved by deliberately intervening in, managing, or controlling one of the underlying processes that determine this willingness (i.e., the processes of motivation)." (Wolters, 2003, p. 190). Theoretical models of motivation regulation have largely focused on a situation-specific, process-oriented perspective (e.g. Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012), linking several conceptually closely related aspects of motivational self-regulation to one causal sequence. After

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perceiving a motivational problem and a reason for it, learners apply motivation regulation strategies (behaviors and thoughts aimed at enhancing, maintaining or changing the quantity or quality of their motivation, Schwinger et al., 2007). This, in turn, is associated with several adaptive outcomes, e.g. persistence, effort and achievement (Eckerlein et al., 2019; Schwinger & Stiensmeier-Pelster, 2012). To assess outcomes of motivation regulation, learners' subjective regulatory effectiveness defined as their perception of the outcome of their regulatory attempts has been used (Engelschalk et al., 2016). Procrastination as "voluntary delay of an intended academic action despite knowing about the negative consequences of this delay, such as reduced subjective well-being or lower academic performance" (Bäulke et al., 2021, p. 2, cf. Klingsieck, 2013; Steel, 2007) has been investigated as a result of motivation regulation failure.

Further, individual beliefs can influence the process of motivation regulation. Self-efficacy for motivation regulation as one such belief refers to learners' beliefs whether they "can effectively implement measures to successfully regulate their motivation even in the face of boring or difficult tasks" (Trautner & Schwinger, 2020, p. 1). Similarly, self-efficacy for self-regulated learning has been defined as "students' perceived capability to use a variety of self-regulated learning strategies such as planning and organizing their academic activities, transforming instructional information using cognitive strategies to understand and remember material being taught, resisting distractions, motivating themselves to complete school work, structuring environments conducive to study, and participating in class." (Zimmerman et al., 1992).

It becomes obvious from these definitions and from a theoretical perspective that these constructs are conceptually distinct yet close by sharing common features regarding thoughts and behaviors on self-regulating one's motivation for studying. Between some constructs, explicit causal and multidirectional theoretical links have been proposed. For example, one primary source of self-efficacy beliefs are prior successes in a given domain (Schunk &

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Zimmerman, 2007). Therefore, in self-report questionnaires aggregating across situations, a person reporting high self-efficacy for motivation regulation will be more inclined to report high regulatory success and vice versa (see also Engelschalk et al., 2016). Similar overlaps occur if procrastination is not only defined as a problematic and irrational behavior of delaying aversive tasks, but framed as learners' failure to effectively regulate their learning and motivation (e.g. Tuckman, 1991, Kim & Seo, 2015), which represents only one of several causes of procrastination (Grunschel et al., 2013). For these reasons, it is important not only to theoretically define the constructs one seeks to examine and their interrelations, but also to differentiate them as clearly as possible from related constructs. Otherwise, measurement instruments may pick up features of other constructs, leading to a lack of empirical separability of scales and impeding interpretations of relations among them (Flake et al., 2017).

Conceptual Overlap in Motivation Regulation Measurement

Due to this theoretical overlap, measurement instruments assessing these constructs will necessarily have some shared content. However, when relations between these constructs are examined, one needs to establish that these scales sufficiently represent the construct in question, but are also distinct from one another. Avoiding unnecessary conceptual tautologies is crucial for examining the process of motivation regulation because otherwise, we predict an outcome not with an antecedent but with itself. This is especially important for self-report questionnaires aggregating across several situations with large "grain sizes" (Roth et al., 2016; Wolters & Won, 2018).

Despite the situation-specific description and process-orientation in current models of motivation regulation (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012), however, motivation regulation has most frequently been examined at a situation-aggregated, trait-like "component" or "aptitude" level (Roth et al., 2016) in the form of self-report questionnaires which do not reflect situational, temporal, or causal dynamics implied by

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theoretical approaches to motivation regulation. This follows a long and popular, but controversial assessment tradition in self-regulated learning (Roth et al., 2016; Wolters & Won, 2018). In turn, if these variables were assessed within one specific situation, it may be easier for learners to disentangle for example their general belief they can effectively regulate their motivation (self-efficacy for motivation regulation) from their actual success in doing so in this moment, which may be contrary to their general belief (cf. Kim et al., 2018).

Therefore, it is important to examine whether situation-aggregating self-report questionnaires are sufficiently separable and validly reflect the construct they were designed to measure.

Besides overlap in scales due to shared content in construct definitions, specific items or scales may be close to each other due to common method variance (Marsh et al., 2014). This describes covariance in scales and items occurring due to the same modality of assessment, e.g., self-report questionnaire items with similar wordings. Similarly, constructs assessed with the same modality are correlated more strongly among each other compared to the same constructs assessed with different methods, such as behavioral, observational, or experimental data (e.g. Dörrenbächer-Ulrich et al., 2021; Duckworth & Kern, 2011). A lack of differentiability can also result from items not precisely measuring the construct. For example, by accident or lack of precise scale construction, an item from one scale may just as well measure the same construct as another scale. Further, some items may not match the goal of the scale or may not be appropriate for a specific sample or context (AERA, APA, NCME, 2014; Flake et al., 2017).

Why Can Conceptual and Methodological Overlap in Scales be Problematic?

Too much overlap between scales can be problematic because participants may get the impression that they keep answering the same questions multiple times, which may lead to boredom and frustration with the study, biases and less serious answers to the questions. Similarly, researchers may be confused about which scale to use for which purpose exactly. Further, when building statistical models (e.g. structural equation models), overlap between

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scales and common method variance may not be represented adequately in the measurement model if scales or parts of scales are treated as strictly distinct. This can lead to a bad overall model fit and problems with interpreting the model (Marsh et al., 2014; Morin et al., 2020). Finally, the largest problems arise in the interpretation of results: If we do not know exactly what we are measuring with which scale it is difficult to interpret any statistical results (which can be obtained nonetheless). If the overlap between two constructs is too large, we end up predicting an outcome with large parts of itself, causing a tautology and false inferences. This taps into the fundamental questions of validity and construct validation.

The Process of Construct Validation for Motivation Regulation Scales

A scale is considered to validly measure a construct in question (in a specific context and population) if it measures precisely the construct which it is supposed to measure, so the values obtained for the scale can be interpreted as a person's actual manifestation of the construct in question and to draw meaningful inferences from the scale (AERA, APA, & NCME, 2014; Moosbrugger & Kelava, 2020). Construct validation refers to the "process of integrating evidence to support the meaning of a number which is assumed to represent a psychological construct." (Flake et al., 2017, p. 371). Evidence on a scales' validity needs to be gathered at multiple levels, e.g. the substantial dimension (theoretical groundwork of the scale including a clear definition and scope of the construct for item development), structural validity (whether the scale contains the theoretically expected factorial structure, measurement precision and generalizability of the scale across samples and contexts), and external validity (a measure's similarity to and differentiability from scales measuring the same (convergent) or other (discriminant) construct, and can predict specific relevant criteria or behaviors outside the test situation from participants' scale values (criterion or predictive validity)).

For the five constructs and scales on motivation regulation and related constructs selected for the present analysis, there is evidence on the scales' validity. Table 1 of the

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electronic supplement (ESM) displays selected validity evidence for the five scales alongside their proposed aims and construct definitions. The short motivation regulation subscale (BRoMS, Kim et al., 2018) aiming at an efficient and contextualized assessment of global motivation regulation tendencies, has been found to correlate moderately with procrastination (using the Tuckman procrastination scale, Tuckman, 1991, $r = -.38$) and strongly with self-efficacy for self-regulated learning (using the Zimmerman et al., 1992 scale, $r = .48$; Kim et al., 2018). However, factor analyses including all three scales simultaneously have not been conducted to date.

The self-efficacy for motivation regulation scale (Trautner & Schwinger, 2020) has been used alongside the self-efficacy for self-regulated learning scale by Zimmerman et al. (1992) in previous research (Trautner & Schwinger, 2020). Structural equation models including both scales revealed a bad model fit. After factor analyses and scale revisions on the latter, three subdimensions emerged tapping into theoretically proposed dimensions of self-regulated learning, i.e. planning and organizing, motivation, and cognitive learning strategies (Trautner & Schwinger, 2020, cf. Pintrich, 2004). The first two were strongly correlated with self-efficacy for motivation regulation ($r = .60$ and $.71$). However, this scale has not yet been used in conjunction with the Tuckman scale, nor regulatory effectiveness, nor the BRoMS.

The self-efficacy for self-regulated learning scale by Zimmerman et al. (1992) used in both Kim et al. (2018) and Trautner & Schwinger (2020) was originally designed to measure students' self-efficacy to implement a variety of behaviors to regulate their learning. In line with past and current models of self-regulated learning, these behaviors stem from multiple domains and mirror several learning strategies from cognitive, metacognitive, and motivational domains (e.g., Pintrich, 2004). Despite this highly heterogeneous content in items, there are some studies reporting evidence for a unidimensional scale (e.g., Bong, 2001; Caprara et al., 2008). Others, however, report a suboptimal model fit for a unidimensional model (Klassen, 2010), or, as stated above, models separating three dimensions of self-

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regulated learning to fit the data better (Trautner & Schwinger, 2020). This makes the ample external validity evidence difficult to interpret and requires further investigation on how potential subdimensions relate to other variables of the motivation regulation process.

Tuckman's (1991) procrastination scale has been used in conjunction with the self-efficacy for self-regulated learning scale (Zimmerman et al., 1992). Klassen et al. (2009) found that the model separating the Tuckman scale and the Zimmerman et al. (1992) scale fitted the data better (after allowing error correlations between several items on both scales) than a unidimensional model. However, the absolute model fit was below acceptable. Correlations between both constructs were strong ($-.58 < r < -.68$). In sum, this requires further analysis.

Finally, the subjective regulatory effectiveness scale (Engelschalk et al., 2016) appeared to be separable from the Tuckman procrastination scale with an excellent fit of the structural equation model containing both scales, but strongly related to it as indicated by a latent correlation of $r = -.64$ (Bäulke et al., 2018).

Overall, all scales presented here have used clear construct definitions, but also noted a conceptual overlap with the other constructs (e.g., Engelschalk et al., 2016; Klassen et al., 2009; Trautner & Schwinger, 2020). Consequently, it is likely that this overlap between constructs also occurs in the measurement instruments. While some scales have been examined jointly regarding their separability, results are mixed and also depend on the exact scales included in the analyses. However, no intentional comprehensive construct validation study clarifying the five scales' similarities and differences especially given their conceptual closeness and similar levels of assessment has been to date.

The Present Study

In summary, the expansion of research on motivation regulation over the past years has seen an increase in self-report measures to capture variables of the motivation regulation process at a trait-like, situation-aggregated level. These scales measure theoretically closely

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linked constructs, such as motivation regulation strategy use, regulatory effectiveness, self-efficacy for motivation regulation, and procrastinatory behavior as regulatory failure. Due to this conceptual closeness, many scales seem to share very similar items, which raises doubts on whether these scales in fact measure empirically separable constructs or how, in fact, they are related due to common method variance as opposed to actual construct. While there is validity evidence for all scales separately, as well as for the relation between some scales, a comprehensive analysis of the empirical relations between and separability of these scales is missing. The current study therefore aims at disentangling the conceptual and measurement fuzziness in motivation regulation research and assessment by answering the following research questions in two studies:

1. Do the scales' construct definitions and intended purposes match the content of the items used? Via item analyses and expert interviews, we seek to establish substantive scale validity (Flake et al., 2017) by disentangling which constructs items of existing scales on motivation regulation strategy use, self-efficacy for motivation regulation, regulatory effectiveness, and procrastination measure.

2. Are the scales empirically separable? In a sample of university students, we seek to examine the structural and factorial validity of the scales taking methodological considerations regarding parallel item wordings and common method variance into account. We investigate how potential changes to these scales can improve their validity.

3. How strongly are the final scales related to each other? Finally, we seek to examine the final scales' external validity (convergent and discriminant validity) by looking at their interrelations.

Based on these results and theoretical considerations, suggestions on scale revisions and future use will be made.

Study 1

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The aim of study 1 was to examine the item validity of selected motivation regulation (and related) scales via the frequently used method of expert interviews (cf. Flake et al., 2017). Results of the expert ratings about which constructs are reflected by which items will aid the interpretation of items and resulting scales and thus contribute to our understanding, revisions, and future use of these scales.

Sample, Procedure, and Measurement Instruments

A total of 22 German-speaking experts on motivation regulation and self-regulated learning were invited via e-mail to fill in an online questionnaire. Experts were defined as having published at least one study on motivation regulation within the past ten years. Out of these, $N = 16$ responded to this request. In order to grant anonymity in such a small sample, no demographic information was collected. All experts received information on the study's aims and procedure, as well as data analysis, storage, and protection upon which they gave their informed consent for participation. An IRB approval was not required for this study. Experts read construct definitions of motivation regulation, self-efficacy, self-efficacy for motivation regulation and self-regulated learning, regulatory effectiveness, and procrastination (see ESM Table 1). For each item, experts chose from a list which construct in their opinion the item measured most strongly (question 1), as well as which additional construct(s) they saw represented by the construct (question 2). This list contained the options "use of specific motivation regulation strategy", "self-efficacy for motivation regulation", "self-efficacy for cognitive and metacognitive self-regulated learning", "regulatory success", "procrastination", and "others". Further, it was possible to comment any further thoughts on each item's content.

The eight items from the brief motivation regulation scale (BRoMS, Kim et al., 2018); the five items of the self-efficacy for motivation regulation scale by Trautner & Schwinger (2020) all eleven items from the Zimmerman et al. (1992) self-efficacy for self-regulated, and all 16 items of the Tuckman procrastination scale were presented. Subjective regulatory

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success was represented by the four items from Engelschalk et al. (2016). In contrast to the original, they were not presented alongside six vignettes of motivational problems, but stood alone to reduce the workload and examine item content rather than situation specificity. Finally, the. This resulted in a total of 44 items, which were presented not by scale but mixed among each other. In order to reduce the workload for each expert, the questionnaire was divided into two halves with 22 items each, and each expert randomly received only one half.

Statistical Analyses

For each of the 44 items presented, it was examined how often it was assigned to the respective constructs from the list in question 1. For question 2 (which other construct a respective item reflected), the same analysis was made.

Results

Figures 1-10 of the electronic supplement display the frequencies of constructs measured by all five scales' items as rated by the experts.

Brief motivation regulation scale (BRoMS, Kim et al., 2018).

For two items, half or more experts stated they measured motivation regulation strategy use, the others voted for self-efficacy for motivation regulation. Three items were judged to measure only or predominantly self-efficacy for motivation regulation and else, regulatory effectiveness or motivation regulation strategy use. The remaining three items showed more mixed results by measuring motivation regulation strategy use, self-efficacy for motivation regulation, self-efficacy for cognitive strategy use, and regulatory effectiveness. All items but one were further judged to measure at least one other construct, which were mainly self-efficacy for motivation regulation and regulatory effectiveness.

Self-efficacy for motivation regulation (Trautner & Schwinger, 2020).

Two of the five self-efficacy for motivation regulation items were judged to measure mainly motivation regulation strategy use or else, self-efficacy for motivation regulation or regulatory effectiveness. Two items were voted to measure mainly self-efficacy for

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motivation regulation, as well as motivation regulation strategy use and regulatory effectiveness. The only inverted item was judged as equally measuring self-efficacy for motivation regulation and regulatory effectiveness, and one expert voted for procrastination. All items were rated to additionally assess regulatory success, self-efficacy for motivation regulation, or (in the case of the inverted item) procrastination.

Regulatory effectiveness (Engelschalk et al., 2016).

Two of the regulatory success items were rated to measure mainly subjective regulatory effectiveness or else, self-efficacy for motivation regulation, while for the other two, the reverse pattern emerged. Three items were rated to tap into one more construct, whereby again, results were mixed between regulatory effectiveness and self-efficacy for motivation regulation.

Self-efficacy for self-regulated learning (Zimmerman et al., 1992).

Six of the eleven items for self-efficacy for self-regulated learning were judged to measure predominantly self-efficacy for cognitive/metacognitive strategy use. Only one to three votes favoured “other” constructs to be measured by these items. One item was unanimously rated as measuring self-efficacy for motivation regulation. The item “How well can you finish work assignments by deadline?” received mixed votes for self-efficacy for motivation regulation, self-regulated learning, procrastination and others. Further, the item “How well can you study when there are other interesting things to do?” received three votes for regulatory effectiveness, and two each for self-efficacy for motivation regulation and other constructs. “How well can you arrange a place to study without distractions?” received one vote for motivation regulation strategy use, and two each for self-efficacy for motivation regulation, self-efficacy for cognitive strategy use and “others”. Finally, the item “How well can you participate in class discussions?” was mainly rated as measuring “other” constructs; only two experts voted in favour of self-efficacy for cognitive strategy use.

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Further, all but three items were rated to measure at least one other construct besides self-efficacy for self-regulated learning.

Procrastination (Tuckman, 1991).

Out of 16 items, three received unanimous support for measuring procrastination. Six items were judged to mainly measure procrastination, as well as “others”; another four were rated to measure mainly procrastination, but also self-efficacy for motivation regulation, regulatory strategy use, or regulatory success. Three items did not receive support for measuring procrastination at all. Again, some items were judged to measure more than one construct. A mixed picture emerged: Most items were rated as additionally measuring procrastination, but some also as tapping into motivation regulation strategy use, self-efficacy for motivation regulation, and self-efficacy for cognitive/metacognitive strategy use.

Discussion

Overall, there was only some degree of consensus between experts regarding which constructs items from the BRoMS, self-efficacy for motivation regulation scale, subjective regulatory effectiveness scale, self-efficacy for self-regulated learning scale, and Tuckman procrastination scale measure. Additionally, besides some disagreement between experts, there were only few items judged to tap only into one single construct. Items from the BRoMS (suggested to measure motivation regulation, Kim et al., 2018) specifically mentioning “tricks” or behaviors to motivate oneself were more frequently regarded as measuring actual motivation regulation compared to items asking for general ability or outcome. Thus, items tapping into more specific behaviors for motivation regulation as opposed to its outcome separate strategy use from self-efficacy for motivation regulation and regulatory effectiveness. Since regulatory effectiveness items (Engelschalk et al., 2016) were rated as measuring self-efficacy for motivation regulation and regulatory effectiveness to a similar degree, their difference only seems to emerge depending on their contextualization, that aggregating regulatory successes across situations will more strongly refer to the more

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general self-efficacy beliefs for motivation regulation. Items from the self-efficacy for motivation regulation scale showed conceptual overlap with regulation strategy use, regulatory effectiveness, and procrastination, indicating that these beliefs are interrelated with the entire process of motivation regulation.

Of the eleven self-efficacy for self-regulated learning items, three items were judged to fall into a motivational as opposed to cognitive/metacognitive domain. According to Pintrich (2004) environmental regulation represents one out of four domains of self-regulated learning. Simultaneously, due to its motivational effects environmental control (avoiding distractions at the workplace) represents a motivational regulation strategy (Schwinger et al., 2007). Therefore, this conceptual overlap is not surprising, but also implies that self-efficacy for self-regulated learning is indeed a multifaceted construct not well represented by a single factor (Trautner & Schwinger, 2020; Pintrich, 2004). Most items from the Tuckman procrastination scale were judged to also assess procrastination except three items, which were regarded to tap into either self-efficacy for cognitive/metacognitive self-regulated learning as they emphasized time management and planning, or motivational problems as causes for procrastinatory behavior. Task aversiveness (e.g., rather boring tasks) have frequently been suggested as one cause of procrastination (Steel, 2007). This again shows possibilities for both conceptual and item overlap between failures to regulate one's learning in several domains and procrastination.

Overall, these expert ratings showed that nearly all items may potentially tap into more than one construct related to the process of motivation regulation. This may on the one hand result from a lack of clear cut definitions and theoretical distinctions between these constructs. On the other hand, it is natural to some degree that responses to one item are influenced by more than one latent construct due to their conceptual closeness. Therefore, in a second study, we seek to examine the factorial structure behind these items, as well as conceptual relations

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between the constructs they are supposed to measure taking their close relations in the nomological network into account.

Study 2

Study 2 aimed at examining the validity of the items and scales previously rated by experts in student data. We investigated whether the theoretically proposed constructs inform students' responses to these items (structural validity). Further, the scales' external validity and place in the nomological network were examined by looking at their relations among each other and other relevant motivation regulation outcomes, such as effort expenditure (Schwinger & Stiensmeier-Pelster, 2012).

Due to conceptual closeness, most items are likely influenced by more than one latent construct. Traditional confirmatory factor analysis (also called “independent cluster model confirmatory factor analysis” ICM-CFA), however, only allows each item to be predicted by one latent construct, assuming the remaining variance in items to be construct-irrelevant or random error variance (Marsh et al., 2011; Marsh et al., 2014; Morin et al., 2020). This is a particularly strong (and often inaccurate) assumption when latent constructs share some common core, e.g., dealing with motivational problems (Marsh et al., 2014; Morin et al., 2016). Restraining associations of items with latent factors to zero even in spite of small, but significant relations, can lead to a bad model fit and “error propagation” in models, which means that as some parameters are held artificially small, other model parameters become artificially inflated, such as correlations between latent factors (Marsh et al., 2014; Morin et al., 2020). This is especially problematic if we want to interpret these correlations to understand their interrelations. In contrast, while exploratory factor analyses (EFA) allow latent factors to predict scores on each item freely, they preclude the possibility of accounting for method effects due to similar item wordings or inverted items which are usually accounted for through correlated item residuals or method factors (Morin et al., 2020). Therefore, in the present study, we compare traditional ICM-CFA and exploratory structural equation

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modelling as an integration of EFA and ICM-CFA into the structural equation modelling framework to address the following research questions and aims: We expect that while ICM-CFA-models for each scale separately will show an at least adequate model fit, an ICM-CFA including all scales will show an inadequate fit and extremely high correlations between latent factors (hypothesis 1). Instead, we expect exploratory structural equation models allowing for item cross-loadings and residual correlations between similarly worded items to match the data better (hypothesis 2). The goal is to understand a) how many and which latent constructs lie behind the scales' items, b) which items may be redundant or imprecise in measuring their respective latent construct, and c) to build more theoretically and empirically valid scales to understand the relations between latent constructs measured.

Sample and Procedure

$N = 365$ university students mainly from one middle-sized German university (93%) participated in an online survey. They were mainly enrolled in psychology courses (52%). On average, they were $M = 22.75$ years old ($SD = 4.09$), in their fourth semester ($M = 3.65$, $SD = 3.32$) and 80.5% were women. Participants were granted course credit for participation if desired and could additionally win one out of two adventure trip vouchers. First, they read information on the study's aims and procedure, as well as data analysis, protection, and storage upon which their informed consent was queried. Items were presented by scale. An IRB approval was not required for this study.

Measurement Instruments

The same scales as in study 1 were used. In contrast to the expert rating, regulatory success items were presented alongside six vignettes reflecting motivational problems (low task value versus low success expectancy, each for pre-actional, actional and post-actional situations). In accordance with the original scales' answering formats, a five point scale from 1 ("do not agree") to 5 ("fully agree") was used for the short motivation regulation scale (BRoMS) and self-efficacy for motivation regulation scale. Procrastination was rated on a

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four point scale from 1 (“do not agree”) to 4 (“fully agree”), regulatory effectiveness rated on a six-point scale from 1 (“do not agree”) to 6 (“fully agree”), and self-efficacy for self-regulated learning was answered on a five point scale answering the question “How well can you...” from (“not well at all”) to 5 (“very well”).

Statistical Analyses

All analyses were conducted using Mplus 8.6. Due to non-normal distributions of several items, the robust maximum likelihood (MLR) estimator was used. First, in order to examine each scale’s model fit, we computed separate ICM-CFA per scale based on their a priori suggested factor structures. For self-efficacy for self-regulated learning both the original unidimensional and the previously found three-dimensional structure (Trautner & Schwinger, 2020) were examined.

Next, an ICM-CFA including all scales at once was computed. Model fit was assessed via the χ^2 Test of Model fit, Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Confirmatory Fit Index (CFI) and the Tucker Lewis Index (TLI). We considered a RMSEA and SRMR $< .08$ as acceptable and $< .05$ as good, a CFI and TLI of $< .90$ as acceptable and $< .95$ as good (Hu & Bentler, 1999; Marsh et al., 2004, Marsh et al., 2011). Further, we computed exploratory structural equation models with all items loading on all latent factors, and oblique factor rotation (geomin with an epsilon value of 0.5). To reduce model complexity, we only included two of the six regulatory effectiveness subscales (actional value and success expectancy problem) and allowed correlated residuals between items with parallel wording (Engelschalk et al., 2016). Models with increasing numbers of latent factors were computed and compared to examine how many latent constructs are necessary to explain the present items. To determine the adequate number of latent factors, we compared the models’ fit via changes in χ^2 (Satorra-Bentler scaled χ^2 test, Satorra & Bentler, 2010), RMSEA and CFI values. According to Chen (2007), a change in CFI values of -0.01 and in RMSEA of ≥ 0.015 and ≥ 0.030 change in SRMR

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indicate a substantial difference between nested models. If differences occurred, the model with more factors was preferred over the more parsimonious model. However, we did not solely rely on model fit statistics as “golden rules”, but also considered the models’ interpretability as an indicator of under- and overfactoring (Marsh et al., 2004). In order to determine potentially problematic items, we collected information from expert ratings from study 1, as well as factor loadings from ICM-CFA and ESEM. If expert ratings indicated little consensus on the item’s main content or mainly “other constructs” not related to the motivation regulation process, and standardized factor loadings confirmed this pattern by being low ($\lambda < .30$), not significant on any factor, or small and similar in size on several factors, we excluded the respective item to gain empirically separable and interpretable scales. Upon this, respective models were recomputed without these items.

Results

Independent cluster model factor analyses.

With three exceptions, all ICM-CFA models for the scales separately showed an at least or slightly below acceptable model fit (Table 1). Model fit for the BRoMS was slightly below acceptable, however, all items loaded significantly onto the latent factor ($\lambda \geq .66$). As expected, the single factor model for self-efficacy for self-regulated learning did not fit the data well, the three-factor model (Trautner & Schwinger, 2020), however, did. Notably, two items (“How well can you participate in class discussions” and “...use the library to get information for class assignments?”) loaded on the respective latent factor with $\lambda < .40$. Surprisingly, the Tuckman procrastination scale neither showed an acceptable model fit despite all factor loadings being substantial ($.46 < \lambda < .83$).

When all scales were included into one model simultaneously (even when separating three factors for self-efficacy for self-regulated learning due to their better fit), however, the model did not fit the data well. Correlations between the latent factors were extremely high ($.40 < r < .96$, Table 2). Besides the two items from the learning strategy subscale of the self-

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efficacy for self-regulated learning subscale, all items loaded on their respective factors significantly and substantially ($\lambda > .40$).

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Table 1

Results from Confirmatory Factor Analyses and Exploratory Structural Equation Modelling.

<i>Model</i>	$\chi^2[df]; p$	<i>CFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>SRMR</i>	$\Delta \chi^2[df]; p$	ΔCFI	$\Delta RMSEA$	$\Delta SRMR$
independent cluster model confirmatory factor analysis (ICM-CFA)									
BRoMS	77.10 [20], < .001	.941	.918	.090	.042	-	-	-	-
self-efficacy for MR	32.77 [5], < .001	.957	.915	.124	.029	-	-	-	-
regulatory effectiveness	265.60 [177], < .001	.987	.980	.038	.024	-	-	-	-
self-efficacy for SRL	207.35 [44], < .001	.842	.803	.101	.056	-	-	-	-
self-efficacy for SRL 3 factors	74.095 [41]; .001	.968	.957	.047	.039	138.0755 [3]; < .001	.144	.054	.017
Tuckman procrastination scale	334.63 [104]; < .001	.908	.894	.079	.048	-	-	-	-
full model	3289.16 [1847], < .001	.915	.907	.046	.050	-	-	-	-
full model adapted	3093.188 [1826]; < .001	.925	.918	.044	.048	174.57 [21]; <.001	-.010	.002	.002
exploratory structural equation models (ESEM)									
model 1) 3 factors	2446.98 [983]; < .001	.849	.827	.065	.046	-	-	-	-
model 2) 4 factors	2045.02 [938]; < .001	.886	.863	.057	.039	345.875 [45]; <.001	-.037	.008	.007
model 3) 5 factors	1783.32 [894]; < .001	.910	.886	.052	.035	232.35 [44]; <.001	-.024	.005	.004
model 4) 6 factors	1651.68 [851]; < .001	.919	.892	.051	.030	108.40 [43]; <.001	-.009	.001	.005
model 5) 7 factors	1421.13 [809]; <.011	.938	.913	.046	.027	259.39 [42]; <.001	-.019	.005	.003
exploratory structural equation models (ESEM) after item exclusion									
model 6) 3 factors	1600.038 [554]; .001	.872	.846	.072	.046	-	-	-	-
model 7) 4 factors	1232.860 [520]; .001	.913	.888	.062	.036	304.24 [34]; <.001	-.041	.010	.010
model 8) 5 factors	980.532 [487]; .001	.939	.917	.053	.029	222.42 [33]; <.001	-.026	.009	.007
model 9) 6 factors	816.187 [455]; .001	.956	.935	.047	.024	140.64 [32]; <.001	-.017	.006	.005
model 10) 7 factors	738.135 [424]; <.001	.961	.939	.045	.020	68.06 [31]; <.001	-.005	.002	.004

Note. *CFI* = comparative fit index, *TLI* = Tucker Lewis Index, *RMSEA* = root mean square error of approximation, *SRMR* = Standardized Root Mean Square Residual. BRoMS = Brief Motivational Regulation Scale (Kim et al., 2018); self-efficacy for MR = self-efficacy for motivation regulation scale (Trautner & Schwinger, 2020); regulatory effectiveness = scale by Engelschalk et al., (2016); self-efficacy for SRL = self-efficacy for self-regulated learning scale (Zimmerman et al., 1992); self-efficacy SRL 3 factors = items divided according to Trautner & Schwinger (2020); Tuckman procrastination scale (Tuckman, 1992); full model = contains all original scales simultaneously; full model adapted = contains all original scales with the three factor solution for self-efficacy for self-regulated learning.

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Table 2

Latent Factor Correlations from the Independent Cluster Model Factor Analysis Including All Scales

	ω	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)
1) BRoMS	.79	1											
2) SE for MR	.82	.87	1										
3) SE for SRL –mot.	.81	.87	.96	1									
4) SE for SRL – learn.	.42	.69	.71	.74	1								
5) SE for SRL - PO	.84	.61	.72	.74	.57	1							
6) procrastination	.89	-.72	-.82	-.81	-.60	-.70	1						
7) RE value pre.	.84	.72	.70	.77	.59	.52	-.63	1					
8) RE value act.	.89	-.74	-.67	-.76	-.56	-.49	.56	-.81	1				
9) RE value post	.83	.59	.59	.58	.61	.40	-.46	.68	-.67	1			
10) RE expectancy pre.	.87	.71	.68	.77	.61	.58	-.62	.76	-.66	.59	1		
11) RE expectancy act.	.88	.74	.69	.75	.60	.52	-.58	.65	-.74	.57	.80	1	
12) RE expectancy post	.78	.57	.59	.59	.58	.42	-.45	.60	-.58	.78	.74	.67	1

Note. BRoMS = Brief Motivation Regulation Scale (Kim et al., 2018); SE = self-efficacy; MR = motivation regulation; SRL = self-regulated learning; mot = motivational; learn. = learning strategies; PO = planning and organizing university work; RE = regulatory effectiveness; value = low task value problems; expectancy = low expectancy problem; pre. = pre-actional; act. = actional; post = post-actional. All latent correlations were significant at $p < .001$.

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Exploratory structural equation models.

Exploratory structural equation models with increasing numbers of factors showed a significantly better fit to the data with each additional factor (Table 1). Although the seven factor model yielded the best (although still not acceptable) model fit, the factor loading pattern showed signs of over-factorization due to a lack of significant loadings on factors, some items' largest loadings not reaching significance and many items not contributing to any factor any more. Similar, but less pronounced symptoms were found in the six factor model. Therefore, the four- and five factor models forming well-interpretable factors were examined for potential sources of misfit. ESM Table 2 provides an overview of items with low content validity to the factor they contributed most strongly to or rather weak and inconsistent loadings. After excluding these 11 problematic items, we recomputed the ESEM models with increasing factor numbers (Table 1). Again, model fit increased significantly with each additional factor. While the six factor model was well-defined, interpretable and showed an acceptable model fit, the seven factor solution did not despite better fit to the data according to χ^2 and CFI changes, indicating over-factorization. Therefore, the six factor version was retained as the final model. Most items showed a substantial loading on one factor, and one to two significant, but smaller loadings on at least one other factor which were in line with their respective content (ESM Table 3).

Factor 1 represented self-efficacy for motivation regulation. All five items from the self-efficacy for motivation regulation scale, three items of the self-efficacy for self-regulated learning scale which had originally formed the self-efficacy for motivation regulation subscale, and two items from the BRoMS. Factor 2 influenced three items from the self-efficacy for self-regulated learning scale tapping into planning, organizing, and scheduling university work. Factor 3 most strongly influenced all remaining items from the Tuckman procrastination scale. Factor 4 had the strongest associations with the five remaining items from the BRoMS and was therefore named "motivation regulation". Factor 5 was most

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strongly associated with the four regulatory effectiveness items for task value problems, while factor 6 was associated most strongly with the four expectancy problem regulatory success items.

In conclusion, six well-defined and interpretable latent factors emerged. Correlations between latent factors were substantially lower than in the ICM-CFA ($-.19 \leq r \leq .47$, Table 3). Self-efficacy for motivation regulation was moderately to strongly correlated with regulatory effectiveness and procrastination, and strongly correlated with motivation regulation. Self-efficacy for planning and organizing was most strongly associated with procrastination and moderately correlated with motivation regulation and regulatory effectiveness. Notably, regulatory effectiveness only showed small to moderate negative associations with procrastination, but moderate to strong associations with motivation regulation.

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Table 3

Latent Factor Correlations from Exploratory Structural Equation Model after Item Exclusion Including All Scales

	1)	2)	3)	4)	5)	6)
1) F1 – self-efficacy for motivation regulation	1					
2) F2 – self-efficacy for planning and organizing	.43	1				
3) F3 – procrastination	-.37	-.41	1			
4) F4 – motivation regulation	.47	.36	-.26	1		
5) F5 – regulatory effectiveness (value problem)	.38	.32	-.19	.40	1	
6) F6 – regulatory effectiveness (expectancy problem)	.38	.34	-.25	.40	.47	1

Note. F1-F6 = latent factors from exploratory structural equation model 9. All correlations were significant at $p < .001$.

Discussion

ICM-CFA of motivation regulation (related) constructs (hypothesis 1).

As expected, most original scales showed an acceptable to good model fit in independent cluster model confirmatory factor analyses, replicating findings from the original scales' publications (Engelschalk et al., 2016; Kim et al., 2018; Trautner & Schwinger, 2020). Also in line with previous findings (Trautner & Schwinger, 2020) and current multidimensional theories of self-regulated learning (Pintrich, 2004), the self-efficacy for self-regulated learning scale (Zimmerman et al., 1992) revealed a three-factor structure reflecting different areas of self-regulation, such as motivational and cognitive domains. In contrast to previous studies (Bäulke et al., 2018; Tuckman, 1991), the Tuckman procrastination scale did not fit the data well despite sufficient factor loadings, indicating potentially problematic conceptual overlap with other present scales. Since the ICM-CFA model containing all scales simultaneously revealed an unacceptable model fit and extremely high correlations between latent constructs, exploratory structural equation models were deemed more appropriate to examine whether the constructs are truly closely related but separable or their relations are artificially inflated by error propagation due to most factor loadings being constrained to zero despite existing in the population (Morin et al., 2020).

ESEMs reflect the latent constructs better than ICM-CFA (hypothesis 2).

Contrary to our expectation, ESEMs allowing for such cross-loadings did not fit the data better than the ICM-CFA per se. Only after identifying and removing eleven problematic items, the six factor model revealed an acceptable model fit and formed well-interpretable, distinguishable, and moderately correlated factors. Also as expected, responses to most items were caused by mainly one construct, but also at least one to two other constructs as indicated by small but significant cross-loadings. This implies that most items represented mainly one construct, but that these constructs jointly contribute to item responses. Ignoring this despite

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these cross-loadings only being small led to a bad model fit in ICM-CFA (Marsh et al., 2014; Morin et al., 2020).

Theoretical implications: Nature of latent factors representing the remaining items.

These six emerging latent factors largely represented the theoretically proposed dimensions behind the scales, namely “self-efficacy for motivation regulation”, “motivation regulation”, “self-efficacy for planning and organizing”, “regulatory success in low task value situations”, “regulatory success in low success expectancy situations”, and “procrastination”. Conceptually identical constructs from different scales also fell onto the same factor. Small, but significant cross-loadings for nearly all items point to some conceptual overlap between these proposed variables, as also reflected by their moderate to strong interrelations. This can be explained by their common theoretical background in self-regulation of motivation and motivation-related aspects of learning (Bäulke et al., 2018; Pintrich, 2004; Schwinger & Stiensmeier-Pelster, 2012). Since correlations did not exceed $r = .50$, empirically separable constructs can be assumed. Notably, correlations were descriptively stronger between variables more directly related to the process of motivation regulation (self-efficacy for motivation regulation, regulatory effectiveness, and motivation regulation) compared to more complex constructs for which motivational self-regulation may only be one cause among others (e.g., procrastination). A good model fit and well-interpretable factors were only obtained after excluding items for four main reasons, which can inform future scale use and construction.

Practical implications: Building theoretically and empirically valid scales.

One main reason for item exclusion was a lack of precision in measuring specific constructs (e.g., measuring two constructs at the same time) which was reflected in small and indifferent factor loadings on several factors simultaneously. Therefore, future research should define the constructs they seek to measure as precisely as possible, carefully balance a

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construct's scope and breadth with precision (Flake et al., 2017) and formulate items reflecting this scope.

The second reason for excluding items referred to construct definitions and item content too broad to form a unitary construct. This was most strongly the case for the self-efficacy for self-regulated learning scale. Future scales should therefore, in line with theoretical conceptualizations of their constructs, reflect potential multidimensionality and include enough items to adequately reflect these (cf. Flake et al., 2017).

The third reason for item exclusion was that some items did not match the construct they were designed to measure at all. This was, for example, the case for most excluded items from the Tuckman procrastination scale by not referring to the core definition of procrastination (Grunschel et al., 2013; Klingsieck, 2013; Steel, 2007) and including unspecific behaviors such as time wasting or behaviors regarding planning and organizing work or reasons or antecedents of procrastination. Future scales should therefore carefully consider the construct definitions they seek to reflect and differentiate clearly between the symptoms of this construct (e.g., irrational delay of aversive tasks despite knowing about maladaptive consequences) and potential causes (e.g., lack of motivation regulation skills, Bäumle et al., 2018) and consequences (e.g., lower achievement, negative emotions and decreased well-being, Grunschel et al., 2013) of this. Further, these symptoms should be specific to the respective construct definition and not others. For example, the item tapping into delaying difficult decisions may indicate procrastination, but also more general problems making decisions unrelated to procrastination as not every person having difficulties making hard decisions may generally procrastinate.

Fourth, some items which intended to assess procrastination or self-regulation of learning and motivation included very specific behaviors – behaviors which can serve multiple purposes, e.g. enhancing motivation, environmental aspects, or cognitive aspects of learning. If the item or its instruction do not ask for this aim, they may not fit well into

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respective scales. Therefore, we suggest adding an intention or aim of such multifinal behaviors to achieve conceptual clarity and more uniform scales.

Taking these considerations into account will also lead to more precise, shorter and thus more economic, as well as more valid scales.

General Discussion

Summary of Key Findings and Further Practical Considerations

Both expert ratings and exploratory structural equation modelling revealed that not all items matched their scales' construct definitions. Therefore, if the scales examined in the present study are used in the future, researchers may consider deleting non-matching items and validate the respective scales further (Flake & Fried, 2020).

When clear construct definitions were used and ambiguous or construct-irrelevant items were excluded from analyses, the proposed constructs emerged, were empirically separable, and, as expected from theory (Pintrich, 2004; Schwinger & Stiensmeier-Pelster, 2012) moderately to strongly related. However, in order to validly and reliably examine associations between constructs it is important to make sure associations do not simply result from imprecise measures including aspects of the other construct.

For the construction of the original scales examined here, definitions of the constructs in question were provided in original publications, but there were only few differentiations of what these constructs are not. Drawing clearer lines between features specific to one construct but not others may be helpful in building more concise scales. For some constructs, however, conceptual overlap remains an issue despite evidence of empirical separability: self-efficacy for motivation regulation and regulatory effectiveness formed different factors in ESEMs, but expert ratings were very ambiguous on their separation. Given their close theoretical link of regulatory successes forming self-efficacy beliefs and vice versa (Schunk & Zimmerman, 2007), their differences may only become apparent at the level of situation specific assessments within one learning situation. Future research should therefore consider carefully

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whether a research question can best be answered at a situation-aggregated questionnaire level or rather through experimental studies or following daily situational experiences through experience sampling and ambulatory assessment methods (Csikszentmihalyi & Larson, 2014). This way, causal relations implied by the process model of motivation regulation (Schwinger & Stiensmeier-Pelster, 2012) can be examined more meaningfully.

Limitations and Implications for Future Research

Despite the encouraging findings regarding the validity of the scales examined here, some limitations to the current study have to be addressed. First, results of factor analyses are to some degree specific to the sample they are conducted with (Costello & Osborne, 2005). Therefore, future studies replicating the present procedure in other samples to examine how stable the current findings regarding item misfit are, are required. Second, there are more areas of measurement validity (Flake et al., 2017), for example, whether a measurement instrument assesses the same construct across several time points and groups of people (measurement invariance across e.g., age or gender groups, or learners from different learning settings such as schools or universities). Due to the fact that the current sample contained only university students and predominantly women, we refrained from conducting these analyses. Future research, however, should examine the validity of these measures in different samples and across times. Third, we only disentangled relations between respective variables in self-report instruments, but did not examine their relations with real-world behaviors of motivation, motivation regulation, and effort as indicators of external validity. Since this has not been done with any of the scales examined in the present research, this would provide valuable insights into how valid the use of self-report measures in the area of motivation regulation are (cf. Wolters & Won, 2018).

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**Conceptual Fuzziness in Motivation Regulation Research and Assessment:
A Measurement Validation Study**

Electronic Supplemental Material – Content:

- Table 1 - Comparison of construct definition provided by the authors, intended scale purpose and use.
- Table 2 - Items with Problematic Features
- Table 3 - Factor Loadings from ESEM with Six Factors after Excluding Problematic Items
- Figure 1 - Expert Ratings of the Main Construct Measured by the Items from the BRoMS (Kim et al., 2018)
- Figure 2 - Expert Ratings on Secondary Constructs the Items from the BRoMS (Kim et al., 2018)
- Figure 3 - Expert Ratings of the Main Construct Measured by the Items from the Self-Efficacy for Motivation Regulation (Trautner & Schwinger, 2020)
- Figure 4 - Expert Ratings on Secondary Constructs the Items from the Self-Efficacy for Motivation Regulation (Trautner & Schwinger, 2020) Scale
- Figure 5 - Expert Ratings of the Main Construct Measured by the Items from the Regulatory Effectiveness Scale (Engelschalk et al., 2016)
- Figure 6 - Expert Ratings on Secondary Constructs the Items from the Regulatory Effectiveness Scale (Engelschalk et al., 2016) Scale
- Figure 7 - Expert Ratings of the Main Construct Measured by the Items from the Self-Efficacy for Self-Regulated Learning Scale (Zimmerman et al., 1992)
- Figure 8 - Expert Ratings on Secondary Constructs the Items from the Self-Efficacy for Self-Regulated Learning Scale (Zimmerman et al., 1992) Scale
- Figure 9 - Expert Ratings of the Main Construct Measured by the Items from the Tuckman Procrastination Scale (Tuckman, 1991)
- Figure 10 - Expert Ratings on Secondary Constructs the Items from the Tuckman Procrastination Scale (Tuckman, 1991)

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Table 1

Selected Validity Evidence for the Analyses' Scales and Construct Definition Provided by the Authors

instrument & (origin)	construct definition as provided by the authors	measurement focus (Lonka et al., 2004)	intended aim, area of use (context and sample)	substantive validity evidence	structural validity evidence	external validity evidence
short motivation regulation scale (Kim, Brady, & Wolters, 2018)	“Regulation of motivation, or students' active efforts to sustain or enhance their own motivation (Wolters, 2003)” (Kim et al., 2018, p. 259)	general (across content/domain and situations) explicitly avoiding situational variances (although the scale can explicitly be contextualized via the instruction)	“Our goal was to offer a new tool for the assessment of regulation of motivation by developing and evaluating a shorter self-report instrument that provides a global and contextually sensitive indication of students' regulation of motivation.” (Kim et al., 2018, p. 259) “An instrument that assesses students' general tendency to deliberately manage their own motivation in response to a larger set of motivational obstacles” (Kim et al., 2018, p. 260)	theoretical considerations on motivation regulation and the influence of context, as well as shortcomings of existing scales	exploratory and confirmatory factor analysis (Kim et al., 2018)	self-efficacy for self-regulated learning, procrastination, task value, achievement behavioural, contextual, and cognitive self-regulation, conscientiousness, neuroticism (Kim et al., 2018, 2020; Bülke et al., 2021)
self-efficacy for motivation regulation scale (Trautner & Schwinger, 2020)	students “can effectively implement measures to successfully regulate their motivation even in the face of boring or difficult tasks” (Trautner & Schwinger, 2020, p. 1)	general (across content/domain and situations)	to assess students' perceived capability to apply motivation regulation strategies in learning contexts	constructed based on Bandura's (2006) guidelines for constructing self-efficacy scales	confirmatory factor analyses both for the scale alone, as well as alongside other self-efficacy scales (academic	motivation regulation strategy use, effort, positive affect, achievement, self-efficacy for self-

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					self-efficacy and self-efficacy for self-regulated learning (Trautner & Schwinger, 2020)	regulated learning, academic self-efficacy (Trautner & Schwinger, 2020)
subjective regulatory effectiveness (Engelschalk et al., 2016)	<p>“effective mastery of a motivational blockage, the maintenance of motivation levels while studying” (Engelschalk et al., 2017, p. 1155)</p> <p>“These appraisals of the effectiveness of motivational regulation should mirror the learners' individual experiences with specific demanding situations” (Engelschalk et al., 2016, p. 73)</p> <p>“Overcoming specific motivational problems” (Engelschalk et al., 2017, p. 1158)</p>	<p>across contents/domains, but takes situational variability into account by asking the same questions for six different motivational problems (e.g. expectancy and value problem situations in preactional, actional, and postactional action phases). Within these contexts, however, it is aggregated across situations</p>	<p>assess university students' subjective appraisals of effectiveness of motivation regulation in six specific motivational problem situations</p>	<p>theoretical considerations (Engelschalk et al., 2015; 2016)</p>	<p>confirmatory factor analyses (Engelschalk et al., 2016)</p>	<p>quantity and quality of motivation regulation strategy use. effort, achievement procrastination, college dropout intentions, ability self-concept, goal orientations, work avoidance goals, (Bäulke et al., 2018; Engelschalk et al., 2017; Steuer et al., 2019)</p>
self-efficacy for self-regulated learning (Zimmerman et al., 1992)	<p>"The scales for perceived self-efficacy for self-regulated learning assess students' perceived capability to use a variety of self-regulated learning strategies such as planning and organizing their academic activities, transforming instructional information using cognitive strategies to understand and remember</p>	<p>general (across content/domain and situations)</p>	<p>see definition; original examined in ninth- to tenth-grade school students</p>	<p>clear definition of self-efficacy; self-efficacy items were constructed to reflect common self-regulated learning strategies</p>	<p>none in the original publication</p> <p>Bong (2001): exploratory factor analyses alongside other scales, when examined in one analysis with other self-efficacy</p>	<p>grades, academic self-efficacy, procrastination, learning strategies, self-esteem, and test anxiety</p> <p>(Klassen et al. 2008a; 2008b; 2009; Zimmerman et al., 1992)</p>

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	material being taught, resisting distractions, motivating themselves to complete school work, structuring environments conducive to study, and participating in class." (Zimmerman et al., 1992, p. 665)				items, cross-loadings emerged	
					Klassen (2010) suboptimal model fit in CFA	
					Trautner & Schwinger (2020): suboptimal fit for a unidimensional model, exploratory factor analysis provided evidence for a three-factor-model, which was replicated in CFA	
Tuckman Procrastination Scale (Tuckman, 1991)	„The lack or absence of self-regulated performance has been labelled procrastination, the tendency to put off or completely avoid an activity under one’s control (Tuckman and Sexton, 1989).” (Tuckman, 1991, p. 474)	general (across content/domain and situations)	“self-report measure of procrastination tendencies” (Tuckman, 1991, p. 474) in student samples	theoretical considerations on procrastination (Tuckman, 1991)	Tuckman (1991): exploratory factor analyses Özer et al. (2013): exploratory and confirmatory factor analyses	self-efficacy for self-regulated learning, learning strategies, grades, academic self-efficacy, procrastination (Tuckman), self-esteem, grades, test anxiety, other measures of procrastination (Klassen et al. 2008a, b; Klassen et al., 2009; Özer et al., 2013; Pinxten et al., 2019)

Note. This table contains an exemplary selection of studies reporting validity evidence on respective scales and is by no means exhaustive.

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Table 2

Items with Problematic Features

item	reason for exclusion
If I need to, I have ways of convincing myself to keep working on a tough assignment.	measures self-efficacy for motivation regulation ($n = 6$) and regulatory effectiveness ($n = 1$) according to expert ratings; $\lambda < .40$ on all factors in ESEMs, two nearly identically high and significant loadings on the regulatory success (expectancy problem) factor and motivation regulation/self-efficacy factor
How well can you arrange a place to study without distractions?	little consensus between experts on the aim of this item ($n = 1$ motivation regulation strategy, $n = 2$ self-efficacy for motivation regulation, $n = 2$ self-efficacy for self-regulated learning, $n = 2$ other); very small factor loadings on all latent factors ($\lambda < .25$)
How well can you take class notes of class instruction?	$n = 5$ experts indicated this item to measure self-efficacy for self-regulated learning, $n = 2$ indicated others; item did not load significantly on any factor
How well can you use the library to get information for class assignments?	$n = 5$ experts indicated this item to measure self-efficacy for self-regulated learning, $n = 2$ indicated others; item did not load significantly on any factor
How well can you remember information presented in class and textbooks?	$n = 5$ experts indicated this item to measure self-efficacy for self-regulated learning, $n = 2$ indicated others; the item's highest loading was $\lambda < .30$ on a factor where it did not fit content-wise
How well can you participate in class discussions?	$n = 3$ experts indicated this item to measure self-efficacy for self-regulated learning, $n = 4$ indicated others; the item's highest factor loading was $\lambda < .2$.
I delay making tough decisions.	$n = 6$ experts indicated this item to measure procrastination, $n = 1$ indicated others; the item's largest loading was $\lambda < .40$

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I put the necessary time into even boring tasks, like studying.

no experts indicated this item to measure procrastination as intended and little consensus regarding what it measures, ($n = 0$ procrastination, $n = 1$ motivation regulation, $n = 1$ self-efficacy for self-regulated learning, $n = 1$ regulatory success, $n = 2$ others); highest factor loading $\lambda < .20$ on a factor where it did not fit well regarding its content (regulatory success – expectancy)

I'm a time waster now but I can't seem to do anything about it.

little consensus between experts on the aim of this item ($n = 4$ procrastination, $n = 1$ self-efficacy for motivation regulation, $n = 1$ self-efficacy for self-regulated learning, $n = 1$ regulatory success); small and indifferent factor loadings ($\lambda < .30$) on two factors

Whenever I make a plan of action, I follow it.

no experts indicated this item to measure procrastination as intended ($n = 1$ motivation regulation, $n = 5$ self-efficacy for self-regulated learning, $n = 1$ others); small and indifferent factor loadings ($\lambda < .40$) on two factors

I always finish important jobs with time to spare.

no experts indicated this item to measure procrastination as intended ($n = 1$ motivation regulation, $n = 3$ self-efficacy for self-regulated learning, $n = 2$ others); small and indifferent factor loadings ($\lambda < .40$) on two factors

Note. Standardized factor loadings are reported.

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Table 3

Factor Loadings from ESEM with Six Factors after Excluding Problematic Items

item	F1	F2	F3	F4	F4	F6
Even for rather boring tasks in my studies I can almost always motivate myself.	.541**	.231**	-.020	.033	.142**	.061
When I don't feel like studying, I usually find a way to make the work more interesting.	.401**	.164**	.028	.306**	.058	.035
I can only with difficulty motivate myself for studying.	-.455**	-.167**	.177*	-.162*	.007	-.124*
Even if I don't see the point in some tasks, I am often successful in finding enough reasons for studying nonetheless.	.446**	.136	.02	-.053	.178**	.110
Even in difficult learning phases I know exactly what I have to do to work fully motivated for a long time.	.487**	.175**	-.072	.131*	.063	.176**
How well can you finish work assignments by deadlines?	-.082	.420**	-.128	-.079	.160*	.045
How well can you study when there are other interesting things to do?	.436**	.131*	-.086	.096	.238**	.030
How well can you concentrate on university subjects?	.327**	.201*	.039	.122	.193**	.162**
How well can you plan your university work?	.100**	.828**	.037	.012	.003	.024
How well can you organize your university work?	-.045	.836**	.045	.139**	-.002	.084
How well can you motivate yourself to do work for university?	.384**	.217**	-.071	.142**	.070	.247**
I needlessly delay finishing jobs, even when they're important.	-.094	-.247**	.635**	.058	-.132**	-.055
I postpone starting in on things I don't like to do.	-.195**	-.026	.607**	-.058	-.102*	-.012
When I have a deadline, I wait until the last minute.	-.011	-.329**	.546**	.076	-.082	.090
I keep putting off improving my work habits.	-.084	-.241**	.411**	-.157*	-.048	-.066
I manage to find an excuse for not doing something.	-.184*	.044	.467**	-.078	.057	-.129*
I am an incurable time waster.	-.114	-.21**	.366**	-.186**	-.002	-.077
When something's too tough to tackle, I believe in postponing it.	.042	-.017	.449**	-.110	.065	-.352**

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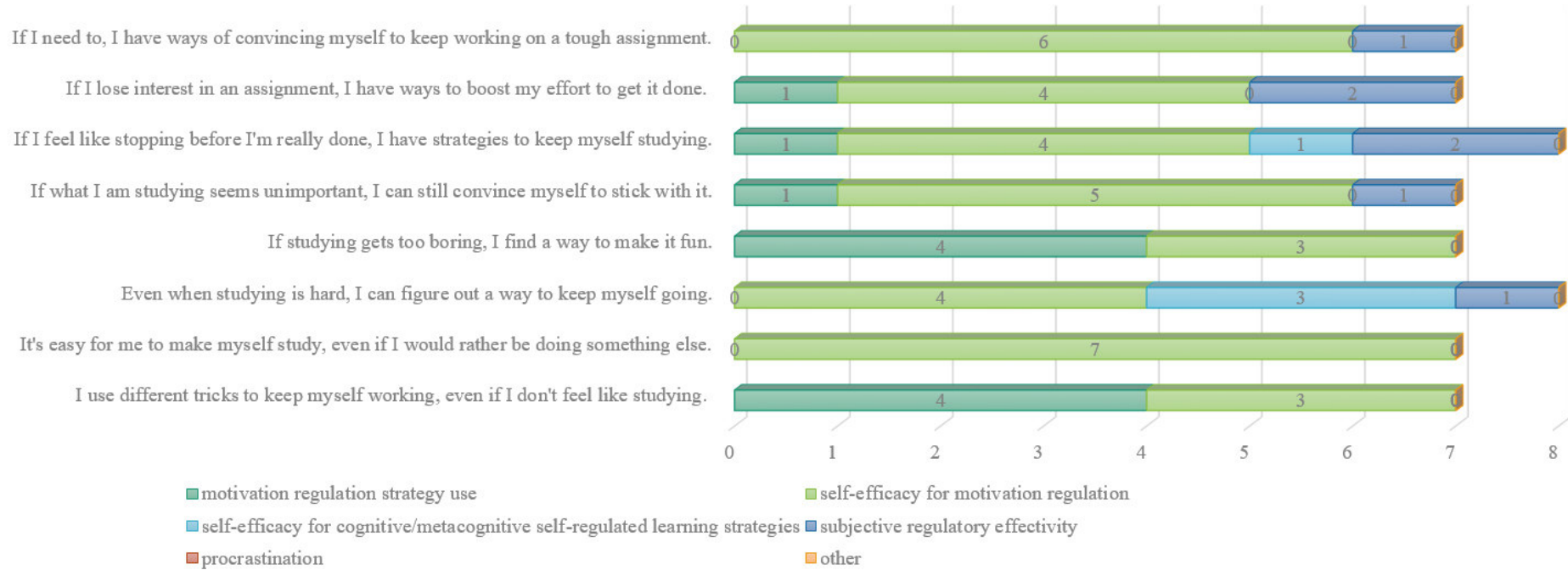
I promise myself I'll do something and then drag my feet.	-.094	-.138**	.560**	-.048	-.105*	-.124**
Even though I hate myself if I don't get started, it doesn't get me going.	-.085	-.149*	.467**	-.252**	-.075	-.092
I get stuck in neutral even though I know how important it is to get started.	-.207**	-.107*	.525**	-.145*	-.055	-.076*
Putting something off until tomorrow is not the way I do it.	.101	.198**	-.514**	.176**	.024	.063
I use different tricks to keep myself working, even if I don't feel like studying.	-.057	.118	.103	.699**	.117*	.002
If I lose interest in an assignment, I have ways to boost my effort to get it done.	.094	.069	.039	.578**	.121*	.068
If I feel like stopping before I'm really done, I have strategies to keep myself studying.	-.062	.059	-.072	.697**	.104	.086*
Even when studying is hard, I can figure out a way to keep myself going.	.158	.046	-.018	.437**	.132*	.219**
It's easy for me to make myself study, even if I would rather be doing something else.	.422**	.104	-.194**	.216*	.102*	.052
If what I am studying seems unimportant, I can still convince myself to stick with it.	.353**	-.104	-.111	.176*	.206**	.169**
If studying gets too boring, I find a way to make it fun.	.323**	.053	.016	.407**	.054	.051
(value problem) In this situation I am able to motivate myself.	.158**	.026	-.022	.086	.699**	.076*
(value problem) In this situation I am able to keep my motivation problem under control.	-.013	0.049	-0.046	.033	.820**	.146**
(value problem) In this situation I am able to increase my motivation.	.086	-0.007	0.028	.128**	.694**	.125**
(value problem) In this situation I am able to overcome my lack of motivation.	-.05	0.065	-0.003	.113*	.797**	.099**
(expectancy problem) In this situation I am able to motivate myself.	.091	0.073*	-0.011	.077	.095*	.696**
(expectancy problem) In this situation I am able to keep my motivation problem under control.	-.036	0.116**	-0.019	.022	.194**	.752**
(expectancy problem) In this situation I am able to increase my motivation.	.114*	-0.038	0.012	.111	.101*	.731**
(expectancy problem) In this situation I am able to overcome my lack of motivation.	-.017	.122*	.042	.020	.130*	.745**

Note. Standardized factor loadings are reported. Bold indicates the items' strongest loadings. * $p < .01$; ** $p < .001$.

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Figure 1

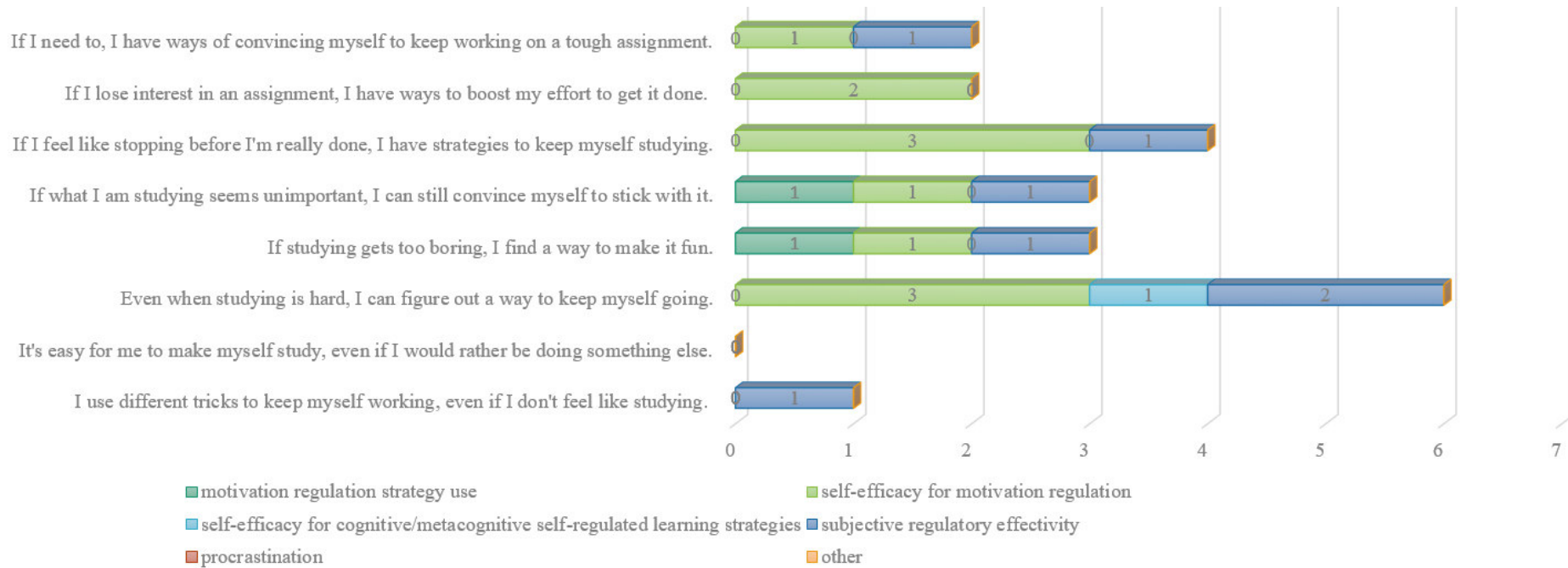
Expert Ratings of the Main Construct Measured by the Items from the BRoMS (Kim et al., 2018)



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Figure 2

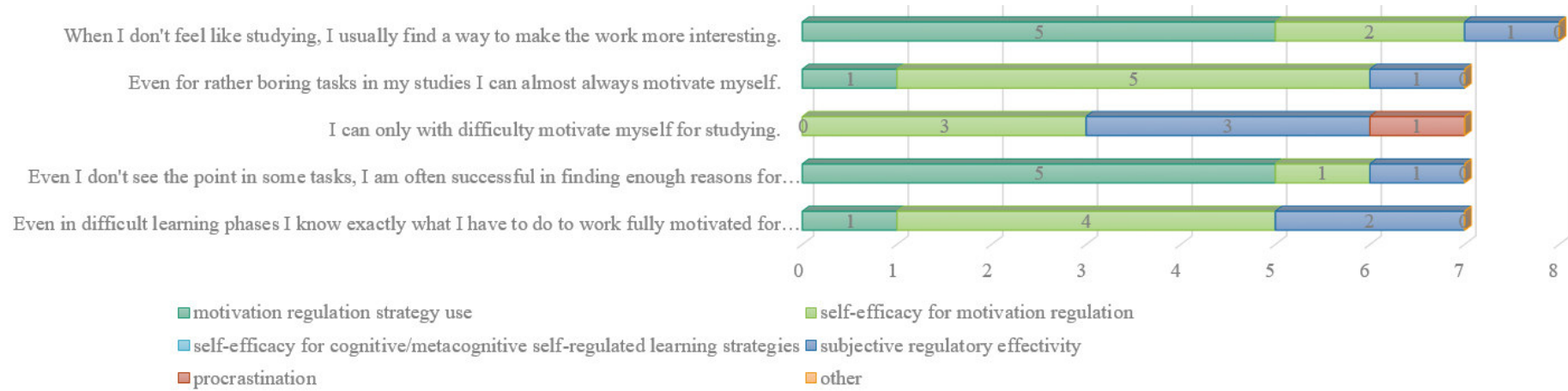
Expert Ratings on Secondary Constructs the Items from the BRoMS (Kim et al., 2018)



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Figure 3

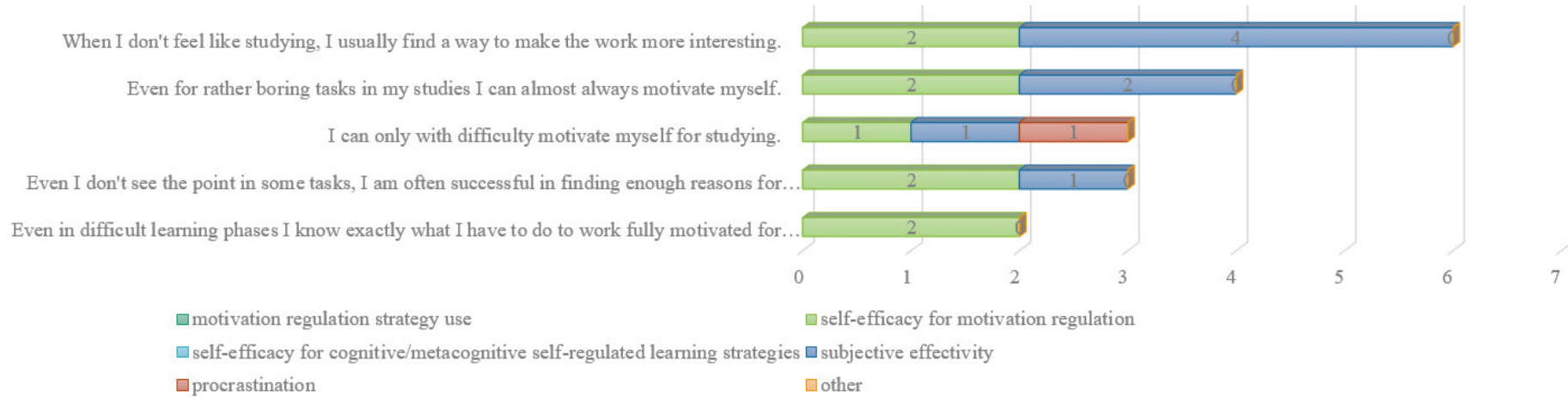
Expert Ratings of the Main Construct Measured by the Items from the Self-Efficacy for Motivation Regulation (Trautner & Schwinger, 2020)



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Figure 4

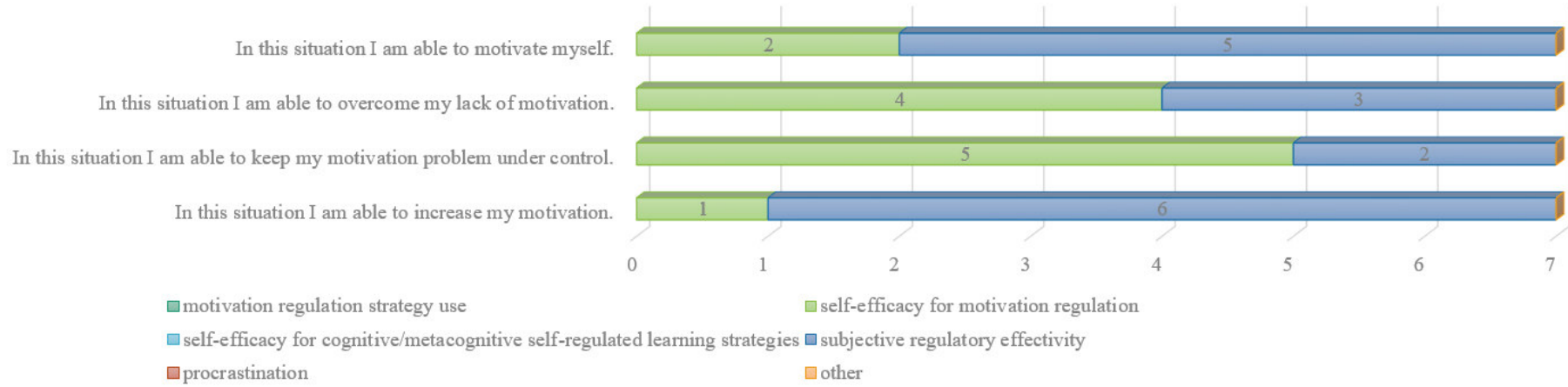
Expert Ratings on Secondary Constructs the Items from the Self-Efficacy for Motivation Regulation (Trautner & Schwinger, 2020) Scale



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Figure 5

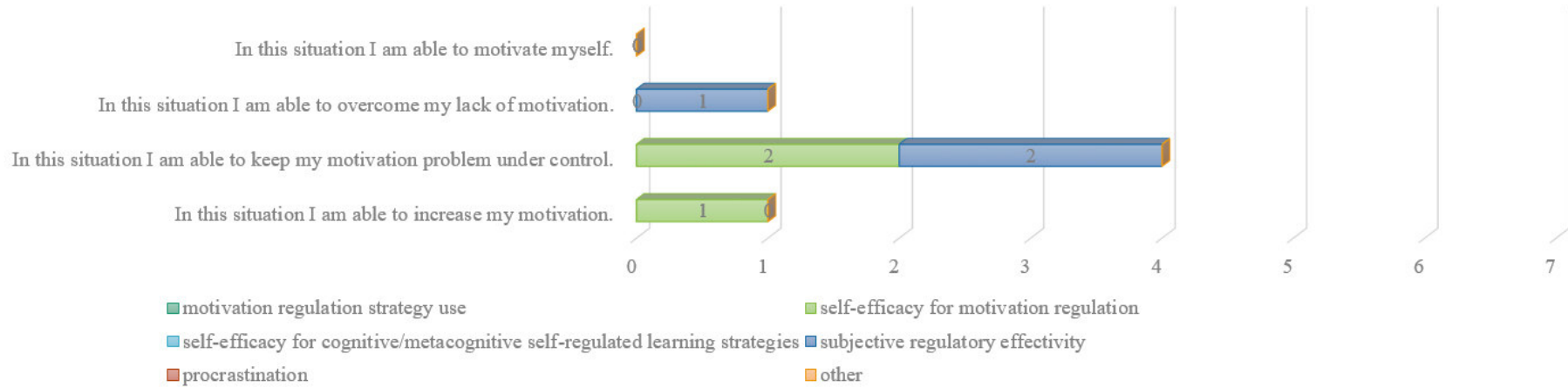
Expert Ratings of the Main Construct Measured by the Items from the Regulatory Effectiveness Scale (Engelschalk et al., 2016)



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Figure 6

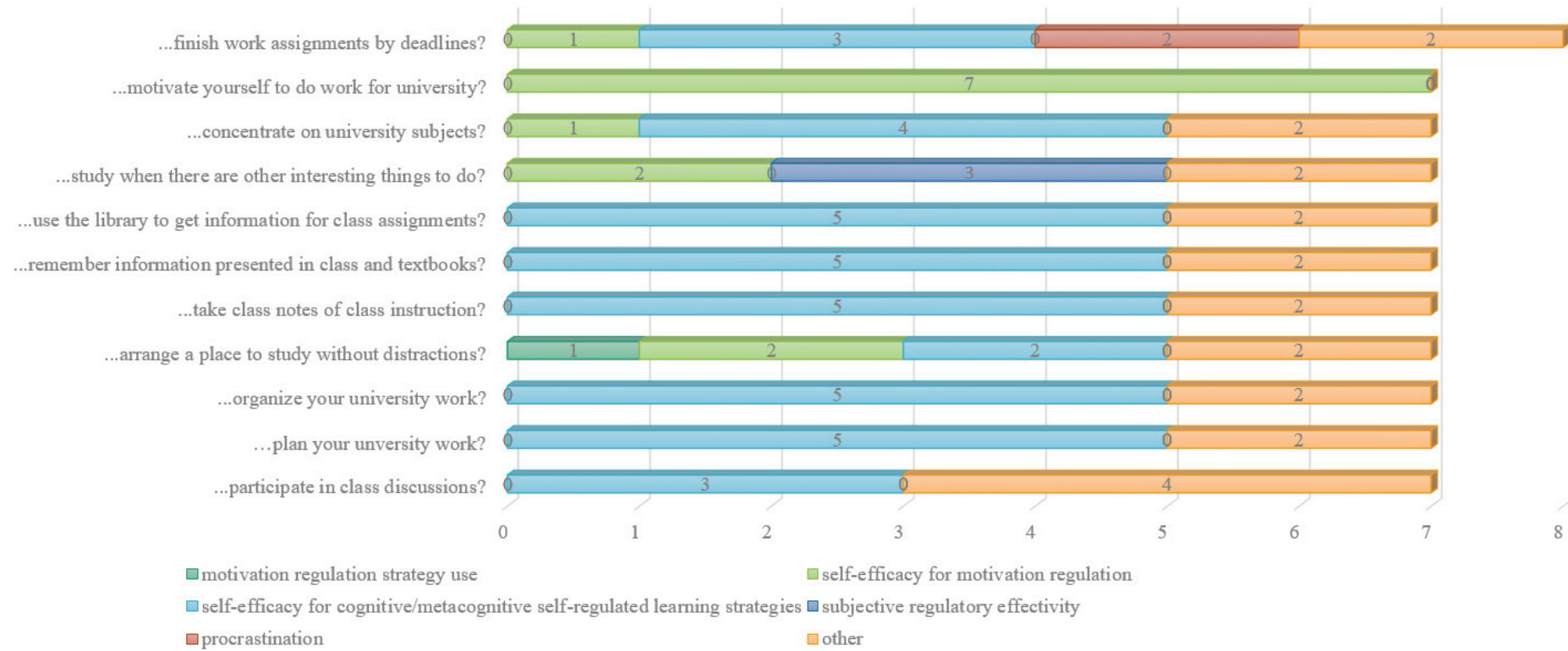
Expert Ratings on Secondary Constructs the Items from the Regulatory Effectiveness Scale (Engelschalk et al., 2016) Scale



MEASURING MOTIVATION REGULATION

Figure 7

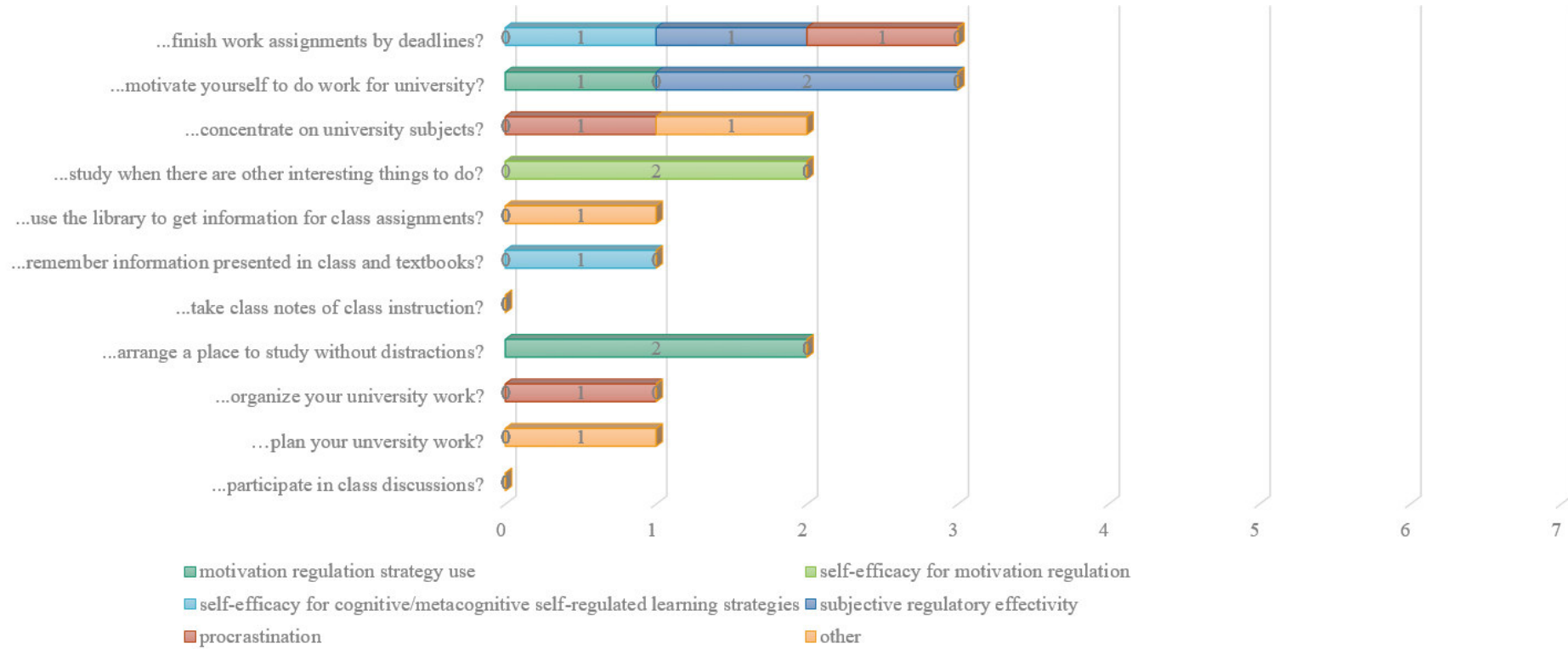
Expert Ratings of the Main Construct Measured by the Items from the Self-Efficacy for Self-Regulated Learning Scale (Zimmerman et al., 1992)



MEASURING MOTIVATION REGULATION

Figure 8

Expert Ratings on Secondary Constructs the Items from the Self-Efficacy for Self-Regulated Learning Scale (Zimmerman et al., 1992) Scale



MEASURING MOTIVATION REGULATION

Figure 9

Expert Ratings of the Main Construct Measured by the Items from the Tuckman Procrastination Scale (Tuckman, 1991)



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Figure 10

Expert Ratings on Secondary Constructs the Items from the Tuckman Procrastination Scale (Tuckman, 1991)



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A4. Eigenständigkeitserklärung und Erklärung zu vorherigen Promotionsversuchen

Hiermit versichere ich, dass ich die vorgelegte Dissertation mit dem Titel „*Individuelle Einflussfaktoren auf Motivationsregulation: Wer reguliert wann und wie die eigene Lernmotivation?*“ selbst und ohne fremde Hilfe verfasst, nicht andere als die in ihr angegebenen Quellen oder Hilfsmittel benutzt, alle vollständig oder sinngemäß übernommenen Zitate als solche gekennzeichnet sowie die Dissertation in der vorliegenden oder einer ähnlichen Form noch bei keiner anderen in- oder ausländischen Hochschule anlässlich eines Promotionsgesuchs oder zu anderen Prüfungszwecken eingereicht habe.

Auch habe ich bisher keinen weiteren Promotionsversuch an einer in- oder ausländischen Hochschule unternommen.

Marburg, den 17.01.2022

(Maika Trautner)