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# Le poids du surpoids dans la pratique d'activité physique : le rôle du contrôle de soi

Margaux de Chanaleilles

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THÈSE

Pour obtenir le grade de

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**Le poids du surpoids dans la pratique d'activité physique : le rôle du contrôle de soi**

**The weight of overweight on physical activity: the role of self-control**

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*« Ce qui remplit le temps c'est vraiment de le perdre. »*

Marguerite Duras, *La Vie Matérielle*, 1987



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## Introduction générale

Les maladies non-transmissibles, comme le diabète de type II, les maladies coronariennes, les accidents vasculaires cérébraux, le cancer, l'asthme et les maladies respiratoires chroniques, sont également connues sous le nom général de maladies chroniques, et sont une cause prépondérante de la mortalité mondiale. En effet, plus de 41 millions de décès leur sont imputables chaque année (Forouzanfar et al., 2016; World Health Organization, 2022), représentant 74% de l'ensemble des décès dans le monde. En d'autres termes, près des trois quarts des décès mondiaux sont induits par ces maladies. Plus particulièrement, elles sont responsables de 17 millions de décès prématurés chez des personnes ayant moins de 70 ans, alors que l'espérance de vie moyenne au niveau mondial est établie à 72.8 ans en 2019 (United Nations, 2023). Les maladies non-transmissibles sont la résultante de facteurs physiologiques, environnementaux, génétiques et comportementaux, mais l'importance des comportements de santé individuels à une place fondamentale dans leur prédiction. L'Organisation Mondiale de la Santé (World Health Organization, 2022) avance que les principaux facteurs de risques des maladies chroniques sont d'origine comportementale et que 75% des décès qu'elles causent pourraient être prévenus par des changements de comportements adaptés.

Les principaux comportements de santé à risque identifiés comme favorisant le développement de ces maladies, sont le tabagisme, une alimentation considérée déséquilibrée, la consommation excessive d'alcool ainsi que la pratique insuffisante d'activité physique (Forouzanfar et al., 2016). L'adoption de ces quatre comportements de santé pathogènes pourrait réduire l'espérance de vie sans maladies non-transmissibles majeures de presque 9 ans, tant chez les femmes que les hommes (Nyberg et al., 2020). Si les effets néfastes des comportements pathogènes sont largement connus, les effets bénéfiques des comportements salutogènes le sont également. Par exemple, la pratique d'activité physique régulière à hauteur

de 30 minutes d'activité modérée par jour, ou de 20 minutes d'activité intense 3 fois par semaine est associée à une diminution du risque de mortalité de 30% (Leitzmann et al., 2007). Néanmoins, une part toujours importante de la population mondiale ne parvient pas à adopter un mode de vie considéré comme sain.

En 2016, plus d'un quart de la population mondiale (i.e., 27.5%) n'atteignait pas les recommandations de santé en termes d'activité physique (Guthold et al., 2018). En d'autres termes, cette population ne réalisait pas, pour les adultes, au moins 150 à 300 minutes par semaine d'activité d'endurance d'intensité modérée, ou au moins 75 à 150 minutes d'activité d'endurance d'intensité soutenue, ou une combinaison équivalente d'activités d'intensité modérée et soutenue tout au long de la semaine. Cela incluant également l'intégration de deux sessions par semaine ou davantage d'activités de renforcement musculaire d'intensité modérée ou supérieure – qui sollicitent les principaux groupes musculaires – celles-ci procurant des bienfaits supplémentaires pour la santé.

Il est intéressant de souligner que ce manque d'activité physique est davantage marqué chez les personnes en surpoids et obèses comparé aux personnes normo-pondérées (Cassidy et al., 2017), c'est-à-dire chez les personnes dont l'indice de masse corporelle (IMC) est supérieur à 25 kg/m<sup>2</sup> pour les personnes en surpoids et au-delà de 30 kg/m<sup>2</sup> pour les personnes obèses. Pourtant, l'activité physique est d'autant plus recommandée pour cette population, car elle permet, justement, la régulation du poids (Chaput et al., 2011), et ainsi de lutter contre ce facteur de risque supplémentaire des maladies non-transmissibles (e.g., Dhawan et al., 2020). Par conséquent, l'activité physique est un facteur de prévention du surpoids et l'obésité qui sont, tous deux, en augmentation constante. De 1975 à 2016, le taux d'obésité mondial a quasiment triplé, avec plus de 1.9 milliard d'adultes en surpoids, parmi lesquels plus de 650 millions sont considérés comme obèses. Ces chiffres représentent respectivement 39 % et 13 % de la population mondiale (World Health Organization, 2022). Cela fait du surpoids et de l'obésité

une source de préoccupation majeure des politiques de santé nationales et internationales, qui multiplient les campagnes de prévention de l'obésité, lesquelles semblent néanmoins manquer d'efficacité. En effet, Young et al. (2016) ont étudié l'effet des campagnes de prévention de l'obésité sur l'intention d'adopter des comportements de santé salutogènes. Leurs résultats montrent que les images présentées aux participants ont suscité l'intention d'adopter des comportements de santé salutogènes, mais que cet effet était uniquement présent chez ceux qui n'étaient pas en surpoids ou obèses. Ces chercheurs suggèrent alors que ces campagnes de prévention soulignent surtout la responsabilité individuelle dans l'obésité. Par conséquent, ces campagnes de santé publique pourraient renforcer chez les personnes normo-pondérées l'intention d'adopter des pratiques qui leur éviteraient de rejoindre le groupe social des personnes en surpoids. En revanche, ces campagnes semblent être avant tout une source de stigmatisation chez les personnes en surpoids. En effet, d'autres études suggèrent que les campagnes de lutte contre l'obésité ont tendance à utiliser la stigmatisation liée au poids pour inciter les personnes en surcharge pondérale à changer leurs comportements (Vartanian & Smyth, 2013). Les préjugés à l'encontre des personnes en surpoids sont souvent flagrants dans ces campagnes et les remarques dévalorisantes sont souvent justifiées par le fait qu'elles sont faites "pour leur bien" (Major et al., 2012).

La stigmatisation est un processus de dévalorisation d'autrui, basé sur un attribut spécifique appelé stigma ou stigmat. Le stigmat marque un écart à la norme et est perçu comme étant une caractéristique déviante de celle-ci. Erving Goffman (p.4, 1963) a proposé l'existence de trois types de stigmates, à savoir 1) les stigmates liés à l'ethnie, la nationalité et à la religion, 2) les stigmates liés à des troubles mentaux et 3) les stigmates liés à des caractéristiques physiques comme le surpoids. Plus particulièrement, la stigmatisation liée au poids est l'une des formes les plus courantes de stigmatisation envers les adultes (Puhl et al., 2008) comme envers les plus jeunes (Bucchianeri et al., 2013; Puhl et al., 2013). En effet, les

personnes en surpoids sont fréquemment jugées négativement, exposées au harcèlement verbal ou physique, traitées injustement ou activement discriminées dans de nombreux aspects de leur vie quotidienne (Puhl & King, 2013). Plus précisément, le phénomène de stigmatisation lié au poids est défini comme "la dévalorisation sociale omniprésente et le dénigrement des personnes perçues comme ayant un excès de poids" (Major et al., 2018).

Comme nous l'avons abordé précédemment, une des particularités du stigmate lié au poids est que le surpoids et l'obésité sont considérés comme la résultante de choix personnels, ainsi que d'un manque de volonté (pour une revue voir Puhl & Heuer, 2009). En d'autres termes, il est communément considéré que les personnes en surpoids et obèses sont dans cette situation parce qu'elles ne font pas suffisamment d'efforts pour ne pas ou ne plus l'être. Et cette banale stigmatisation liée au poids a de nombreuses implications négatives sur l'humeur, l'estime de soi, le sentiment de honte, l'image corporelle, la santé mentale, la qualité de vie, l'espérance de vie, l'isolement social, et les comportements de santé comme l'activité physique ou l'alimentation (e.g., Puhl & Heuer, 2009; Ramos Salas et al., 2019).

Ces relations entre la stigmatisation liée au poids et l'activité physique posent plusieurs interrogations : Est-ce que les personnes en surpoids et obèses pratiquent peu d'activité physique en raison de cette stigmatisation ? Et si oui, par quels mécanismes la stigmatisation liée au poids opère envers cette population ? Enfin, au vu des standards de beauté et de normalité véhiculés par nos sociétés contemporaines, à savoir des corps minces, des silhouettes presque inaccessibles (e.g., Åberg et al., 2020; Cohen et al., 2021), nous pouvons nous demander si la stigmatisation liée au poids touche uniquement les personnes objectivement en surpoids, ou si elle touche une population plus large. Ainsi, ce travail doctoral a pour volonté d'apporter des éléments de réponse à ces questions chez des personnes ciblées par la stigmatisation liée au poids.

Les recherches en psychologie sociale ont proposé plusieurs cadres théoriques afin d'identifier les facteurs de l'engagement et du maintien dans les comportements salutogènes, et ceux notamment basés sur des dimensions motivationnelles, comme les modèles socio-cognitifs (e.g., la théorie du comportement planifié, Ajzen, 1991, le modèle des processus de l'action en santé, HAPA, Schwarzer, 1992) ou les modèles duaux (e.g., le modèle réflexif-impulsif de Brand & Ekkekakis, 2018). À l'inverse à côté de ces modèles très généralistes, des modèles très spécifiques aux comportements de santé des personnes en surpoids se sont développés, autour du concept de la stigmatisation liée au poids. Ainsi, Major et collaborateurs (2018), ont proposé un modèle illustrant l'effet de la stigmatisation liée au poids envers la santé. Dans ce modèle différents processus de la stigmatisation liée au poids sont décrits et mis en relations. Ils agissent de manière directe et indirecte sur la santé des personnes ciblées. Plus précisément, le modèle illustre les différentes voies par lesquelles la stigmatisation liée au poids pourrait avoir un impact négatif sur la santé mentale et physique. Le modèle suggère également des effets bidirectionnels, indiquant que ces mécanismes peuvent tout aussi bien contribuer à la prise de poids qu'entraver la perte de poids.

Afin d'investiguer les relations entre la stigmatisation liée au poids et la santé, et plus particulièrement avec l'activité physique, nous faisons le choix dans cette thèse de nous focaliser sur le rôle d'un processus spécifique : le contrôle de soi - comme cela a pu être suggéré dans la littérature sur la stigmatisation liée au poids (e.g., Major et al., 2018) ainsi aussi dans la littérature sur le changement de comportements (e.g., Chalabaev et al., 2023; Forestier et al., 2022).

Certaines études ont examiné les effets de la stigmatisation (non spécifique au poids) sur le contrôle de soi (e.g., Araiza & Wellman, 2017; Inzlicht et al., 2006; Rojas-Sánchez et al., 2021), et les résultats de ces dernières semblent aller dans une même direction. Ils indiqueraient une altération du contrôle de soi suite à une exposition à de la stigmatisation. Malheureusement,

ces études n'ont pas utilisé de définition claire du contrôle de soi, et ont utilisé des conceptualisations très différentes, limitant l'interprétation de ces résultats.

Ainsi, l'enjeu de cette thèse sera d'étudier la relation entre la stigmatisation liée au poids et l'activité physique, dans le cadre d'un nouveau modèle théorique qui conceptualise différentes composantes du contrôle de soi (Forestier et al., 2022), dans l'objectif d'avoir une vision plus précise des différentes composantes du contrôle de soi qui sont altérés ou non par la stigmatisation liée au poids. Le manuscrit de thèse sera organisé en trois parties : La Partie 1 sera consacrée au contexte théorique, la Partie 2 aux contributions personnelles et la Partie 3 à la discussion générale. Au sein de la Partie 1, Le Chapitre 1 sera consacré à la stigmatisation liée au poids et à ses conséquences sur l'activité physique, où nous aborderons également le sujet des cibles de la stigmatisation liée au poids ainsi que les mécanismes d'action de cette dernière. Dans le Chapitre 2, nous discuterons du contrôle de soi et de sa pertinence pour expliquer le comportement d'activité physique, et plus particulièrement de récents modèles qui tentent d'outrepasser les limites de la littérature plus ancienne sur ce construit. Dans le Chapitre 3 nous développerons la problématique générale de ce travail doctoral, ainsi que le programme de recherche que nous avons poursuivi.

La Partie 2 sera consacrée aux contributions personnelles du travail doctoral. Plus précisément, cinq manuscrits seront inclus dans ce chapitre, dont trois études empiriques, une revue systématique et un modèle théorique. Le Manuscrit 1 présentera une étude traitant de la saillance de l'attribut du poids. Le Manuscrit 2 présentera un modèle théorique du contrôle de soi cherchant à examiner et dépasser les limites des modèles précédents du contrôle de soi. Le Manuscrit 3 présentera une revue systématique évaluant l'impact de la stigmatisation envers le contrôle de soi, basée sur ce premier modèle. Enfin, le Manuscrit 4 s'intéressera à l'effet de la stigmatisation liée au poids sur une stratégie avec effort de contrôle de soi, en lien avec le

Manuscrit 2, tandis que le Manuscrit 5 proposera une étude s'intéressant à l'effet de la stigmatisation liée au poids sur une stratégie sans effort de contrôle de soi.

Enfin, la Partie 3, inclura le Chapitre 4, qui proposera une discussion générale résumant les principaux résultats obtenus, tout en discutant des limites, des perspectives de recherche et des implications de cette thèse. Finalement le Chapitre 5 proposera une synthèse du travail qui a été fourni durant la thèse.

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# **PARTIE 1**

Contexte théorique et objectifs de la thèse

# Chapitre 1. Le poids de la stigmatisation

## I. Le manque d'activité physique et ses conséquences

La pratique d'activité physique régulière fait partie des comportements de santé salutogènes (i.e., bons pour la santé) recommandés d'adopter afin d'avoir une espérance de vie en bonne santé la plus importante possible. Réaliser de l'activité physique à hauteur des recommandations de santé, soit pour les adultes au minimum 150 à 300 minutes par semaine d'une activité d'endurance d'intensité modérée, ou pratiquer au moins 75 à 150 minutes d'activité d'endurance d'intensité soutenue, ou une combinaison équivalente d'activités d'intensité modérée et soutenue tout au long de la semaine, permet de prévenir les maladies non transmissibles telles que les maladies cardio-vasculaires, les cancers ou encore le diabète de type II (WHO, World Health Organization, 2022). De plus, il a été mis en évidence dans de nombreuses recherches que l'activité physique a un effet positif sur la santé mentale, sur la diminution de la dépression et de l'anxiété (voir Rebar et al., 2015 pour une meta-analyse).

« Le fer se rouille faute de s'en servir, l'eau stagnante perd sa pureté et se glace par le froid.

De même, l'inaction sape la vigueur de l'esprit. »

Léonard de Vinci, 1452 - 1519

Néanmoins, malgré les bénéfices largement avérés de la pratique régulière d'activité physique, quel que soit l'âge, un nombre important de personnes a des difficultés à réaliser ce comportement. En 2016 plus d'1.4 milliard de personnes, soit un peu moins d'un quart de la population mondiale, n'étaient pas suffisamment actives (Guthold et al., 2018). Le manque d'activité physique a des conséquences au niveau individuel, avec une augmentation de la morbidité et de la mortalité, mais également au niveau sociétal. Le manque d'activité physique a un coût financier, établi par le Ministère des Sports en 2018 (voir Graphique 6, Ministère des

Sports, 2018) a plus de 240 millions d'euros chaque année en France. La modélisation des gains nets économiques en fonction de l'accroissement de la pratique sportive par cet organisme, a révélé qu'en augmentant le niveau d'activité physique de 10% en France, le gain net serait de 300 millions d'euros par an. Il atteindrait près de 1.3 milliard d'euros avec une hausse de la pratique de 50%, et plus de 2.6 milliards pour une hausse de la pratique d'activité physique régulière de 100%. En d'autres termes, ce dernier chiffre indique que si 50% des français.es pratiquaient une activité physique régulière (i.e., soit une augmentation de 100%), les économies générées pourraient être de 2.6 milliards d'euros d'après ces estimations. Afin de promouvoir l'activité physique, des campagnes de promotion et de prévention ont été réalisées et diffusées par les États, comme en France avec le Programme national nutrition santé (PNSS) dès 2002, ou par les institutions internationales (e.g., World Health Organization, 2022b). Néanmoins, le niveau d'activité physique mondial n'a pas augmenté depuis 2001 et est resté stable (Guthold et al., 2018).

Force est de constater que toutes les populations ne sont pas égales face au manque de pratique d'activité physique. Les personnes en surpoids (i.e., ayant un indice de masse corporelle (IMC)  $> 25\text{kg/m}^2$ ) et obèses (i.e., IMC  $> 30\text{kg/m}^2$ ) pratiquent encore moins d'activité physique que la population normo-pondérée. En effet, les résultats d'une étude réalisée au Royaume-Uni sur plus de 398 984 participants montrent que plus l'IMC des participants est important, plus la probabilité des individus à rapporter un faible niveau d'activité physique est élevée (Cassidy et al., 2017). Par exemple, la probabilité pour quelqu'un de normo-pondéré de pratiquer peu d'activité physique est de 1.23 (OR=1.23 ; CI [1.20–1.26]), tandis que pour quelqu'un en surpoids, la probabilité est de 1.66 (OR= 1.66 ; CI [1.61–1.71]), et pour quelqu'un en obésité morbide, c'est-à-dire avec un IMC  $> 40 \text{ kg/M}^2$ , cette probabilité est de 3.13 (OR=3.13 ; CI [2.95–3.32]). Ce qui signifie qu'une personne avec une importante surcharge

pondérale aurait près de 3 fois plus de chance qu'une personne normo-pondérée de pratiquer peu d'activité physique.

Ainsi, la compréhension des déterminants d'une pratique d'activité physique régulière est une question centrale, et qui l'est particulièrement pour cette population des personnes en surpoids et obèses, qui ont un risque de morbidité et mortalité plus important que les personnes normo-pondérées. Certains auteurs, comme Bauman et al., (2012) proposent que le comportement d'activité physique est corrélé et prédit par différentes dimensions organisées en cinq niveaux, allant de facteurs personnels à des facteurs globaux (voir Figure 1, p. 259, Bauman et al., 2012). Premièrement, les auteurs proposent un niveau très individuel qui comprend la génétique, et des dimensions psychologiques comme les croyances, les émotions ou encore la motivation (e.g., faire de l'activité parce que l'on aime cela, ou pratiquer de l'activité physique pour répondre à des attentes). Ensuite, ils proposent un niveau interpersonnel qui inclut les normes et pratiques liées à la culture tout aussi bien que l'influence des proches au niveau familial, professionnel et amical. Le troisième niveau concerne l'environnement de manière générale, allant de l'environnement social jusqu'à l'environnement au sens géographique du terme. L'avant dernier niveau concerne les politiques régionales et nationales comme les plans nationaux pour la promotion de l'activité physique ou les politiques de transports (e.g., promotion des transports actifs tels que la marche ou le vélo). Enfin le niveau le plus large, le niveau global s'intéresse à toutes les influences qui peuvent exister au niveau international, comme le développement économique, les médias ou encore les normes sociales et culturelles. Finalement, les auteurs proposent que l'activité physique est prédite par l'ensemble de ces facteurs opérant à différents niveaux.

Dans le cadre de cette thèse nous faisons le choix de nous positionner et de nous focaliser sur des déterminants globaux de l'activité physique, à savoir les normes sociales et les phénomènes associés comme la stigmatisation, et nous chercherons à croiser ces déterminants

avec des déterminants au niveau intra-individuel, en investiguant les effets de la stigmatisation liée au surpoids sur certains processus psychologiques en lien avec l'activité physique.

## **II. La norme du poids et les cibles de la stigmatisation liée au poids**

Les organismes de santé publique tels que l'Organisation Mondiale de la Santé (OMS) ou la Haute Autorité de Santé (HAS), établissent qu'un indice de masse corporelle (IMC) compris entre 18.5 et 25 représente un poids normal, tandis qu'au-delà de 25 d'IMC, la personne est caractérisée comme étant en surpoids, et au-delà de 30 d'IMC comme obèse. Aujourd'hui la surcharge pondérale, qu'elle soit modérée dans le cadre du surpoids ou plus importante dans le cadre de l'obésité, est considérée comme anormale malgré sa prévalence grandissante.

Les normes sociales perçues représentent l'interprétation des individus d'une norme collective ou dominante qui donne des informations sur ce qui est communément fait par autrui (i.e., normes descriptives), ou ce qui doit être fait (i.e., normes injonctives ou prescriptives) (Girandola & Fointiat, 2016). Il pourrait être légitime de penser que l'accroissement généralisé de ces situations pondérales, d'autant plus dans les régions du monde où le surpoids et l'obésité sont majoritaires (e.g., plus de 70% des adultes Américains sont en surpoids ou obèses en 2020, Wang et al., 2020), rendrait cet attribut normal et accepté socialement. Néanmoins, ce groupe social est largement discriminé, même dans ces pays (e.g., Lee et al., 2021), ce qui suggère que cette caractéristique est en décalage avec les attentes normatives de la société dans laquelle nous vivons. Ainsi, nous nous intéresserons particulièrement à la vision du poids dans les sociétés occidentales, qui semblent concevoir le surpoids et l'obésité comme déviant de ces attentes, cette thèse ayant été conduite dans ce cadre.

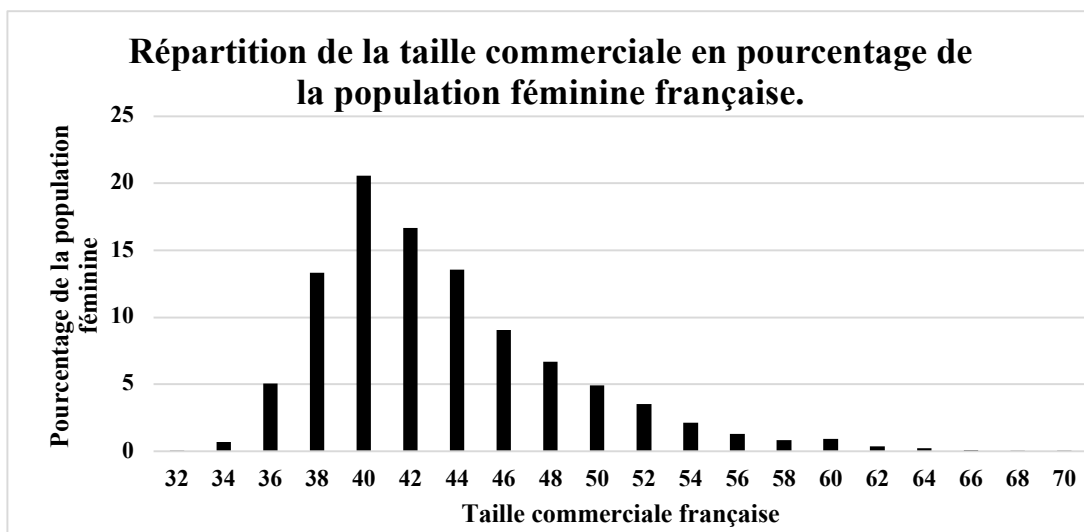
Les médias, que ce soit les médias de masse, les magazines, la télévision ou encore les réseaux sociaux, sont une source importante de diffusion de ces normes, et particulièrement, les effets des réseaux sociaux sur les normes sociales en termes de poids ont été largement

investigués ces dernières années (e.g., voir Grabe et al., 2008 pour une revue). Ainsi, un des déterminants les plus importants de l'image corporelle des jeunes femmes est la représentation omniprésente d'un type de corps idéalisé et souvent inaccessible, appelé « idéal de minceur » (i.e., *thin ideal* en anglais ; Grabe et al., 2008; Groesz et al., 2002; Want, 2009). Depuis une vingtaine d'années les femmes présentées dans les médias sont plus minces qu'elles ne l'ont été par le passé (e.g., Silverstein et al., 1986), plus minces que la population féminine actuelle (e.g., Fouts & Burggraf, 1999, 2000), et souvent plus minces que les critères de la maigreur - l'IMC moyen recommandé par les standards des agences de mode est de 16.22 pour les femmes, soit un IMC indiquant une maigreur modérée (FFN, 2016). Au point où exposer de manière chronique des participants à ces corps d'extrême minceur surreprésentés, sert même de condition expérimentale dans les études cherchant à investiguer l'effet de l'influence des médias sur les représentations de l'image corporelle (Tiggemann, 2011).

Dans son ouvrage *Les métamorphoses du gras : Histoire de l'obésité*, l'historien Georges Vigarello (2010), propose que la minceur prend son importance dès le XIII<sup>ème</sup> siècle, et que celle-ci est considérée comme un modèle social à partir du XV<sup>ème</sup> siècle. Cet idéal de minceur semble s'être largement imposé après la Seconde Guerre Mondiale dans les années 1950, lorsque la *haute couture* a commencé à céder de la place au *prêt-à-porter* (Volonté, 2019). Dans cet article l'auteur propose que l'industrialisation de masse de la mode vestimentaire serait à l'origine de l'idéal de minceur tel que nous le connaissons aujourd'hui, représenté par des mannequins extrêmement minces. Les vêtements en prêt-à-porter sont proposés à la consommation via un système de taille, qui permet aux industriels de produire des vêtements en grande quantité, pour le plus grand nombre de clients (i.e., production de masse, Mears, 2011; Wissinger, 2015). Toujours d'après cette autrice, il semblerait que le système de taille facilite la standardisation et la production des vêtements, par « (1) [la stabilisation des] mesures, et donc le fonctionnement des machines, le stockage, la distribution et la vente des

marchandises, réduisant ainsi les coûts ; (2) [la rationalisation de] l'utilisation des tissus, réduisant ainsi le gaspillage ; (3) [la simplification de] la variabilité du produit (en le limitant à un nombre fini de patrons correspondant au nombre de tailles), facilitant ainsi les changements et (4) il [simplifierait] le processus de conception parce qu'il [permettrait] la création de patrons par simple dérivation algorithmique à partir d'un seul patron original conçu sur une taille de base ». Ainsi, la production de vêtements au-delà de la taille américaine 12, soit une taille française 42, serait plus compliquée à standardiser et à produire pour les industriels, et par conséquent moins rentables pour eux. Cela pourrait être dans cette logique de rentabilité et de standardisation que l'idéal de minceur aurait été largement mis en avant par les industriels de la mode.

Il est intéressant de noter que la dernière campagne de mensurations des Françaises (Institut Français du Textile et de l'Habillement, 2006) a révélé que la taille moyenne de vêtements des femmes en France se situe entre la taille 40 et la taille 42, et que plus de 43.67% des françaises portent des tailles supérieures au 42, soit près de la moitié d'entre elles. En revanche seulement 5.77% des femmes françaises portent les tailles commerciales correspondant à la taille dite « mannequin » qui équivaut à une taille commerciale de 32 à 36 (voir figure 1).





**Figure 1.** Répartition de la taille commerciale en pourcentage de la population féminine française, basée sur les données de la campagne de mensurations de français de IFTH de 2006

De nos jours ces idéaux sont largement véhiculés par les réseaux sociaux tels que Instagram et TikTok, des réseaux qui sont utilisés par plus de 2.5 milliards et plus de 1.7 milliards d'utilisateurs respectivement dans le monde en 2023 (Statista, 2022, 2024). Sur ces réseaux, l'utilisation de hashtags (i.e., des mots clés précédés du symbole #), permet de catégoriser les contenus (e.g., photos, vidéos) postés par les utilisateurs.rices et de suivre leur nombre d'utilisations. Depuis quelques années l'idéal de minceur évolue et la dimension liée au fitness prend une part de plus en plus importante. En d'autres termes, il ne s'agit plus de seulement d'être mince, mais d'être mince et musclé.e (e.g., Bozsik et al., 2018; Novella et al., 2015), que ce soit chez les hommes, comme chez les femmes. Par exemple, le hashtag *fitness* a été utilisé plus de 532 millions de fois et le hashtag *fitnessmotivation* plus de 146 millions de fois. Ces contenus visent à motiver les individus à adopter un mode de vie plus sain en faisant de l'exercice et en mangeant sainement, afin d'atteindre les idéaux corporels. Les images représentent généralement des individus reflétant ces standards, vêtus de tenues d'entraînement dans divers contextes, qu'ils soient activement engagés dans un exercice ou non, et souvent accompagné d'un texte de motivation. Ces hashtags sont également régulièrement utilisés lors de la présentation d'aliments perçus comme sains (Carrotte et al., 2017; Tiggemann & Zaccardo, 2018). Ainsi, on peut remarquer que ces idéaux, masculins et féminins sont à l'opposé du surpoids et de l'obésité, et vont peut-être même plus loin en proposant une norme injonctive presque inatteignable. L'exposition chronique à des idéaux de minceurs, amènent les personnes concernées à intérioriser cette minceur comme un standard, comme une norme. Par exemple, Grabe et al. (2008) ont souligné dans leur méta-analyse réalisée sur 23 études indépendantes, une relation significative, entre l'exposition aux réseaux sociaux et

l'internalisation de l'idéal de minceur, avec une taille d'effet petite à moyenne (Cohen's  $d = .33$ ).

Mises en commun, les normes descriptives et injonctives du poids peuvent montrer une certaine dissonance quant à la normalité du surpoids et de l'obésité. En effet de manière descriptive, la surcharge pondérale est une situation de plus en plus courante qui est présente chez une part importante de la population mondiale. Néanmoins, les normes injonctives considèrent cet attribut comme anormal. Ainsi, le surpoids peut être établi au regard de l'idéal de minceur, présenté ci-dessus, et des personnes non-objectivement en surpoids pourrait être considérées comme tel ou se considérer comme tel car leur poids ne correspondrait pas à l'idéal de minceur proposé dans la société occidentale comme étant la norme.

« Le gros n'est plus que le gras »

Georges Vigarello, 2010

### **III. La stigmatisation liée au poids**

#### **1. Le surpoids comme stigmaté**

La stigmatisation n'est pas un phénomène récent, loin de là, et l'Histoire témoigne amplement de cette réalité. La stigmatisation a opéré et opère toujours envers de nombreux groupes sociaux, tous caractérisés par un attribut déviant de la norme sociale établie à un moment donné. Dévier des normes a de nombreuses implications pour les personnes concernées par la stigmatisation. En effet la stigmatisation entraîne des comportements négatifs, tel que du rejet, de la discrimination, ou la transmission de stéréotypes négatifs pouvant résulter en inégalités structurelles, en actions négatives actives et passives (e.g., discrimination à l'embauche et moqueries), et bien d'autres conséquences au niveau des individus eux-mêmes, et ceux, quelle que soit la raison de la stigmatisation. L'attribut à l'origine de la stigmatisation,

soit cet attribut déviant, appelé stigmaté, marque un écart avec les attentes normatives de la société et des personnes qui la constitue. Erving Goffman (1963), un des pionniers des travaux sur la stigmatisation, a proposé trois types de stigmatés : 1) ceux liés à des déformations externes, par exemple dans le cas de cicatrices, de traces visibles de maladies ou de handicap physique ; 2) ceux liés à des troubles ou déviances mentales ou comportementales, comme les addictions ou des antécédents criminels ; enfin 3) ceux liés à la nationalité, les origines, ou encore la religion. D'après cette catégorisation, le surpoids et l'obésité feraient partie du premier type de stigmaté, soit celui lié à des caractéristiques externes. De plus, une définition plus récente du stigmaté (Crocker et al., 1998) met l'accent sur la perception de l'attribut déviant, en précisant que "les individus stigmatisés possèdent (ou sont supposés posséder) un attribut ou une caractéristique qui véhicule une identité sociale dévalorisée dans un contexte social particulier" (p. 505). Cette conceptualisation est supportée par la définition de la stigmatisation liée au poids proposée par Major et al., (2018), comme étant « la dévalorisation sociale et le dénigrement omniprésents des personnes perçues comme ayant un excès de poids », ou encore comme étant « la dévalorisation sociale et le rejet des personnes qui ne se conforment pas aux idéaux culturels dominants en matière de poids et d'apparence physique » (Epel et al., 2014). Mises en commun, ces quatre définitions s'accordent sur des éléments majeurs à savoir que 1) la surcharge pondérale est une caractéristique visible et perçue (i.e., saillante) par autrui, et que 2) les personnes étant en surpoids, ou étant perçues comme tel, ont une identité sociale dévalorisée, et qu'elles sont ainsi dévalorisées et dénigrées par les autres membres de la société. Revenons plus en détails sur ces deux points.

## **2. La saillance du surpoids dans la formation d'impressions**

A priori, il semble que le surpoids est une caractéristique largement perceptible par autrui, d'autant plus que la stigmatisation liée au poids est un phénomène fréquent (e.g., Puhl et al.,

2008). Les caractéristiques physiques des individus jouent un majeur dans la formation d'impressions (Fiske et al., 1999; Knapp & Hall, 1972). Selon l'approche des modèles duaux de la formation d'impressions, celle-ci s'étend des impressions basées sur des catégories à des impressions individualisées (Brewer & Feinstein, 1999; Fiske et al., 1999). De plus, selon le modèle du continuum (i.e., *continuum model* en anglais), l'utilisation d'informations catégorielles (i.e., liée à des catégories) semble être une étape initiale et cruciale de ce processus (e.g., Fiske et al., 1999). En effet, les individus ont tendance à recourir à la pensée catégorielle lorsqu'ils évaluent autrui, cherchant à minimiser leurs efforts (Moskowitz, 2005). Cependant, tous les attributs catégoriels ne sont pas équivalents en terme de saillance (Fiske & Neuberg, 1990; Higgins, 1996), c'est-à-dire qu'ils ne sont pas tous visibles et accessibles cognitivement de la même manière pour un observateur. De nombreuses études ont souligné l'existence de catégories primaires, automatiquement activées et priorisées dans la formation d'impressions. Ces catégories comprennent le sexe et l'origine ethnique (e.g., Brewer et al., 1987), et l'âge (Klauer et al., 2002). La saillance élevée de ces catégories peut s'expliquer par leur accessibilité « chronique » due à leur visibilité immédiate ainsi qu'à leur fréquence d'activation (i.e., soit à l'applicabilité du concept lié à la catégorie ; Fiske & Neuberg, 1990 ; Higgins, 1996), ou par la croyance répandue que, dans notre société, cette catégorie est naturelle (e.g., Demoulin et al., 2006). Plus une catégorie est perçue comme naturelle, plus elle sera essentialisée, et par définition l'essentialisation est l'acte de réduire un individu à une catégorie. C'est-à-dire que plus la catégorie d'appartenance du groupe social est perçue comme étant naturelle, plus les individus de ce groupe seront réduits à cet attribut partagé (e.g., le sexe ou encore la couleur de peau sont considérés comme des catégories naturelles, car ce ne sont pas des catégories choisies, et peuvent être connues sous le nom de catégories sociales forcées). A l'inverse, les catégories non naturelles qui dépendent alors de choix et d'un certain contrôle (i.e., *chosen social category* en anglais), semblent partager une forte entitativité, qui est associée un partage

de caractéristiques communes fortes entre les membres du groupe. Cela signifie que les personnes d'un groupe social choisi, sont perçues comme partageants d'importants attributs semblables, ce qui les fait former un groupe social à part entière, de par leurs ressemblances.

Par ailleurs, les caractéristiques non-normatives peuvent également être particulièrement saillantes (e.g., Klauer et al., 2002). Par exemple, Louvet et Rohmer (2006) ont constaté que le handicap physique était de loin la caractéristique la plus saillante chez les individus portant cet attribut. Dans cette étude, les participants avaient à décrire des cibles comme s'ils essayaient de les faire deviner à un partenaire de jeu au *Qui Est-ce ?*<sup>1</sup>. Les participants devaient faire deviner à un partenaire fictif « l'identité d'un personnage dessiné sur une carte en ne donnant qu'un élément descriptif à la fois », sachant que le partenaire disposait d'un ensemble de cartes supposées contenir des dessins de différents personnages. Le but étant que le partenaire découvre le plus rapidement possible la carte / le personnage décrit. Pour cela chaque participant était autorisé à utiliser quatre mots pour décrire la cible, et devait décrire une unique cible. Leurs résultats ont révélé que les cibles affectées d'un handicap physique étaient décrites comme « en situation de handicap » avant d'être décrites par leur sexe ou leur couleur de peau. Cette caractéristique était systématiquement utilisée pour décrire ces cibles, et à l'inverse, aucune cible « valide » n'était décrite par son absence de handicap. De plus, la saillance du handicap physique n'était en rien diminuée par d'autres appartenances à des catégories non-normatives : le handicap physique était tout aussi important chez les cibles de sexe féminin et masculin et chez les cibles à la peau blanche et noire. Ces résultats ont été interprétés comme étant dus à la nature non normative du handicap physique, à la fois numériquement (le handicap physique est rare) et, plus important encore, socialement (le handicap physique est socialement dévalorisé, e.g., Rohmer & Louvet, 2018). En résumé, la littérature suggère que les caractéristiques peuvent être particulièrement saillantes lorsqu'elles sont visibles, perçues

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<sup>1</sup> Hasbro. (2023). Who is it? [Board game]

comme rares et/ou socialement dévalorisées (e.g., Rohmer & Louvet, 2009). Toutefois, à notre connaissance, nous ignorons encore dans quelle mesure ce mécanisme peut également s'appliquer au surpoids et à l'obésité, et à quel point la surcharge pondérale est saillante dans le processus de formation d'impressions.

### **3. Stéréotypes, préjugés et discrimination**

Le surpoids et l'obésité en tant que stigmates sont associés à des conséquences sociales importantes. Les personnes en surcharge pondérale se voient attribuer des stéréotypes négatifs qui peuvent conduire à un traitement injuste (i.e., discrimination), et à des préjugés (Link & Phelan, 2001). Ces croyances partagées sur les caractéristiques personnelles, comme des traits de personnalité, mais aussi des comportements des personnes en surpoids et obèses (i.e., stéréotypes, Leyens et al., 1994), sont multiples. Plus précisément, nombre de ces stéréotypes (i.e., dimension cognitive des relations intergroupes) envers les personnes en surpoids et obèses sont négatifs. Il est important de considérer la dimension affective consécutive à ces stéréotypes (e.g., « je les aime » ou « je ne les aime pas »), les préjugés. Précisément, les préjugés sont des attitudes affectives, souvent négatives, à l'égard d'un groupe social en raison de leur appartenance à ce groupe (Yzerbyt & Benoite, 2018). Ils sont donc la dimension affective des relations intergroupes. Par exemple « je n'aime pas vraiment les personnes en surpoids » est un préjugé, alors que « les personnes en surpoids sont feignantes » est un stéréotype. Il peut être néanmoins intéressant de noter que les termes de stéréotypes et de préjugés sont souvent utilisés de manière indistinctes, même si par définition ces concepts sont différents.

Les croyances négatives envers les personnes en surpoids et obèses ont fait l'objet de diverses recherches, et des caractéristiques communes ont été attribuées à ce groupe social. Un questionnaire largement utilisé dans la littérature pour mesurer les attitudes envers les

personnes en surpoids et obèses, a été proposé par Crandall (voir Table 1, Crandall, 1994) et comporte trois dimensions.

La première dimension « aversion » (i.e., *dislike* en anglais), comporte des items comme « *Je n'aime pas beaucoup les personnes en surpoids* » ou encore « *Je n'ai pas beaucoup d'amis qui sont en surpoids* ». Cette première dimension fait référence à la littérature sur la perception des personnes avec une surcharge pondérale. Ainsi, les personnes en surpoids seraient perçues comme étant peu séduisantes ou attirantes (e.g., Harris et al., 1982) et peu sympathiques (Goodman et al., 1963). Une étude plus récente (Wu et al., 2021) réalisée auprès de 253 jeunes femmes chinoises montrent que les jeunes femmes avec une conception de la beauté restreinte autour de la minceur avaient une forte aversion envers les personnes en surpoids ( $\beta = -.20$ ,  $p < 0.01$  ; il n'y avait pas de relation significative dans les dimensions peur du gras et volonté). De plus, les personnes en surpoids sont fréquemment discriminées à l'embauche, et ont moins de chance d'obtenir un emploi par rapport à des personnes normo-pondérées. Par exemple, Morris (2007) a proposé que les préjugés envers les personnes en surpoids amenaient les employeurs à éviter de recruter les personnes en situation de surcharge pondérale car ces personnes sont perçues comme inefficaces et incompetentes, ou parce qu'elles pourraient être moins rentables à cause des comorbidités associées à leur poids. Ainsi, certains employeurs considèrent que les personnes en surpoids n'arriveraient pas à contrôler leurs comportements pour réguler leur poids, ce qui conduit à des attitudes négatives à l'égard de leurs actions (Lane et al. 2020). En d'autres termes que leur surpoids serait le reflet de leur paresse, de leur manque de stabilité émotionnelle et de leur faible maîtrise d'eux même (i.e., contrôle de soi, Khan et al., 2023).

La deuxième dimension « peur du gras » (i.e., *fear of fat* en anglais) inclut des items comme « *Je me sens dégoûté.e de moi-même lorsque je prends du poids* » ou encore « *L'une des pires choses qui pourraient m'arriver serait de prendre 10 kg* ». Elle concerne la peur de prendre soi-

même du poids et de se retrouver en situation de surpoids ou d'obésité (Crandall, 1994). Cette appréhension pourrait découler du fait qu'en prenant du poids, les individus risqueraient de ne plus être perçus comme ayant un poids considéré comme "normal". Ils pourraient alors être catégorisés comme déviants, suscitant ainsi la crainte de faire partie de ce groupe largement stigmatisé et entouré de préjugés négatifs. Par exemple, Vartanian et al. (2006) ont montré qu'une proportion importante des participants à leur étude indiquait qu'ils étaient prêts à endurer des événements de vie aversifs afin d'éviter d'être obèses. Dans leur échantillon, 46 % des participants ont reporté qu'ils préféreraient perdre une année dans leur vie plutôt que de devenir obèses, et 30 % d'entre eux ont déclaré qu'ils préféreraient divorcer plutôt que d'être obèses.

La troisième dimension « volonté » (i.e., *willpower* en anglais) intègre des items comme « *Les personnes en surpoids pourraient perdre au moins une partie de leur surcharge pondérale en faisant un peu d'exercice physique* », renvoie au fait qu'il est généralement admis que les personnes en surpoids sont souvent perçues comme ayant un manque de contrôle de soi ou de volonté (i.e., *self-control*), ou encore qu'elles sont paresseuses, ce qui les tient responsables de leur statut pondéral (e.g., Puhl & Brownell, 2001; Puhl & Heuer, 2009 pour une revue; Schwartz et al., 2006). Cependant, la notion de "volonté" n'est pas définie de manière précise, et de nombreuses études se réfèrent à l'article de Crandall (1994) qui introduit cette idée de volonté dans son questionnaire sur les croyances envers les personnes en surpoids. Il est important de noter que, malgré son rôle prépondérant, le concept de volonté n'est pas explicitement défini dans l'étude de Crandall. Ainsi, la stigmatisation liée au poids s'appuierait sur ces trois dimensions, et l'ensemble de ces croyances négatives à l'égard des personnes perçues en surpoids conduirait à leur discrimination ainsi qu'à diverses conséquences négatives sur leur santé et leur qualité de vie.

Il est intéressant de faire un parallèle avec la partie précédente (II.). La poursuite de l'idéal de minceur amène à des préoccupations par rapport à son poids (Killen et al., 1994), qui sont le



socle de nombreux troubles (e.g., troubles du comportement alimentaire) qui peuvent être exprimés par les items suivants, utilisés dans les questionnaires adressant cette dimension : « A quel point avez-vous peur de prendre 3 kg ? », « Vous sentez-vous en surpoids ? », « Quand avez-vous fait pour la dernière fois un régime ? », « En comparaison d'autres choses dans votre vie, à quel point votre poids est important pour vous ? » (Killen et al., 1994), ou encore « A quel point êtes-vous préoccupé.e par le fait de surveiller votre poids ? » et « A quel point êtes-vous préoccupé.e par le fait d'être mince ? » (Fishbach et al., 2003). Nous pouvons remarquer que ces énoncés se rapprochent des sous-dimensions des attitudes envers les personnes en surpoids. Cela sous-entend que les personnes préoccupées par leur poids s'appliquent les mêmes croyances que les personnes objectivement en surpoids. Elles seraient alors ainsi, elles aussi, la cible potentielle de la stigmatisation liée au poids telle que décrite ci-après.

#### **IV. Les mécanismes d'action de la stigmatisation liée au poids**

Il a été mis en évidence que la stigmatisation liée au poids affecte les personnes ciblées par le biais de différents processus majeurs (e.g., Major et al., 2018) qui sont 1) la discrimination perçue (ou stigmatisation), 2) l'intériorisation des préjugés liés au poids et 3) les préoccupations relatives à la stigmatisation du poids. Les personnes qui vivent au sein d'une culture véhiculant une représentation négative des personnes en surpoids, comme les sociétés occidentales, prennent conscience que la surcharge pondérale est socialement dévalorisée et associée à des stéréotypes péjoratifs. Dans le cadre de la socialisation culturelle, les personnes développent dès le plus jeune âge des croyances autour du fait que le « surpoids est mauvais » (e.g., Davison & Birch, 2004). Cette conscience générale, qu'une part importante de la population méprise et supporte des croyances négatives à l'encontre des personnes avec une surcharge pondérale, fait que la stigmatisation liée au poids est aussi bien conscientisée par des personnes en surpoids comme par des personnes qui ne le sont pas (Puhl, Moss-Racusin, et al., 2008).

La discrimination perçue par les personnes en surpoids et obèses, ou par celles qui se perçoivent comme tel, peut être définie comme un traitement négatif par rapport au stigmaté du surpoids (Major et al., 2018; Romano et al., 2018). Il peut prendre la forme de discriminations interpersonnelles, d'exclusion, de rejet, de moqueries, ou de formes de discriminations à plus larges échelles comme des politiques ou programmes qui désavantagent les personnes en surpoids par rapport aux autres (e.g., le coût des ambulances bariatriques est très important, et est quasiment 10 fois plus onéreux que celui pour des ambulances conventionnelles, et non pris en charge par les assurances ou la sécurité sociale, SENAT, 2022). Aussi, les comportements de discrimination envers les personnes en surpoids semblent être fréquents. Par exemple Vartanian et al. (2014) ont montré auprès de 46 personnes en surpoids ou obèses sur une période de deux semaines, que ces individus reportaient en moyenne 11.12 épisodes de stigmatisation perçue, soit presque un par jour.

L'internalisation des préjugés, aussi connue sous le terme d'« auto-stigmatisation » (i.e., *self-stigma* en anglais), est la tendance à accepter et à s'appliquer des croyances basées sur les stéréotypes et préjugés associés au stigmaté lié au poids (Hilbert et al., 2014; Major et al., 2018). Comme les personnes normo-pondérées, les personnes en surpoids intériorisent les stéréotypes et préjugés à l'encontre de leur groupe social. Ce mécanisme pernicieux, amène les personnes en surpoids à afficher elles aussi des niveaux importants d'attitudes négatives envers les personnes en surpoids (Schwartz et al., 2006). Cela est d'autant plus vrai lorsque la croyance des personnes en surpoids envers la responsabilité du surpoids est importante (i.e., dimension volonté ; Crandall, 1994). Cette internalisation peut être mesurée à l'aide d'items tels que « *C'est de ma faute si je suis en surpoids* » ou « *Si seulement j'avais plus de volonté, je n'aurais pas le poids que j'ai* » (WBIS, Latner & Durso, 2008) qui soulignent la responsabilité du surpoids, ou des items tels que « *Je me déteste d'être en surpoids* » (WBIS) ou « *Je suis en*

*situation de surpoids parce que je suis une personnes faible* » (WSSQ, Lillis et al., 2010) qui exprime notamment une faible estime de soi.

Enfin, les préoccupations relatives à la stigmatisation liée au poids (que l'on peut aussi connaître sous la dénomination de menace de l'identité sociale dans le cadre général de la stigmatisation) sont un état psychologique déclenché par une situation, dans laquelle les individus craignent d'être dévalorisés, rejetés, stéréotypés négativement ou discriminés en raison de leur identité sociale de personne en surpoids (Major et al., 2018). L'identité sociale se réfère à la composante de la perception de soi d'un individu qui émerge de son sentiment d'appartenance à une catégorie sociale ou à un groupe social particulier. Lorsqu'une personne s'identifie comme étant en surpoids (qu'elle le soit objectivement ou non), ou perçoit que les autres la voient ainsi, cette identification devient une composante de son identité sociale partagée avec d'autres individus également perçus comme étant en surpoids. Il est important de noter que même si ces personnes ne partagent pas personnellement les stéréotypes négatifs associés aux individus en surpoids, elles peuvent néanmoins ressentir cette crainte d'être stigmatisée en raison de leur identité sociale.

Ainsi, il est intéressant de souligner que la stigmatisation liée au poids existe chez les personnes en surpoids et obèses (i.e., qui le sont d'après leur IMC) comme chez celles et ceux qui ne le sont pas objectivement mais qui peuvent être perçus comme tel par elles-mêmes ou par autrui (i.e., norme injonctive du poids) (Puhl et al., 2008). A l'inverse, ne pas s'identifier au groupe social pourrait prévenir de cette stigmatisation. Par exemple, l'exposition à des médias véhiculant des messages stigmatisant envers le surpoids entraînerait une conséquence comportementale uniquement chez les femmes se percevant comme étant en surpoids (e.g., augmentation de la consommation de calories, Major et al., 2014).

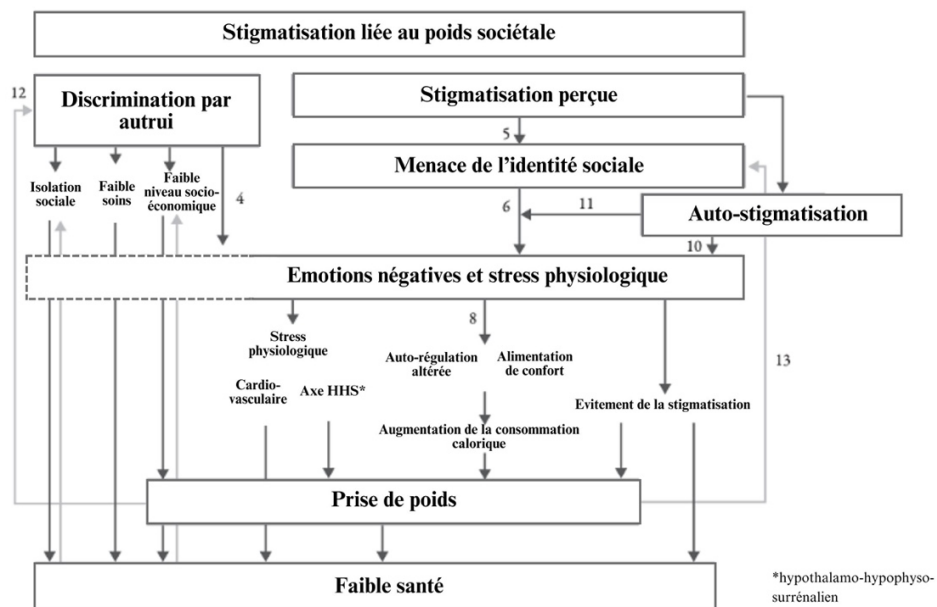
## 1. Les relations entre les mécanismes de la stigmatisation liée au poids et leurs conséquences sur la santé

Au cours des dernières années, de nombreuses recherches se sont intéressées aux conséquences de la stigmatisation liée au poids envers la santé des personnes qui en sont la cible. Les conséquences le plus souvent reportées sont : une faible santé mentale, une augmentation du stress, un risque accru de dépression, un risque de mortalité précoce, et également des conséquences sur le plan comportemental, comme l'adoption de comportements pathogènes tels que la consommation excessive de calories, ou encore une faible pratique d'activité physique (e.g., Puhl & Heuer, 2009, 2010; Romano et al., 2021). Cela suggère qu'en plus de contribuer à une altération de la santé, la stigmatisation liée au poids pourrait aussi réduire l'espérance de vie.

Un récent modèle proposé par Major et al. (Voir Figure 27.1, 2018 ; voir Figure 2 ci-dessous), cherche à illustrer l'effet de la stigmatisation liée au poids sur la santé, en représentant les effets directs et indirects des trois processus présentés précédemment (i.e., stigmatisation perçue, internalisation des préjugés, menace de l'identité sociale).

Plus précisément, le modèle illustre les différentes voies par lesquelles la stigmatisation liée au poids pourrait avoir un impact négatif sur la santé mentale et physique. La stigmatisation liée au poids au niveau sociétal est le point de départ de ce modèle. Il suggère ensuite que la discrimination des personnes étant perçue en surpoids (ou stigmatisation perçue dans le modèle) génère chez les personnes ciblées différentes émotions négatives en même temps qu'elle amène à de l'isolement social, à de moins bonnes prises en charge par les professionnels de santé, ainsi qu'à une diminution de leur statut socio-économique à cause de faibles opportunités et d'accès limités à certaines infrastructures (e.g., accès aux soins de qualité, accès limité à des environnements sains et où les personnes se sentent en sécurité). Le modèle propose par ailleurs que même sans discrimination perçue (i.e., stigmatisation perçue), la simple crainte de la

stigmatisation liée au poids pourrait elle aussi altérer la santé (i.e., menace de l'identité sociale), mais aussi renforcer les conséquences négatives de la discrimination. L'augmentation du stress et des émotions négatives engendrées par cette crainte d'être stigmatisé.e pourrait ensuite amener à une réactivité physiologique accrue, par une augmentation des marqueurs du stress physiologiques (e.g., cortisol), une altération du contrôle de soi (voir Chapitre 3), ainsi qu'à l'adoption d'une alimentation de confort, qui peut s'avérer pathogène comme la boulimie, et à l'adoption de comportements d'évitement de la stigmatisation (e.g., l'évitement de la pratique d'activité physique en public, l'évitement du corps médical ou encore amené à un retrait social). Ce modèle suggère également des effets bidirectionnels, indiquant que ces mécanismes peuvent contribuer à la prise de poids mais tout aussi bien entraver la perte de poids. Enfin, l'internalisation des préjugés, pourrait générer du stress et des émotions négatives, et ainsi exacerber les effets négatifs de la menace de l'identité sociale sur la santé.



**Figure 2.** Modèle théorique illustrant les voies par lesquelles la stigmatisation et la discrimination liées au poids peuvent nuire à la santé psychologique et physique (Major et al., 2018, traduction libre).

## **V. L'effet délétère de la stigmatisation liée au poids envers l'activité physique**

Nous nous intéresserons ici à l'effet de la stigmatisation liée au poids sur le comportement d'activité physique. Un nombre de recherche croissant s'est intéressé à l'implication de la stigmatisation liée au poids envers l'engagement dans l'activité physique, et cette problématique a été dans un premier temps particulièrement investiguée chez les jeunes. Par exemple, dans une étude portant sur 361 adolescents participant à un programme de perte de poids dans un centre spécialisé (Puhl et al., 2013), 73% d'entre eux ont reporté avoir été victimes de moqueries ou d'insultes à propos de leur poids lorsqu'ils pratiquaient de l'activité physique à l'école. De plus, près de la moitié d'entre eux (i.e., 42%) ont également indiqué avoir subi le même traitement de la part d'enseignants ou entraîneurs sportifs. Ces résultats sont supportés par ceux d'une autre étude réalisée sur 1555 adolescents, dont 85% d'entre eux ont déclaré avoir été victimes de propos discriminatoires à propos de leurs poids dans le cadre d'activités physiques et sportives à l'école (Puhl et al., 2013). Comme nous pouvons le deviner le fait d'être victime de moqueries sur son poids que ce soit à l'école ou pendant des séances d'activité physique limite l'engagement des jeunes dans des activités physiques subséquentes. Ainsi, les enfants stigmatisés rapportent des niveaux d'activité physique plus faibles que les enfants qui ne l'ont pas été ( $F(4, 1384) = 2.58, p < .05, \eta^2 = .007$ ) (Greenleaf et al., 2014). Même si les recherches sur l'implication de la stigmatisation liée au poids envers l'engagement dans l'activité physique chez les adultes ont été initialement moins nombreuses, les études qui ont investigué cette relation montrent des résultats similaires à ceux trouver chez les enfants. Par exemple, Vartanian & Novak (2011) ont investigué auprès de 111 participants en surpoids ou obèses l'effet de la stigmatisation liée au poids envers l'évitement de l'activité physique. Leurs résultats montrent que la stigmatisation liée au poids prédit positivement l'évitement de l'exercice ( $\beta = 0.46, P < 0.001$ ), et que cet effet était particulièrement important pour les

participants avec de fortes attitudes négatives envers le surpoids ( $t = 6.01$ ,  $P < 0.001$  vs.  $t = 2.80$ ,  $P = 0.006$ , pour ceux avec de faibles attitudes négatives). Une autre étude (Phibbs et al., 2019) réalisée auprès de 19382 participants de plus de 50 ans a pu mettre en évidence que les personnes subissant de la discrimination liée à leur poids avaient une probabilité plus faible que les personnes qui n'en étaient pas la cible de pratiquer une activité physique d'intensité soutenue (OR=.79,  $p < .01$ , CI [.66 - .94]), de même que pour une activité physique d'intensité modérée (OR=.76,  $p < .01$ , CI [.62 - .92]).

Ces résultats sont corroborés par ceux d'une récente revue systématique (Pearl et al., 2021), incluant 29 études sur les adultes et 9 études sur les jeunes (pour un total de 38 articles inclus), qui met en avant un effet délétère de la stigmatisation liée au poids envers l'activité physique, et cela particulièrement dans le cadre de discrimination perçue (e.g., moqueries), de discrimination récurrente (i.e., quotidienne) ou encore de forte internalisation des préjugés.

Néanmoins, ces études ne proposent pas de mécanisme explicatif quant à la relation négative existant entre la stigmatisation liée au poids et l'activité physique, que ce soit chez les jeunes ou les adultes. D'autant plus que la stigmatisation liée au poids est également associée positivement avec la motivation de perdre du poids (e.g., Major et al., 2020). Ainsi, il est légitime de se demander pourquoi une population qui a tant besoin de pratiquer de l'activité physique, est néanmoins une des populations les moins actives. Au travers des deux chapitres suivants de cette thèse nous nous intéresserons aux mécanismes qui peuvent expliquer cette relation entre stigmatisation liée au poids et activité physique.

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## Chapitre 2. Le contrôle de soi comme déterminant de l'activité physique

### I. Le conflit motivationnel

Comme nous l'avons vu dans le chapitre précédent, la stigmatisation liée au poids peut avoir tendance à limiter la pratique d'activité physique, et semble être un frein à l'engagement dans ce comportement de santé néanmoins essentiel. La stigmatisation pourrait agir à l'encontre de l'engagement dans l'activité physique même chez des individus qui ont la ferme intention d'être physiquement actifs. Cette stigmatisation des personnes perçues comme étant en surpoids ou obèses peut ainsi s'opposer à des processus motivationnels qui eux favorisent l'activité physique. Les forces qui déterminent nos comportements peuvent être de deux natures, elles peuvent soit faciliter le comportement souhaité en lien avec notre objectif à long terme, comme pratiquer une activité physique régulière, soit à l'inverse prévenir ce comportement à cause d'une motivation pour un objectif à plus court terme que l'on pourra nommer tentation (e.g., éviter de pratiquer de l'activité physique en public par crainte d'être stigmatisé.e à cause de son poids). Par définition les tentations résultent de désirs (i.e., une force qui dirige le comportement vers des stimuli associés à une récompense immédiate) qui motivent un certain comportement, et plus spécifiquement de désirs qui s'opposent à un but à long terme (Hofmann & Van Dillen, 2012)<sup>1</sup>.

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<sup>1</sup>Plus précisément, Kotabe et Hofmann (2015) définissent le désir comme *“a driving force that begins as a subcortically mediated visceral state of “wanting”, usually followed by cognitive elaboration, that directs a person toward immediate reward-related stimuli”* et le conflit entre un désir et un but comme *“A desire-goal conflict is a form of response conflict caused by the coactivation of a given desire and an at least partly incompatible higher order goal. Desire-goal conflict turns desire into temptation and the higher order goal into a self-control goal.”*

Le terme tentation pourrait faire penser qu'il se cache une valence positive derrière le comportement qu'elle motive. Néanmoins, si la littérature laisse entendre que l'objet de la tentation est directement gratifiant et positif (i.e., utilisation du terme « *reward* » qui veut dire récompense), nous ne pouvons expliciter si seule l'atteinte d'un comportement pour le comportement lui-même peut être défini comme une tentation (e.g., manger des bonbons alors qu'on cherche à perdre du poids), ou si l'évitement du but à long terme en réalisant un comportement donné (e.g., rester chez soi, afin éviter de faire une séance de balnéothérapie de peur d'être jugé par rapport à son poids) peut aussi être considéré comme une tentation.

De l'opposition de telles forces résulte un conflit motivationnel (Duckworth et al., 2018; Forestier, de Chanaleilles, Deschamps, et al., 2022; Kotabe & Hofmann, 2015), dont la résolution prédira le comportement, soit en faveur du comportement souhaité (e.g., faire de l'activité physique) soit en faveur du comportement opposé (e.g., rester dans son canapé). Plus particulièrement, il est communément admis que le comportement à long terme (i.e., motivation distale) est important pour le soi et que son atteinte vaut la peine d'outrepasser des motivations, impulsions ou tentations qui offriraient une gratification à court terme (i.e., motivation proximale), en opposition avec ce but à long terme (e.g., de Ridder et al., 2017, p.35-46).

Bien que l'idée selon laquelle le comportement humain dépend du contrôle de forces motivationnelles immédiates et situationnelles en concurrence les unes avec les autres ait déjà été largement discutée dans la littérature (Eysenck, 1952; Lewin, 1943), l'étude de ces conflits motivationnels est néanmoins peu commune dans le cadre de la recherche sur les changements de comportements. Un pan de la littérature sur les modèles du changement de comportements de santé s'est intéressé aux modèles pré-intentionnels comme la théorie du comportement planifié (*theory of planned behavior*, Ajzen, 1991). Ces modèles prennent peu en considération la question du conflit motivationnel. Ils proposent que les individus forment des projections cognitives (i.e., attentes) des conséquences associées à la réalisation de certains comportements. Dans ce contexte, la régulation du comportement repose essentiellement sur l'importance accordée aux attentes, et une valorisation plus importante de ces projections augmente la probabilité d'adoption du comportement en question.

Certains modèles du changement de comportements de santé se sont intéressés aux processus post-intentionnels et ont investigué comment certains obstacles peuvent altérer les forces motivationnelles qui facilitent l'adoption d'un comportement de santé, comme c'est le cas, par exemple, dans le modèle *Heath Action Process Approach* (HAPA, Schwarzer & Luszczynska, 2008). Le modèle du HAPA prend en considération le conflit motivationnel que

les obstacles peuvent engendrer, ainsi que leur résolution lorsqu'ils sont prévus ou prévisibles notamment par le biais de stratégies de planification des adaptations (i.e., *coping planning* en anglais, qu'est-ce que je vais concrètement mettre en place pour dépasser les obstacles rencontrés, dont les forces motivationnelles opposées au but font partie) et de contrôle des actions (i.e., *action control* en anglais, qui est une réévaluation continue du comportement). Dans ce modèle il est également proposé que l'auto-efficacité à faire face à des obstacles prévus, soit la croyance d'une personne dans sa capacité à outrepasser ces obstacles, est un médiateur des forces motivationnelles facilitatrices du comportement. C'est également le cas dans le modèle transthéorique (*transtheoretical model* en anglais), qui intègre dans son modèle une étape de résolution de conflit, sous le terme de « contrôle des stimuli » (*stimulus control*, Grimley et al., 1994).

Les modèles du contrôle de soi développés en psychologie sociale vont encore plus loin dans la prise en considération des conflits motivationnels (e.g., Stroebe et al., 2013), ainsi que dans la considération des moyens de résoudre ces conflits (Hofmann & Kotabe, 2012), et également des conditions limites de leur résolution (Forestier, de Chanaleilles, Boisgontier, et al., 2022). Quelques études empiriques soulignent l'argument selon lequel les forces facilitatrices et préventives, interagissent pour prédire le comportement salutogène, et que les conflits motivationnels peuvent limiter l'atteinte des buts à long terme.

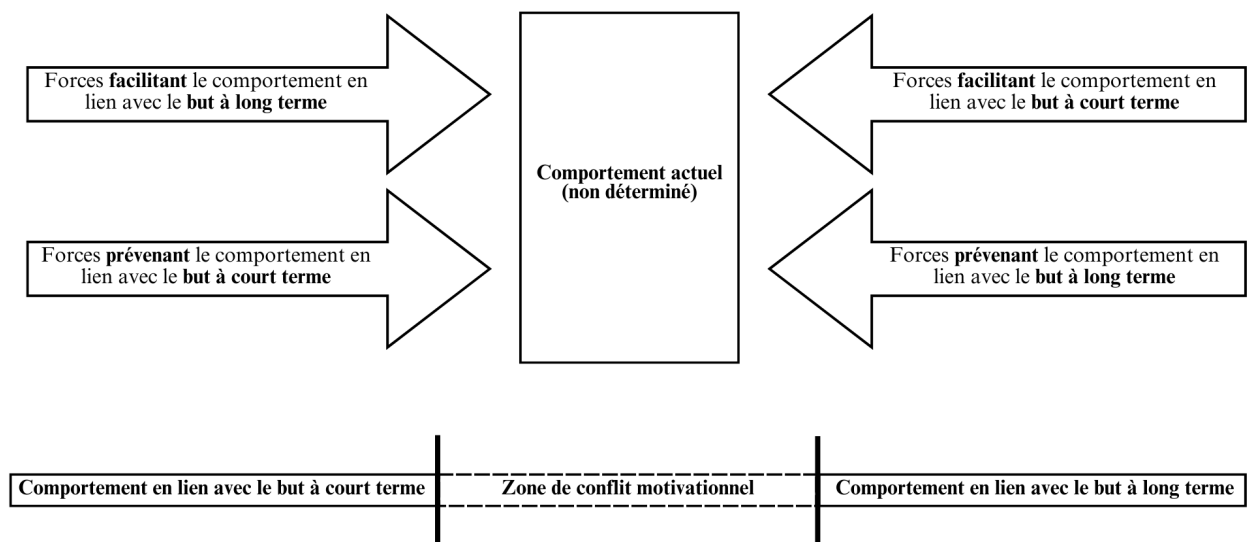
Par exemple, Vaughan et al. (2018) ont conduit une étude auprès de 982 adultes (76.5% de femmes) qui cherchait à identifier des profils d'individus avec plus ou moins de forces facilitatrices ou préventives des comportements d'activité physique et alimentaires. Dans le cadre de l'activité physique, ils ont pu mettre en évidence l'existence de quatre profils de personnes, avec un profil 1) « moyen » où les individus avaient des forces facilitatrices (e.g., intention, soutien social, normes sociales) moyennes, une auto-efficacité à surmonter les obstacles légèrement en dessous de la moyenne et des forces préventives du comportement



d'activité physique légèrement au-dessus de la moyenne. Puis un profil 2) « positif » où les individus avaient d'importantes forces facilitatrices envers l'activité physique, des forces préventives élevées mais moins que les forces facilitatrices, et une forte auto-efficacité à surmonter les obstacles. Les individus du troisième profil 3) « faibles barrières et bénéfiques », avaient peu de forces facilitatrices envers l'activité physique et avaient une auto-efficacité à surmonter les obstacles en dessous de la moyenne, ainsi que des forces préventives du comportement d'activité physique importantes. Enfin, les participants du dernier profil, 4) « attitudes négatives envers l'activité physique » reportaient des attitudes négatives envers l'activité physique (i.e., pas ou peu de forces facilitatrices envers ce comportement) et un faible sentiment d'auto-efficacité quant à leur capacité à surmonter les barrières à la pratique d'activité physique, ils reportaient également des barrières moyennes envers l'activité physique. Ainsi, les personnes du profil n°2 ayant d'importantes forces motivationnelles facilitatrices et un sentiment d'auto-efficacité à surmonter les obstacles envers l'activité physique également important, malgré la perception de barrières à surmonter, étaient plus susceptibles d'adopter des comportements actifs.

Une autre étude (Presseau et al., 2013) portant sur la poursuite des buts en terme d'activité physique, a investigué si la perception de forces facilitatrices et des conflits motivationnels pouvait prédire le niveau d'activité physique mesuré sur sept jours à l'aide d'accéléromètres (i.e., mesure directe du niveau d'activité physique). Leurs résultats ont montré que la perception de forces facilitatrices sans percevoir de conflit motivationnel prédisait positivement le niveau d'activité physique d'intensité modérée à intense (i.e., *moderate to vigorous physical activity* en anglais, MVPA). A l'inverse, la poursuite de buts contradictoires (e.g., passer beaucoup de temps à travailler pour obtenir une promotion et faire une heure d'activité physique par jour, ces deux buts peuvent rentrer en compétition pour une raison temporelle) prédisait négativement ce niveau d'activité physique. Ces résultats sont corroborés

par ceux de Conner et al. (2016), qui ont montré que plus le conflit motivationnel est important, plus l'association entre l'intention de faire de l'activité physique (i.e., le but) et le niveau d'activité physique est faible.



**Figure 3.** Illustration de la manière dont les quatre types de forces motivationnelles peuvent influencer un comportement (Forestier, de Chanaleilles, Deschamps, et al., 2022, traduction libre).

La résolution de conflits motivationnels pourrait s'opérer via deux familles de stratégies, qui sont les stratégies inadaptées et adaptatives. Les stratégies inadaptées supportent les forces qui s'opposent au but à long terme et celles qui facilitent le comportement concurrent. Par exemple, on peut citer les cognitions compensatrices, qui sont des croyances selon lesquelles les implications négatives d'un comportement pathogène sont compensées par l'adoption d'un comportement salutogène (e.g., je peux rester toute la journée dans le canapé, car j'ai couru 30 minutes hier). De plus, elles sont faciles à mettre en œuvre cognitivement (Rabiau et al., 2006).

De telles croyances renforcent les forces qui s'opposent au but à long terme, et renforcent celles qui facilitent le comportement concurrent (i.e., but à court terme).

À l'inverse, les stratégies adaptatives accentuent les forces qui facilitent le but à long terme et diminuent celles qui s'y opposent, et une stratégie considérée comme une pierre angulaire de la résolution des conflits motivationnels est le contrôle de soi.

## **II. Définitions du contrôle de soi**

Bien que le contrôle de soi ait longtemps été réduit au processus d'inhibition de ce qui s'oppose au but à long terme (e.g., "le contrôle de soi est une ressource limitée qui détermine la capacité de contrôler des réponses dominantes" Hagger et al., 2010) certains auteurs ont une conception moins réductrice du contrôle de soi, et le définissent plus globalement comme l'habileté qui permet la résolution d'un conflit motivationnel entre deux buts opposés (i.e., l'un à long terme et l'autre opposé, à court terme) (de Ridder, et al., 2012; Fujita, 2011). Nous adoptons dans cette thèse cette définition plus englobante. Dans ce cadre, le contrôle de soi peut s'exercer au travers de différentes stratégies, soit par celles dites sans effort (*effortless strategies* en anglais, qu'on pourra aussi appeler stratégies non coûteuses), soit par celles dites avec effort (*effortful strategies* en anglais, qu'on pourra aussi appeler stratégies coûteuses). Le premier type de stratégies renvoie à des stratégies automatiques qui ne demandent pas de ressources pour être mises en œuvre, tandis que le second type de stratégies renvoie à des stratégies réfléchies qui nécessitent l'utilisation de ressources pour être effectives (Gillebaart, 2018). De plus, il est important de différencier le contrôle de soi du processus d'auto-régulation (*self-control* vs *self-regulation* en anglais). Même si cette distinction a rarement été faite dans la littérature et que certains auteurs utilisent indistinctement ces deux concepts (e.g., Baumeister et al., 2007), il est important de les différencier.

Un des premiers articles à faire la distinction entre l'auto-régulation et le contrôle de soi est celui de Baumeister et al. (2007). Les auteurs considèrent le contrôle de soi comme un composant parmi d'autres de l'auto-régulation. Ils proposent que le contrôle de soi est un effort délibéré par lequel une personne tente de limiter ou de dépasser une réponse initiale pour aboutir à une réponse différente (voir définition du contrôle de soi dans le paragraphe précédent). Tandis que l'auto-régulation est un construit qui englobe tous les processus de maintien des équilibres chez une personne, comme la régulation de la température corporelle, la régulation de la posture et bien sûr le contrôle de soi. Cette distinction a été précisée et affinée notamment par Gillebaart (2018). Cette autrice explique la différence entre ces deux concepts en se basant sur les définitions de l'auto-régulation proposée par Carver & Scheier (1982, 2000) ainsi que par le modèle T.O.T.E (*Test-Operate-Test-Exit model* en anglais, Powers, 1973). Selon ces différents auteurs, l'auto-régulation comprendrait trois éléments clés : l'établissement de standards et d'objectifs à long terme par l'individu, l'évaluation de l'écart entre son état actuel et ses standards préalablement établis, ainsi que l'opérationnalisation de la réduction de cet écart état-standards. Le modèle T.O.T.E cherche surtout à expliquer la phase d'opérationnalisation de l'auto-régulation dans une situation donnée. Pour réduire un écart perçu, l'individu suivrait un processus en quatre étapes : (T pour *Test*) un test initial, qui vérifie la congruence entre l'état actuel et les standards fixés, (O pour *Operate*) la mise en œuvre d'une action pour réduire l'écart, (T pour *Test*) un nouveau test afin de vérifier la congruence entre le nouvel état atteint et les standards visés, et (E pour *Exit*) une sortie de la boucle lorsque l'état et les standards sont congruents, ou lorsque les standards sont modifiés ou abandonnés. Une boucle de feedback peut s'opérer entre la troisième et la deuxième étape afin de réajuster l'action jusqu'à obtenir une réduction de l'écart état-standards.

En résumé, dans ces modèles définissant les mécanismes de l'auto-régulation, le contrôle de soi est considéré comme faisant partie intégrante de la phase d'opérationnalisation

de l'auto-régulation. Ainsi, Gillebaart (2018) propose que le contrôle de soi peut être défini comme « un ensemble de compétences, de capacités et de comportements dont nous avons besoin pour opérer dans une boucle de feedback de l'auto-régulation ». Cette définition du contrôle de soi inclut l'emploi de stratégies coûteuses ou non (i.e., avec ou sans effort).

### 1. Le contrôle de soi coûteux

Le contrôle de soi coûteux a d'abord été abordé sous la facette de l'inhibition, à savoir que cette stratégie permettrait la résolution du conflit motivationnel, en renonçant au but à court terme (i.e., qui offre une récompense quasi-immédiate), par un effort d'inhibition (e.g., Ainslie, 1975; Kirby & Herrnstein, 1995). Pour illustrer cette facette inhibitrice nous pouvons présenter une recherche largement connue sur ce construit, le test du Marshmallow. Dans ce test, il est présenté à des enfants seuls dans une pièce, un marshmallow. Il leur est expliqué que s'ils réussissent à attendre pendant 15 minutes sans manger ce bonbon ils se verront offrir un second marshmallow, et ils pourront alors manger les deux bonbons. Ce test permet d'illustrer simplement cette facette inhibitrice qui permet d'outrepasser une petite récompense à court terme pour atteindre une récompense plus importante à plus long terme.

C'est dans ce cadre de l'inhibition d'une tentation que le modèle de la force du contrôle de soi, un modèle majeur du contrôle de soi coûteux, a été proposé (Baumeister et al., 2007). En effet, cette capacité permettrait d'inhiber certaines réponses comportementales et serait basée sur des ressources limitées, qui dépendent d'une certaine réserve « d'énergie », qui s'épuiserait en fonction de son utilisation (Baumeister et al., 1994, 1998). Afin de tester leur théorie, les auteurs ont utilisé le paradigme des tâches séquentielles (*sequential-task paradigm* en anglais). Ce paradigme expérimental est surtout utilisé dans le cadre d'études en laboratoire, au cours desquelles les participants de deux groupes (i.e., expérimental vs. contrôle) sont évalués sur leur performance de contrôle de soi. Pour cela ils doivent réaliser une première

tâche supposée épuiser les ressources de contrôle de soi, pour le groupe expérimental, tandis que le groupe contrôle réalise une tâche qui ne devrait pas avoir d'incidence sur les ressources de contrôle de soi. Ensuite, les participants des deux groupes doivent réaliser une tâche subséquente où leur performance de contrôle de soi est évaluée. Ainsi, une diminution des ressources de contrôle de soi suite à une première utilisation de contrôle de soi (i.e., plus particulièrement un effort d'inhibition), mènerait au phénomène « d'épuisement de l'égo » (*ego-depletion* en anglais), limitant la performance au contrôle de soi des participants du groupe expérimental. Afin de tester leur paradigme, les auteurs (Baumeister et al., 1998) ont comparé la performance des participants dans trois conditions : une condition qui sollicite de manière importante le contrôle de soi, une condition qui sollicite peu le contrôle de soi et une condition sans contrôle de soi. Après cette première tâche, il était demandé aux participants de résoudre un puzzle insoluble. En accord avec leur théorie sur l'épuisement de l'égo, leurs résultats indiquent que les participants du groupe demandant un effort important de contrôle de soi, avaient de plus faibles performances subséquentes à la première tâche, que les participants des deux autres groupes. Ces résultats ayant été initialement supportés par de nombreuses études empiriques (e.g., Hagger et al., 2010 pour une méta-analyse).

De plus, il est intéressant de souligner que d'autres études ont cherché à identifier quelle pouvait être la ressource engagée et utilisée dans cadre du contrôle de soi coûteux. C'est ainsi que l'hypothèse du glucose a émergé. Gailliot et Baumeister ont affirmé que le glucose serait la source d'énergie la plus importante (voire la seule) du contrôle de soi (Gailliot et al., 2007; Gailliot & Baumeister, 2007). Ainsi selon ces auteurs, le glucose serait l'unique ressource qui permet au cerveau de fonctionner efficacement, et permettrait le fonctionnement cérébral en fournissant aux neurones le carburant nécessaire à l'émission d'impulsions. Bien que presque toutes les fonctions cérébrales dépendent du glucose comme carburant, les processus mentaux contrôlés ou exécutifs, tels que le contrôle de soi nécessiteraient, toujours d'après ces auteurs,

une quantité plus importante de glucose que les processus automatiques. Par conséquent, les processus mentaux contrôlés ou exécutifs tels que le contrôle de soi coûteux seraient plus sensibles aux fluctuations de glucose et donc plus susceptibles d'être altérés lorsque le taux de glucose est faible (e.g., par exemple lorsqu'il a été altéré au préalable), limitant son utilisation.

## 2. Le contrôle de soi non-coûteux

Même si ces recherches traditionnelles sur le contrôle de soi coûteux semblaient pertinentes, et ont considéré qu'un contrôle de soi actif, réfléchi, délibéré, et nécessitant un effort était nécessaire pour outrepasser des tentations (i.e., récompenses à court terme, en opposition avec un but à long terme) (Hofmann et al., 2009), plusieurs chercheurs.euses ont suggéré que pour réussir à utiliser de manière prospère le contrôle de soi dans la vie quotidienne, il ne suffisait pas d'inhiber nos tentations pour des buts à courts termes en opposition avec nos objectifs à long terme.

Ainsi, en opposition avec la conceptualisation coûteuse du contrôle de soi, des théories plus récentes ont proposé que le contrôle de soi pouvait, non pas uniquement être un processus réfléchi et coûteux, mais pouvait également être un processus automatique ne nécessitant pas d'utilisation des ressources (Fujita, 2011; Gillebaart & De Ridder, 2015; Werner & Milyavskaya, 2019). Le contrôle de soi non coûteux (i.e., *effortless self-control* en anglais) opèrerait de manière automatique. Il pourrait opérer 1) suite à la présentation d'un élément rappelant le but à long terme, ce qui permettrait d'activer de manière implicite la représentation de ce but et l'inhibition de la tentation (Shah et al., 2002), ou dans le cas 2) de la présentation d'un élément rappelant la tentation. Cette présentation de la tentation pourrait automatiquement activer le but à long terme qui lui est contraire, facilitant l'atteinte du but (Fishbach et al., 2003). Néanmoins, nous ne considérerons pas dans ce travail doctoral, ni dans ce chapitre, l'opérationnalisation du contrôle de soi par des stratégies non-coûteuses basées sur l'activation

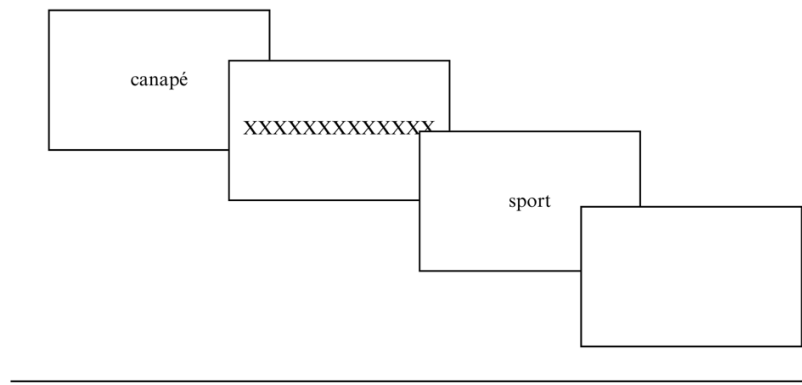
automatique du but à long terme suite à la représentation d'un élément rappelant directement ce but. En effet, dans ce type de processus, aucun conflit motivationnel ne semble avoir lieu, aucune opposition entre le but à long terme et une tentation est engagée, alors que cet élément est central dans la définition du contrôle de soi. Cela nous permet de penser que ce type de stratégie opère dans le cadre de l'auto-régulation uniquement, et non dans le cadre du contrôle de soi.

Ainsi nous nous concentrerons sur les stratégies où l'opposition but-tentation est présente. C'est le cas de l'asymétrie cognitive (*cognitive asymmetry* en anglais), une stratégie non coûteuse, proposée par Fishbach et al. (2003), aussi connue sous le nom de « l'activation des objectifs déclenchée par la tentation » (*temptation-elicited goal activation* en anglais). Les auteurs proposent que les personnes qui ont réussi par le passé à utiliser de manière fructueuse leur contrôle de soi dans des situations où des tentations s'opposaient à leurs buts à long terme, peuvent développer des associations cognitives automatiques entre les différents stimuli qui rappellent les tentations, et la représentation mentale de leurs buts à long terme opposés à ces présentes tentations. Par conséquent, la présence de stimuli liés à la tentation dans l'environnement conduit à l'activation des buts à long terme, plutôt qu'à l'inhibition des tentations. A l'inverse, les stimuli liés aux objectifs à long terme n'activent pas la représentation mentale des tentations, ce qui entraîne un modèle d'activation asymétrique entre les tentations et les objectifs qui pourrait être déterminant dans l'adoption du but à long terme. Cet effet a généralement été capturé par l'utilisation de tâches cognitives comme avec une tâche de décision lexicale (*lexical decision task* en anglais) informatisée.

Dans cette tâche les participants doivent indiquer le plus rapidement et le plus précisément possible si une série de lettres apparaissant à l'écran (i.e., cible) est un mot qui existe ou non en appuyant sur une touche du clavier, représentant la réponse "Oui" ou "Non". Avant chaque essai, un mot (i.e., amorce) était présenté à l'écran pendant un temps très court,



puis était masqué par une série de X pendant également un court instant. Ensuite, la cible apparaissait à l'écran et restait affichée jusqu'à ce que le participant réponde (voir Figure 4), et elle était suivie d'un écran blanc avant que l'essai suivant soit présenté. Les cibles et les amorces d'intérêt pouvaient être de deux natures. Les amorces pouvaient appartenir à une catégorie liée aux buts ou aux tentations, de même que pour les primes. Un temps de réaction plus court sur les essais avec une amorce liée à la tentation et une cible liée au but, était représentatif de cette asymétrie cognitive.



**Figure 4.** Structure de chaque essai de la tâche de décision lexicale

**Note.** Cet exemple montre un essai d'intérêt dans lequel une amorce liée à une tentation précède une cible liée à un but à long terme (une amorce pertinente).

### **III. Intérêts et limites du contrôle de soi pour l'activité physique**

#### **1. Relations entre activité physique et contrôle de soi**

De nombreuses études ont mis en évidence une relation entre le contrôle de soi et les comportements de santé. Par exemple, une méta-analyse conduite en 2012 (de Ridder, et al., 2012) incluant 102 études et un total de 32648 participants, a investigué la relation entre le contrôle de soi et les comportements, tels que la réussite à l'école ou au travail, le bien-être ou encore les comportements de santé (toutes les études portant sur la santé ont été regroupées en

un même sous-groupe). Leurs résultats ont montré un effet faible à moyen du contrôle de soi sur les comportements liés à la santé ( $r = .17, p < .001$ ).

Dans le cadre plus spécifique de l'activité physique, des relations entre le contrôle de soi et ce comportement ont également été reportées. C'est le cas, entre autres, dans une étude réalisée auprès de 124 participants (Pfeffer & Strobach, 2018) qui a mis en évidence une corrélation entre le contrôle de soi et l'activité physique, mesurée de manière auto-rapportée, avec une taille d'effet faible à moyenne ( $r = .29, p < .05$ ). Ces résultats sont supportés par une étude publiée la même année (Forestier et al., 2018), où le rôle du contrôle de soi comme prédicteur des comportements de santé, à savoir l'alimentation, la consommation de tabac et l'activité physique, a été étudié auprès de 325 participants. Leurs résultats envers l'activité physique ont montré une association positive entre le contrôle de soi et la pratique d'activité physique aussi mesurée de manière auto-rapportée. Un effet similaire a été reporté dans l'étude de Forestier et al. (2023) avec une relation positive du contrôle de soi envers l'activité physique ( $\beta = .31, 95\% \text{ CI } [.18, .43], p < 0.001, R^2 = .08$ ), et une prédiction négative du contrôle de soi envers les comportements sédentaires ( $\beta = -.17, 95\% \text{ CI } [-.30, -.05], p = .01, R^2 = .03$ ). Ces résultats sont soutenus par une autre étude (Rojas-Sánchez et al., 2021), qui trouve également une prédiction positive du contrôle de soi envers l'activité physique.

Enfin, cette fois dans le cadre plus précis des stratégies non coûteuses de contrôle de soi, Cheval et al. (2017) ont pu mettre en avant le processus d'asymétrie cognitive chez des participants qui avaient pour but de pratiquer de l'activité physique, ce processus ayant été souligné au préalable dans le cas de buts liés à la régulation du poids, de buts liés à la réussite scolaire et professionnels, ou encore de buts religieux (Fishbach et al., 2003). Les auteurs ont trouvé que les cibles liées à l'activité physique (i.e., représentant le but à long terme) précédées d'une amorce liée à la sédentarité (i.e., représentant les tentations) étaient reconnues plus rapidement que les cibles d'autres conditions. De plus les cibles liées aux tentations et précédées

d'une amorce liée aux buts n'étaient pas reconnues plus rapidement. Ces résultats supportent le fait que la présentation d'amorces liées aux tentations peut permettre une activation automatique des buts à long terme.

Même si toutes ces études soutiennent l'hypothèse que le contrôle de soi pourrait expliquer le comportement d'activité physique, elles comportent néanmoins certaines limites qui doivent être adressées.

## **2. Les limites des recherches sur le contrôle de soi**

L'intérêt grandissant dont a fait l'objet le contrôle de soi depuis les années 2000 à malheureusement engendré une prolifération de ses définitions et mesures, et par conséquent un bruit théorique important autour de ce concept (e.g., Gillebaart, 2018; Milyavskaya et al., 2019). En 2011, Duckworth et Kern (2011) recensait déjà plus de 100 façons différentes de mesurer le contrôle de soi. Malheureusement, peu d'entre elles ont utilisé des définitions robustes et falsifiables du contrôle de soi (e.g., Forestier, de Chanaleilles, Boisgontier, et al., 2022).

Dans le cadre du contrôle de soi coûteux, une crise de la répliquabilité du phénomène d'épuisement de l'égo a vu le jour, remettant en cause l'existence du construit lui-même. En 2010 une méta-analyse avait mis en évidence un effet moyen à élevé ( $d=.62$ ) de l'épuisement de l'égo (Hagger et al., 2010). Néanmoins cette étude a été critiquée à cause d'un biais de sélection des études (i.e., ce sont surtout de petites études, avec peu de participants qui ont été incluses dans cette méta-analyse), et parce qu'il semble que l'effet global de leur méta-analyse ait été surestimé en raison de corrections inappropriées (Carter & McCullough, 2013, 2014). Cela a amené des auteurs à considérer que la taille d'effet du phénomène d'épuisement de l'égo était proche de 0 ou non distinct de celui-ci (voir Friese et al., 2019 pour une revue). Cette absence d'effet a été répliqué par des études utilisant une approche statistique fréquentiste (e.g.,

Lurquin & Miyake, 2017) et par des études utilisant une approche statistique bayésienne (e.g., Vohs et al., 2021). Aussi, l'hypothèse du glucose a également été largement réfutée, et de nombreuses études ont échoué à répliquer les résultats de la première étude publiée qui avait confirmé cette hypothèse. Cette absence de réplication est soutenue notamment par la méta-analyse conduite par Dang (2016), ainsi que par l'une des plus récentes réplifications multi-laboratoires (Vohs et al., 2021 ;  $k = 36$ ,  $n = 3531$ ), où différents experts de ce domaine ont été invités à collaborer pour outrepasser les limites des précédentes études sur le phénomène. Malgré toutes leurs précautions, ils n'ont pas réussi à répliquer le phénomène d'épuisement de l'égo et ont finalement conclu que la réplication n'était pas centrale pour déterminer l'existence ou non d'un phénomène (e.g., "l'épuisement de l'égo se produit parfois, mais pas tout le temps" Baumeister, 2019). Néanmoins cette conclusion n'est pas en lien avec les études qui soulignent qu'un phénomène ne peut être considéré comme fiable ou sérieux si il ne peut pas être régulièrement répliqué (e.g., Coles et al., 2018; Ioannidis, 2005).

Durant cette même période d'autres études ont montré un effet significatif de l'épuisement de l'égo sur la faculté à rester concentré sur un but (Dang et al., 2017). De plus, une autre méta-analyse a montré que l'épuisement de l'égo avait une taille d'effet plus petite que ce qui avait été initialement démontré dans la littérature mais que pour autant cet effet était significatif ( $g = .38$ ,  $p < .001$ , Dang, 2018). La taille d'effet était d'autant plus importante pour les études qui avaient utilisé des tâches pertinentes ( $g = .42$ ,  $p < .001$ , voir Table 2, Dang, 2018). Enfin, une dernière étude multi-laboratoires a reporté un effet petit de l'épuisement de l'égo mais significatif ( $d = .16$ ,  $p < .003$  Dang et al., 2021). Ces résultats contradictoires en font une limite majeure de la littérature sur le contrôle de soi coûteux.

Les études portant sur les stratégies non coûteuses du contrôle de soi envers l'activité physique sont peu nombreuses. Une difficulté quant à leur réplication semble également exister. Par exemple, si une étude a pu mettre en évidence l'effet de l'asymétrie cognitive dans le cadre

de l'activité physique (Cheval et al., 2017), une étude plus récente n'a pas réussi à répliquer le phénomène malgré la robustesse de leur projet de recherche (Francis et al., 2022). Dans cette étude, et afin de s'assurer de la validité de leurs résultats, les auteurs ont mis en place un protocole leur permettant d'atteindre une puissance statistique de plus de 95%, pour détecter un effet quatre fois plus petit que celui mis en évidence initialement par Fishbach et al. (2003). Les auteurs rapportent avoir trouvé un effet principal de l'amorce ( $b = -8.87\text{ms}$ ,  $SE = 1.46$ ,  $t(22194) = -6.08$ ,  $p < .001$ ), mais cela, que ce soit pour une cible en lien avec le but ou la tentation. En d'autres termes, une amorce liée aux tentations facilitait la reconnaissance d'une cible liée au but ( $b = -6.16\text{ms}$ ,  $SE = 1.94$ ,  $t(22194) = -3.17$ ,  $p = .002$ ), et une amorce liée au but facilitait encore plus la reconnaissance d'une cible liée aux tentations ( $b = -11.57\text{ms}$ ,  $SE = 1.95$ ,  $t(22194) = -5.94$ ,  $p < .001$ ). Ainsi cette étude reporte un effet symétrique et non asymétrique comme le proposait Fishbach et al. (2003).

En conclusion, ce deuxième chapitre a proposé une vue d'ensemble du contrôle de soi et différentes de ses stratégies coûteuses ou non, les plus connues et/ou prometteuses pour expliquer la résolution d'un conflit motivationnel. Le premier modèle lié à l'épuisement de l'ego a été largement exploré dans la littérature et même si de nombreuses études ont révélé son importance pour la prédiction du comportement d'activité physique, d'autres ont soulevé des limites majeures, jusqu'à existence elle-même du phénomène, notamment par manque de répliquabilité. Il en est de même pour le processus d'asymétrie cognitive qui après avoir été révélé dans le cadre de l'activité physique, a été remise en cause par une étude plus récente avec un protocole beaucoup plus robuste que les précédentes études sur le sujet. Nous nous proposons de répondre à ces limites dans la Partie 2 de cette thèse.

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## Chapitre 3. Problématique générale

### I. Les relations entre la stigmatisation liée au poids et le contrôle de soi

Dans les chapitres précédents nous avons discuté de l'intérêt du contrôle de soi pour prédire le comportement d'activité physique ainsi que du rôle de la stigmatisation liée au poids comme frein à l'engagement des personnes qui en sont la cible dans ce comportement, pourtant salutogène. Dans la chaîne de mécanismes explicatifs du lien entre la stigmatisation et ses conséquences comportementales, comme une faible pratique d'activité physique, plusieurs auteurs ont proposé le rôle central du contrôle de soi pour expliquer cette relation délétère (e.g., Major et al., 2018 ce point sera développé dans le Manuscrit 3) .

Par exemple, des auteurs ont proposé (e.g., Inzlicht & Kang, 2010; Johns et al., 2008; Van Laar et al., 2019) que faire face à de la stigmatisation et essayer de la surmonter, que cela résulte en la réussite de l'engagement dans le comportement visé ou non, nécessiterait des ressources qui peuvent être réduites ou épuisées en raison des tentatives successives pour faire face à cette stigmatisation. Comme nous l'avons vu dans le chapitre précédant le contrôle de soi comporte des stratégies coûteuses, qui en ferait une capacité de résolution de conflit limitée. En d'autres termes, la stigmatisation pourrait être une force préventive des comportements de santé salutogènes, comme de l'activité physique. Elle pourrait pousser les personnes ciblées vers des comportements pathogènes, comme l'évitement de l'activité physique afin de ne pas se retrouver dans une situation dans laquelle ces individus pourraient être stigmatisés (i.e., but à court terme) en raison de leur excès de poids, alors qu'ils souhaiteraient pratiquer de l'activité physique pour améliorer leur santé et/ou réguler leur poids (i.e., but à long terme). Ainsi, l'opposition de ces deux motivations pourrait amener les personnes stigmatisées à vivre un conflit motivationnel, qui peut nécessiter l'utilisation de ressources s'il est résolu à l'aide d'une stratégie coûteuse. Les auteurs font l'hypothèse que c'est ce genre de stratégie coûteuse qui serait utilisée, ce qui pourrait résulter (suite à des tentatives successives d'outrepasser des

situations conflictuelles entre les buts à long terme et la crainte d'être stigmatisé) à un manque de ressources pour faire face à d'autres conflits motivationnels subséquents et donc en l'adoption du comportement tentant (i.e., éviter la stigmatisation, ne pas faire d'activité physique par crainte d'être moqué en raison de son poids par exemple) plutôt que du comportement visé (i.e., but à long terme, faire de l'activité physique).

Cette proposition théorique est supportée par le modèle de Major et al. (2018) présenté dans le Chapitre 1, qui place le contrôle de soi entre les mécanismes de la stigmatisation liée au poids et les comportements de santé (voir figure 27.1, Major et al., 2018). Plus particulièrement, les auteurs suggèrent que la gestion de la menace de l'identité sociale, soit cette crainte d'être stigmatisé en raison de son identité de personne en surpoids, demande des efforts cognitifs qui peuvent nuire à des efforts de contrôle de soi ultérieurs (Major et al., 2012; Schmader et al., 2008). Ils suggèrent également que la menace de l'identité sociale augmenterait la vigilance des personnes ciblées envers les stimuli en lien avec cette crainte d'être stigmatisé. Cela conduirait les personnes à devoir outrepasser un nombre important de stéréotypes négatifs et d'émotions négatives qu'ils suscitent, réduisant les ressources de contrôle de soi, rendant plus difficile la résolution de conflit motivationnel en direction du comportement à long terme souhaité.

Un autre modèle théorique plus récent (Chalabaev et al., 2023) et spécifique à l'activité physique, est en accord avec les deux modèles présentés ci-dessus. Il propose un modèle à deux voies (voir Figure 1, Chalabaev et al., 2023) pour expliquer l'effet des stéréotypes sociaux négatifs, ciblant les populations les moins actives comme les personnes en surpoids ou les personnes âgées, envers le comportement d'activité physique. Plus particulièrement, les auteurs proposent que le contrôle de soi pourrait être diminué en raison des conflits motivationnels générés à cause de l'interaction entre l'intention de pratiquer de l'activité physique et les affects négatifs générés par la crainte d'être stigmatisé en raison de son groupe social d'appartenance (e.g., personne en surpoids, personne âgée...).

Néanmoins, à notre connaissance, peu d'études ont investigué empiriquement ces relations entre la stigmatisation, le contrôle de soi et les comportements de santé, et d'autant plus dans le cadre de la stigmatisation liée au poids et de l'activité physique (e.g., Rojas-Sánchez et al., 2021). Afin de comprendre et d'investiguer les relations entre la stigmatisation liée au poids, le contrôle de soi et l'engagement dans l'activité physique, il est nécessaire d'outrepasser les limites de la littérature sur le contrôle de soi, qui comme nous l'avons vu dans le chapitre précédant nécessite d'être adressées pour réaliser des études robustes scientifiquement.

## **II. Problématique**

L'objectif central de cette thèse est de comprendre par quel(s) mécanisme(s) explicatif(s) la stigmatisation liée au poids est délétère pour le comportement d'activité physique. Pour répondre à cette problématique nous avons fait le choix de l'aborder par le prisme du contrôle de soi qui comme nous l'avons vu dans le chapitre précédant. Il semble être une pierre angulaire de l'adoption et du maintien des comportements de santé telle que l'activité physique. Nous avons également pour objectif d'investiguer quelles facettes du contrôle de soi peuvent être altérées par la stigmatisation. Plus précisément, nous faisons le choix dans cette thèse d'examiner le rôle de la stigmatisation liée au poids sur le contrôle de soi et sur différentes de ses stratégies, à savoir une non-coûteuse, l'asymétrie cognitive, et une coûteuse. Pour ce qui est du contrôle de soi coûteux, nous proposons de l'étudier au travers d'un récent modèle théorique (Forestier et al., 2022) qui cherche à dépasser les limites de la littérature sur le contrôle de soi coûteux et notamment du célèbre épuisement de l'égo (Baumeister et al., 1998). La synthèse de la littérature réalisée dans cet article, a permis aux auteurs de proposer que le contrôle de soi était composé de plusieurs facettes : les ressources de contrôle de soi, la motivation au contrôle de soi et la capacité de contrôle de soi. Une altération du contrôle de soi

se traduirait en un acte de contrôle de soi ultérieur détérioré, qui peut être réussi ou non (adoption du comportement visé ou non). Cet article sera présenté dans le Manuscrit 2 et une application de ce modèle à l'activité physique et à la stigmatisation liée au poids sera présentée dans le Manuscrit 4 (voir ci-dessous).

Nous avons cherché à comprendre pourquoi la stigmatisation liée au poids est une des formes de stigmatisation les plus courantes (e.g., Major et al., 2018). Parce que de nombreux travaux se sont intéressés aux croyances entourant le stigmate du poids, nous avons fait le choix de tourner notre regard vers une zone d'ombre de la littérature sur le surpoids, à savoir la saillance de cet attribut dans la formation d'impressions. A notre connaissance aucune étude n'a investigué la saillance de l'attribut du surpoids dans ce processus, et connaître à quel point le surpoids est un attribut visible et accessible par autrui permettrait d'avoir une meilleure connaissance des fondements de la stigmatisation liée au poids.

Les travaux qui ont découlé de ce travail doctoral ont poursuivi différents objectifs, à savoir : 1) déterminer dans quelle mesure le surpoids est un attribut saillant, 2) étudier la relation entre la stigmatisation (non spécifique à un attribut) et le contrôle de soi, et plus spécifiquement les relations entre la stigmatisation liée au poids, l'activité physique et le contrôle de soi a) non-coûteux et b) coûteux de contrôle de soi. Pour répondre à ces objectifs, trois études expérimentales indépendantes et une revue systématique ont été conduites, ainsi que la rédaction d'un modèle théorique du contrôle de soi.

Le Manuscrit 1 présente une étude expérimentale, qui avait pour but de répliquer et d'étendre les résultats de l'étude de Rohmer et Louvet (2006) réalisée sur la saillance du handicap physique, au surpoids. Le Manuscrit 2 fait la synthèse des limites de la littérature actuelle des travaux sur le contrôle de soi coûteux, notamment du phénomène d'épuisement de l'ego, et propose un modèle théorique du contrôle de soi, la fatigue du contrôle de soi, qui vise à outrepasser ces limites. Le Manuscrit 3 présente une revue systématique pré-enregistrée, qui



visé à investiguer la relation entre la stigmatisation et le contrôle de soi, et plus précisément à faire la synthèse d'études ayant investigué cette problématique dans le cadre d'études expérimentales<sup>1</sup>. Le Manuscrit 4 présente un protocole de recherche d'une étude investiguant le lien entre la stigmatisation liée au poids et le contrôle de soi coûteux, basé sur le modèle théorique présenté dans le Manuscrit 2. Afin d'obtenir le matériel nécessaire à la réalisation de l'étude présentée dans ce cinquième manuscrit, nous avons répondu à un appel à projet pour lequel nous avons été financé à hauteur de 10000€ (Appel à projet SAM, Santé Activité physique Métiers de l'ingénierie et des Sciences humaines). Néanmoins, nous présenterons dans ce manuscrit uniquement les résultats préliminaires de cette étude, l'inclusion des participants étant toujours en cours. Enfin, le Manuscrit 5 présente une étude expérimentale pré-enregistrée, qui vise à répliquer et étendre les résultats de Cheval et al. (2017) sur une stratégie non-coûteuse de contrôle de soi, l'asymétrie cognitive, envers l'activité physique. Nous avons ajouté à l'étude initiale, deux conditions liées à la stigmatisation liée au poids (i.e., contrôle vs. expérimentale), afin de déterminer si l'exposition à la stigmatisation liée au poids pouvait altérer cette stratégie automatique de contrôle de soi.

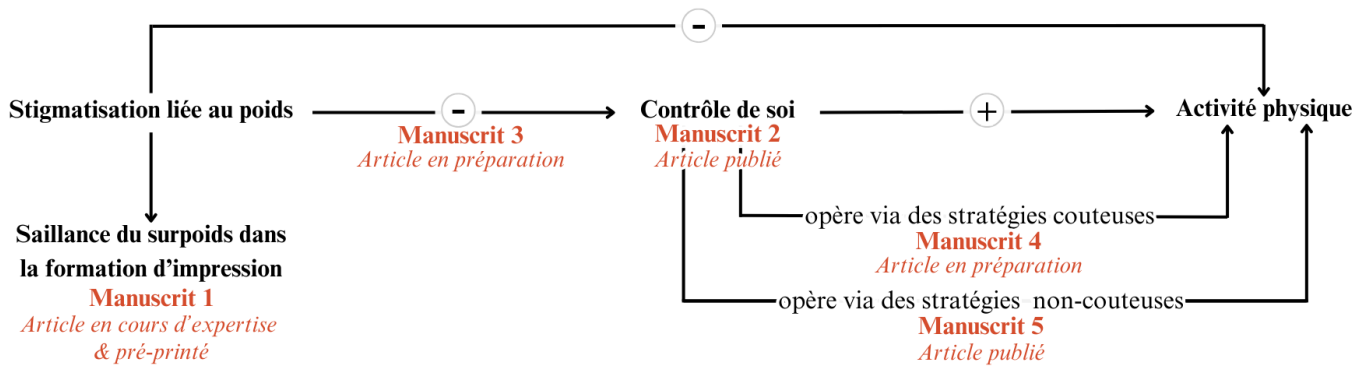
Afin de présenter visuellement l'imbrication des différents manuscrits entre eux vis-à-vis de la problématique de cette thèse, nous nous proposons de la résumer sur la figure ci-dessous (voir Figure 5).

Nous tenons à préciser que tous les manuscrits présentés ci-après sont rédigés sous le format d'articles scientifiques publiés, soumis, ou en rédaction. Ces articles pouvant être abordés indépendamment et en dehors de ce manuscrit de thèse, certains recouvrements et redondances peuvent se retrouver entre les manuscrits eux-mêmes et avec ce manuscrit de

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<sup>1</sup> Veuillez noter qu'il était initialement prévu de réaliser une méta-analyse, mais qu'en raison de reports de données incomplets dans les articles inclus, et de l'absence de réponses des auteurs quant à nos demandes répétées de partages des données, voir leur refus de partager leurs données, conduire ce travail nous a été impossible.

thèse. Afin de faciliter la lecture de ces derniers, une courte introduction et une synthèse de chaque manuscrit seront proposées.



**Figure 5.** Synthèse graphique des travaux doctoraux

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## **PARTIE 2**

### Contributions personnelles

## **Manuscrit 1. Le poids du poids : L'importance du poids corporel dans le processus de formation d'impressions**

Cette première étude a pour objectif d'évaluer la saillance du poids corporel dans le processus de formation d'impressions. Pour cela nous avons répliqué et étendu l'étude de Rohmer et Louvet (2006) sur le handicap physique au poids corporel. Ce travail ayant donné lieu à un manuscrit soumis dans la revue scientifique *International Journal of Obesity*, et en cours d'expertise, nous proposons ci-dessous la version adressée au journal et pré-printée sur la plateforme PsyArXiv.

Contribution personnelle selon la Taxonomie CRediT (Allen et al., 2019) : Conceptualisation, Méthodologie, Programmation, Analyses, Curation des données, Écriture de la première version du manuscrit (i.e., *Writing – original draft*) , Visualisons, Supervision, et Valorisation.

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**The weight of weight: The salience of body weight in the impression formation process**

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**Abstract**

Western societies preach slimness. However, overweight and obesity are increasing. Overweight individuals often face weight discrimination. No studies have investigated the salience of body weight in the impression formation. This study aims to examine the salience of the overweight attribute in shaping first impressions. Forty-nine participants ( $M_{\text{age}} = 25.82$  years,  $SD = 13.44$ ; 19 women) were asked to describe fictitious characters who differed in age, gender, skin color, and weight. Overweight targets (i.e., five overweight characters) constituted the experimental condition. Non-overweight targets formed the control condition (i.e., five non-overweight characters). Multilevel analyses showed that weight-related words were more used to describe the overweight target than the non-overweight target (25.41% vs 11.83%;  $OR=1.56$ , 95% CI 1.24–1.96,  $p<0.01$ ). Moreover, the probability of using a weight-related word to describe overweighted targets was significantly higher for the earlier words, than for the later words – ( $OR=3.82$ , 95% CI 2.36–6.20,  $p<0.001$  for the first,  $OR=2.44$ , 95% CI 1.78–3.33 for the second,  $OR=1.62$ , 95% CI 1.24–2.12,  $p<0.001$  for the third, and fourth  $OR=1.08$ , 95% CI 0.73–1.60,  $p=0.695$  words used to describe the character). These findings support that the overweight characteristics of individuals is salient in the impression formation process.

**Keywords:** Salience, overweight, obesity, impression formation

## I. Introduction

The physical characteristics of individuals are major elements in the impression formation process (Fiske et al., 1999; Knapp & Hall, 1972). According to the dual-process approach, impression formation ranges from category-based impressions to individualized impressions (Brewer & Feinstein, 1999; Fiske et al., 1999). The continuum model regards the use of categorical information as an essential initial step in this process (e.g., Fiske et al., 1999). Indeed, “people have a tendency to rely on “less effort” and categorical thinking when evaluating others” (Moskowitz, 2005).

However, not all categorical attributes are equivalent in terms of salience (i.e., the cognitive accessibility of an attribute, Fiske & Neuberg, 1990; Higgins, 1996), in other words, its immediate visibility to perceivers. Many studies point to the existence of primary categories that are automatically activated and prioritized in the impression formation process. These categories include gender and ethnicity, as well as age (e.g., Klauer et al., 2003). The high salience of these categories is sometimes explained by their "chronic" accessibility due to their immediate visibility and the frequency of their activation (i.e., the applicability of the related concept) (Fiske & Neuberg, 1990; Higgins, 1996), or by the widespread belief in Western societies that they are « natural », immutable, and imposed on the individual (e.g., Demoulin et al., 2006).

In addition, non-normative characteristics may be particularly salient (e.g., Klauer et al., 2003). For example, Louvet and Rohmer (2006) found that physical disability was by far the most salient characteristic when forming an impression of a character affected by that characteristic. Indeed, in their study, people with physical disabilities were described as "disabled" before they were identified by reference to their gender or ethnicity. This salience of disability was in no way diminished by other "non-normative" categorical affiliations: disability was equally salient for women and men, regardless of skin color or age. These



results were interpreted as being due to the non-normative nature of physical disability, both numerically (i.e., physical disability is rare) and, more importantly, socially (i.e., physical disability is socially devalued). In sum, the literature suggests that characteristics are particularly salient when they are visible, perceived as rare, and socially devalued (e.g., Rohmer & Louvet, 2009).

However, the extent to which this mechanism can also be applied to overweight and obesity remains unknown, what this study aims to examine. First, excess weight is visible, under-represented (25% of the worldwide population is overweight or obese, World Health Organization, 2022), and highly stigmatized (e.g., Major et al., 2014), with many studies documenting weight stigma as one of the most common stigma among children, adolescents and adults (Puhl et al., 2008, 2013). Indeed, in contemporary Western societies, having a body weight above the social norm is very often negatively judged (Major, Tomiyama, et al., 2017; Palmeira et al., 2020), and leads to verbal or physical harassment, unfair treatment, and active discrimination in many aspects of daily life (Puhl & King, 2013). Second, another thing about being overweight or obese is that many people think it is the individual's fault. People often believe it happens because someone lacks the willpower and control to stay thin and healthy (Puhl & Heuer, 2009). As such, whether overweight operates as a primary (i.e., natural) category (i.e., automatically activated and prioritized in the impression process) remains an open question: it is visible, relatively rare, and socially devalued, but it is not a category that is perceived as natural. Indeed, believing that body weight is controllable means considering that people can enter and exit this category depending on their willpower (Puhl & Brownell, 2001).

Despite a large number of studies documenting the negative effects of weight stigma in many areas of daily life, such as employment (Khan et al., 2023) or health and health behaviors (e.g., Araiza & Wellman, 2017; Major et al., 2017), to our knowledge, no studies

have examined the salience of the weight attribute in the impression formation process. In the present study, we examined the visibility of the overweight attribute, in a society where both men and women models are almost exclusively endorsed by thin and slim public figures. In this context, is weight noticed when meeting or seeing someone for the first time? More specifically, are people more likely to notice a weight that conforms to the norm or, on the contrary, more likely to notice a weight that deviates from this norm, especially if the person is overweight or obese?

### **Present Study**

This study aimed to determine the extent to which weight is a salient attribute in a Western European country. Due to the negative stereotypes surrounding overweight and obesity (see Major et al., 2018), we hypothesized that the weight attribute would be more salient in overweight targets than in non-overweight targets, i.e., that the overweight attribute would be more salient than the non-overweight attribute.

To this end, our methodology was based on the experimental paradigm used in Louvet and Rohmer (2006), which focused on the salience of physical disability. In their study, 272 participants were invited to complete a study about ‘interpersonal communication’. Participants were instructed to describe a character providing only one descriptive element at a time. The targets differed in terms of three categorical characteristics: physical otherness (wheelchair-bound or not), gender (male or female) and ethnicity (black or white). Participants were given only three words to describe the target. The authors then calculated a salience index, indicating the order of appearance of the target categories.

Because the attribute of physical disability and overweight share a common and visible "out of the ordinary" dimension (Louvet & Rohmer, 2006), we used a similar design adapted to our research question about weight salience.

## **II. Method**

Data and supplementary materials are available on the Open Science Framework ([https://osf.io/x9tmd/?view\\_only=998dd39bb89445e9ad15c14ad90307b2](https://osf.io/x9tmd/?view_only=998dd39bb89445e9ad15c14ad90307b2)). All procedures adhered to the ethical principles of the APA. Informed consent was obtained from all participants before the study began. They were informed that the study was anonymous and confidential, with a self-generated code replacing their identity. Given that our resources were limited due to time constraints (Lakens, 2022), we recruited 60 participants at Nantes University and Grenoble Alpes University, via university classes, posters, and at the university libraries over the course of one month. Participants were not compensated for their participation.

The entire study was conducted online on Inquisit Web (Inquisit 6, 2021). Participants were first invited to read and sign an informed consent form before performing the task of interest. To compensate for our limited sample size, each participant was asked to describe 10 out of 16 possible characters (instead of one per participant in Louvet and Rohmer, 2006), with four words (open-ended question format). Particularly, they had to describe five overweight characters (i.e., the experimental condition), and five non-overweight characters (i.e., the control condition). The 10 characters were picked up and presented to the participants in a pseudo-random order (i.e., participants can see only once a character). Finally, they completed a short questionnaire assessing their sex (Women; Men; Don't want to answer), age, height, weight, skin color (Fitzpatrick, 1988), and perceived weight (Major et al., 2014).

### **a. Experimental procedure**

#### **i. Characters**

The characters were created using the Electronic Arts<sup>1</sup> video game “The SIMS 4” based on a combination of four characteristics: gender (women, men), age (young, old), skin color (light, dark), and weight (overweight, non-overweight), resulting in a total of 16 characters. Moreover, all of the characters' clothes were standardized to avoid any effects from what they wore.



**Figure 1.** Characters example

#### **b. Outcomes and data analysis**

Participants had to describe the characters using four words, as if they were trying to get a partner to guess the character in question in the famous board game<sup>2</sup> “Who is it?”.

Specifically, participants were asked to "make an imaginary partner guess" the identity of a character drawn on a card, providing only one descriptive element at a time. In the original game, the partner is given a board containing the drawings of all the characters, and is instructed to "discover" the identity of the individual described by the participant after four clues have been given. Each participant had to describe 10 out of the 16 possible targets on a

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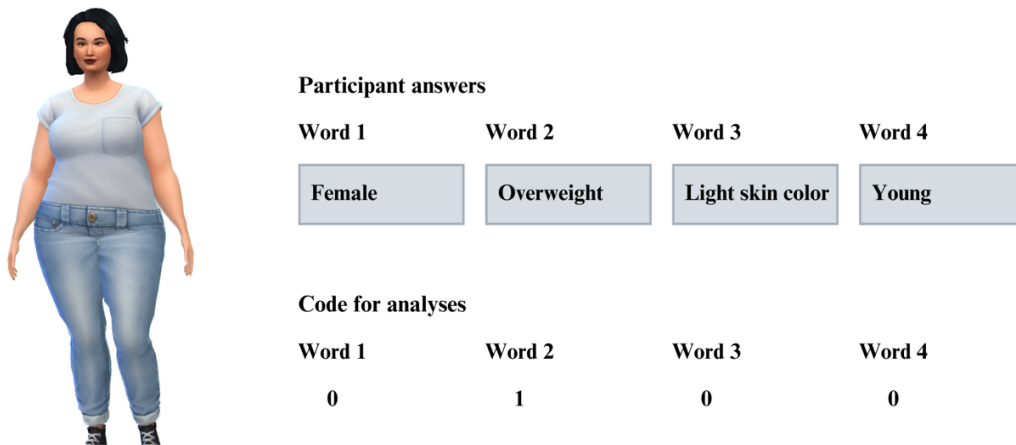
<sup>1</sup> Electronic Arts. (2023). The SIMS 4 [Video game]

<sup>2</sup> Hasbro. (2023). Who is it? [Board game]

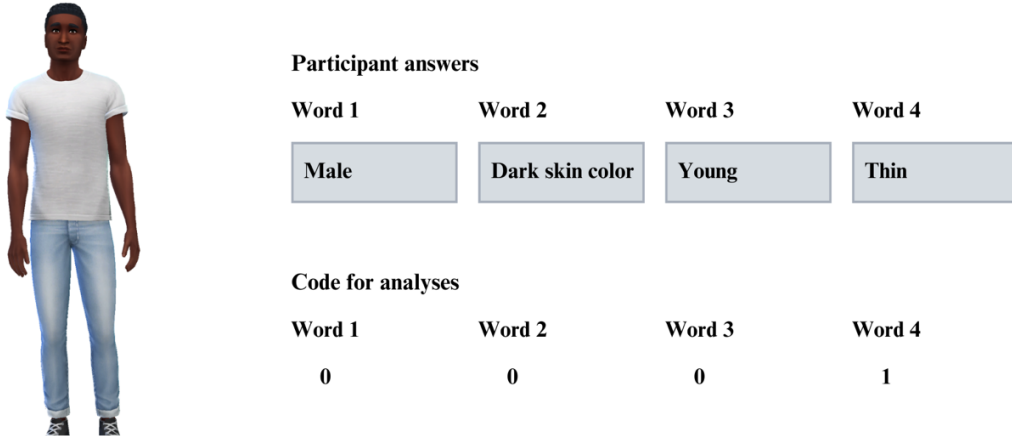
computer and did not know all of the possible targets. They were asked to not describe the characters by their clothes.

*i. Data preparation*

The final sample included 49 participants (Mage = 25.82 years, SD = 13.44; 19 women), and 483 observations. Indeed, 11 participants were excluded because they did not fully describe at least one target. Answers were coded as 1 if the participant used a word related to weight, in the ‘categorization order’ column 1, 2, 3, or 4, depending on the order in which the participants used the word. For all other answers, the code was 0. For example, if a participant described the presented character as a “man”, “overweight”, “tall”, and “blond”, the code turned to: (category 1; 0), (category 2; 1), (category 3; 0) and (category 4; 0). However, if a character was first described by its weight, word 1 was coded 1.



**Figure 2a.** Code analyses – example n°1



**Figure 2b.** Code analyses – example n°2

*ii. Statistical models*

To test our hypotheses, we conducted multilevel binomial logistic regressions using the *lme4* package in R Studio (RStudio Team, 2015). First, we created a model to test the overall effect of the condition (i.e., overweight vs. non-overweight) on the probabilities of using a weight-related word to describe the character. Then, in a second model, we included an interaction term between the condition and the word number (i.e., first, second, third and fourth word used) to examine whether the probabilities of using a weight-related word to describe the character were more likely in the earlier words than in the later words. In the first model, we defined as random factor the condition at the participant level. In the second model, the interaction between condition and word order at the participant level and the word order at the characters level were included as random factors.

**III. Results**

**a. Descriptive analyses**

Descriptive analyses revealed that, on average, weight-related words were used twice as many to describe the characters in experimental condition than in control condition (25.41% vs 11.83% respectively, see Table 1a). Moreover, in the experimental condition,

weight was used as the first attribute to describe the character 11.98% of the time, as the second attribute 30.17% of the time, as the third attribute 38.01% of the time, and as the fourth attribute 21.90% of the time. In the control condition, weight was used 5.39% as the first attribute to describe the character, 18.67% as the second attribute, 20.75% as the third attribute, and 12.49% as the fourth attribute. It may be interesting to note that participants could use several words related to a same attribute to describe a target (e.g., several words related to weight).

**Table 1a.** Descriptive analyses for experimental and control conditions – by word

Attribute type	Condition	In percentage of times by word	
		Don't used to describe the characters	Used to describe the characters
Sex	Experimental	80.89%	19.11%
	Control	80.81%	19.19%
Age	Experimental	91.74%	8.26%
	Control	89.83%	10.17%
Skin color	Experimental	80.62%	13.69%
	Control	78.94%	21.06%
Weight	Experimental	74.59%	25.41%
	Control	88.17%	11.83%

**Note.** There are 4 words used by characters. In total 968 words in experimental condition and 964 words in control condition ( $N_{\text{total}} = 1932$ ).

**Table 1b.** Descriptive analyses for experimental and control conditions – by character

Attribute type	Condition	In percentage of times by character			
		First attribute used to describe the characters	Second attribute used to describe the characters	Third attribute used to describe the characters	Fourth attribute used to describe the characters
Sex	Experimental	66.94%	3.72%	2.48%	3.31%
	Control	68.87%	4.15%	1.25%	2.49%
Age	Experimental	2.07%	4.96%	11.16%	14.88%
	Control	3.73%	8.71%	17.43%	10.79%
Skin color	Experimental	9.91%	42.56%	12.40%	12.40%
	Control	13.69%	43.98%	15.37%	11.20%
Weight	Experimental	11.98%	30.17%	38.01%	21.90%
	Control	5.39%	18.67%	20.75%	12.49%

**Note.** In total 242 characters in experimental condition and 241 characters in control condition ( $N_{\text{total}} = 483$ ).

**b. Main effect of the condition**

This first analysis showed that the condition was positively associated with the predicted probabilities of using a weight-related word to describe the character (OR=1.56, 95% CI 1.24–1.96,  $p < 0.01$ ). More specifically, participants were more likely to describe characters by their weight when these characters were overweight (i.e., experimental condition) than when they were not overweight (i.e., control condition).



**Table 2.** Predicted probabilities of using a weight-related word to describe the character, main effect of the condition

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.22</b> ***	<b>0.18 – 0.27</b>	<b>&lt;0.001</b>
Condition [1]	<b>1.56</b> ***	<b>1.24 – 1.96</b>	<b>&lt;0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	0.15		
$\tau_{11}$ ID.condition1	0.07		
$\rho_{01}$ ID	-1.00		
$N_{ID}$	49		
Observations	1932		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.015 / NA		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

### c. Effect of the condition depending on the word order

The second model showed that the effect of condition significantly depended on the word order as indicated by a significant condition x time interaction (OR=1.98, 95% CI 1.45–2.71,  $p < 0.001$ ) – the higher probabilities of using a weight-related word to describe the character in the experimental condition relative to the control condition significantly decreased as the number of words used to describe the target increased. Specifically, the interaction decomposition revealed a significant effect of the condition for the first word used to describe the character (OR=3.82, 95% CI 2.36–6.20,  $p < 0.001$ ; the probability of using a weight-related word to describe the character under the control condition is 5% (CI 0.02-0.08) against 16% (CI 0.10-0.23) in the experimental condition), the second word (OR=2.44, 95% CI 1.78–3.33,  $p < 0.001$ ; 9% (CI 0.06-0.13) vs. 16% (CI 0.10-0.23) for control and experimental conditions) and the third word (OR=1.62, 95% CI 1.24–2.12,  $p < 0.001$ ; 17% (CI 0.14-0.20) vs. 25% (CI 0.22-0.28) for control and experimental conditions), but the effect of the condition was not

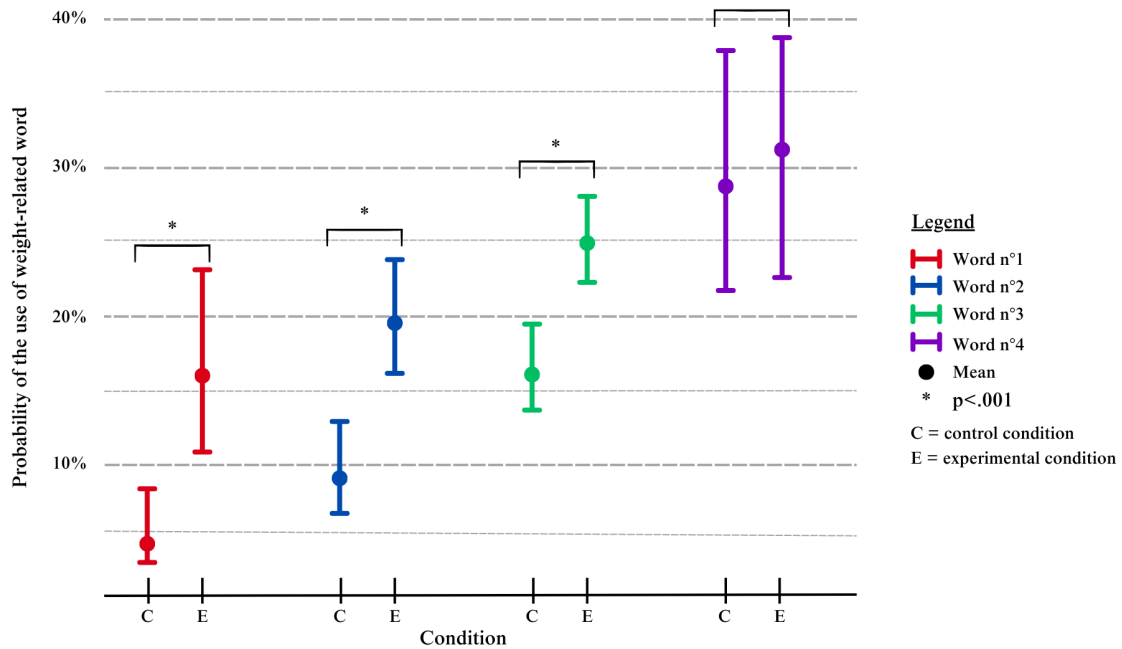
significant for the fourth word (OR=1.08, 95% CI 0.73–1.60,  $p=0.695$ ; 29% (CI 0.22-0.38) vs. 31% (CI 0.24-0.39) for control and experimental conditions) (See supplementary for more details). Thus, participants were more likely to use a word related to weight to describe a character in the experimental condition (i.e., overweight) than in the control condition, but this effect was significantly stronger the earlier rather than later words used.

**Table 3.** Predicted probabilities of using a weight-related word to describe the character, depending of the word order

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.05 ***</b>	<b>0.03 – 0.10</b>	<b>&lt;0.001</b>
Condition [1]	<b>3.73 ***</b>	<b>2.29 – 6.09</b>	<b>&lt;0.001</b>
Condition [1] x Centered order [1]	<b>1.98 ***</b>	<b>1.45 – 2.71</b>	<b>&lt;0.001</b>
Centered order [1]	<b>0.66 ***</b>	<b>0.53 – 0.84</b>	<b>0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	3.55		
$\tau_{00}$ stimulusitem1	0.00		
$\tau_{11}$ ID.condition1	0.36		
$\tau_{11}$ ID.order_cent1	0.85		
$\tau_{11}$ ID.condition1:order_cent1	0.07		
$\tau_{11}$ stimulusitem1.order_cent1	0.00		
$\rho_{01}$ ID.condition1	-0.93		
$\rho_{01}$ ID.order_cent1	-0.97		
$\rho_{01}$ ID.condition1:order_cent1	0.54		
ICC	0.26		
N ID	49		
N stimulus	16		
Observations	1932		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.095 / 0.326		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

**Figure 3.** Predicted probabilities for the use of weight-related word depending of the word order



#### IV. Discussion

The present study examined the salience of weight among when forming an impression about overweight and non-overweight characters. The results showed that participants were more likely to describe the characters by their weight when the targets were overweight (i.e., experimental condition) than when the targets were not overweight (i.e., control condition). Besides, results showed a primacy effect of weight-related words, with a decrease in attribute salience from the fourth word used to describe the targets, illustrated by a significant effect of the interaction between the word order (i.e., first, second, third or fourth word) and the condition. These results support our hypothesis that a weight above the norm is more salient, when one has to describe a target than a weight considered normal in participants from a Western European country. The descriptive analyses are also in line with

these primary analyses, showing that overweight characters were more than twice as often described by their weight than non-overweight characters.

These results provide insights into the accessibility of the overweight category against the non-overweight one, the former being more salient than the latter. The difference in salience between overweight and normal-weight can be explained by its “non-normative” nature, both numerically and socially. Indeed, while a significant proportion of the world’s population is overweight or obese (25%, World Health Organization, 2022), this does not represent the majority of the population. In addition, overweight and obesity have very negative connotations and are associated with negative stereotypes (e.g., lazy, lack of willpower, incompetent, Major et al., 2018). We can therefore suggest that this pejorative attribute is more visible because it could not correspond to what is positively valued by the society. As it was suggested by Rohmer and Louvet (2006) for physical disability, the salience of overweight may be explained mainly by its significant deviation from the dominant norm in Western societies, which value body perfection on the one hand, and performance and competitiveness on the other hand (e.g., Major et al., 2018).

Nevertheless, even if the accessibility of an attribute or concept is important, this does not necessarily mean that it will be used, as concepts may come to mind without us using them (Higgins, 1996). This is what happens, for example, when the concept in question is linked to negative stereotypes and we feel that using it to judge a person is not socially acceptable (Gilbert & Hixon, 1991). This could explain why, in the case of overweight in this study, despite a greater relative difference in the first words used, the absolute probability of using a weight-related word is greater in the last words used, that may illustrate a certain social desirability bias.

### **Strengths and Weaknesses**

Three limitations should be acknowledged. First, the stimuli were created for the needs of this study, but were not validated beforehand. Second, the stimuli used did not varied in a range a weight, but were only created with the same amount of overweight. Taking into account different weight levels, could have enabled us to investigate whether there is a weight level at which a person is considered overweight, and whether this level corresponds to the definition given by international health agencies or more to standards of beauty (Swami, 2015)? Third, the stimuli were not based on real pictures, and so could be considered as not realistic targets, the use of photos, in a more ecological environment, such as social media, could have been more ecological.

Nevertheless, this study has at least two main strengths. First, the within-subject design provides a high power, and a certain robustness of results thanks to the 483 trials included in the analyses (Lakens, 2022). Moreover, converting our effect size to Cohen's  $D$  allowed us to compare it ( $d=.73$  for the more complex model) with the effect size found in Louvet and Rohmer's (2006) study ( $d=.92$ ), Rohmer and Louvet (study 1, 2009) study ( $d=.66$ ) on physical disability, and with the effect size in Ruchaud et al., (2017), which investigated the salience of gender ( $d=.70$ ) in sport. Even though there are differences in our design, we can already observe that our results tend in the same direction. Second, our study partially replicates the results from Rohmer and Louvet (2006, 2009) and extends them to another population - overweight.

## **Conclusion**

To sum up, our results showed that perceivers are more likely to describe overweight people by their weight than non-overweight people. These findings suggest that the overweight is more salient than non-overweight and suggest that overweight people are quickly categorized on the basis of this attribute. This salience of overweight may be a source

of the considerable stigmatization of overweight people in Western societies. Thus, this study could enable future research to take a closer look at this determinant, and to continue explore weight salience.

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## **Supplementary materials**

**Table 4.** Probabilities of using a weight-related word to describe the character for the first word used

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.10</b> ***	<b>0.07 – 0.15</b>	<b>&lt;0.001</b>
Condition [1]	<b>2.44</b> ***	<b>1.78 – 3.33</b>	<b>&lt;0.001</b>
Condition [1] x Centered order [1]	<b>1.99</b> ***	<b>1.46 – 2.71</b>	<b>&lt;0.001</b>
Centered order [1]	<b>0.67</b> ***	<b>0.53 – 0.84</b>	<b>&lt;0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	0.99		
$\tau_{11}$ ID.condition1	0.15		
$\tau_{11}$ ID.order_cent2	0.82		
$\tau_{11}$ ID.condition1:order_cent2	0.06		
$\rho_{01}$	-1.00		
	-0.88		
	0.25		
$N_{ID}$	49		
Observations	1932		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.123 / NA		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

**Table 5.** Probabilities of using a weight-related word to describe the character for the second word used

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.05</b> ***	<b>0.03 – 0.10</b>	<b>&lt;0.001</b>
Condition [1]	<b>3.66</b> ***	<b>2.27 – 5.89</b>	<b>&lt;0.001</b>
Condition [1] x Centered order [1]	<b>1.99</b> ***	<b>1.46 – 2.71</b>	<b>&lt;0.001</b>
Centered order [1]	<b>0.67</b> ***	<b>0.53 – 0.84</b>	<b>&lt;0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	0.99		
$\tau_{11}$ ID.condition1	0.15		
$\tau_{11}$ ID.order_cent2	0.82		
$\tau_{11}$ ID.condition1:order_cent2	0.06		
$\rho_{01}$	-1.00		
	-0.88		
	0.25		
N ID	49		
Observations	1932		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.123 / NA		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

**Table 6.** Probabilities of using a weight-related word to describe the character for the third word used

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.20</b> ***	<b>0.16 – 0.26</b>	<b>&lt;0.001</b>
Condition [1]	<b>1.62</b> ***	<b>1.24 – 2.12</b>	<b>&lt;0.001</b>
Condition [1] x Centered order [1]	<b>1.99</b> ***	<b>1.46 – 2.71</b>	<b>&lt;0.001</b>
Centered order [1]	<b>0.67</b> ***	<b>0.53 – 0.84</b>	<b>&lt;0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	0.23		
$\tau_{11}$ ID.condition1	0.18		
$\tau_{11}$ ID.order_cent3	0.82		
$\tau_{11}$ ID.condition1:order_cent3	0.06		
$\rho_{01}$	-0.89		
	0.06		
	-0.77		
N ID	49		
Observations	1932		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.123 / NA		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

**Table 7.** Probabilities of using a weight-related word to describe the character for the fourth word used

<i>IVs</i>	<i>Odds Ratios</i>	<i>95% CIs</i>	<i>P-Value</i>
Intercept	<b>0.40</b> ***	<b>0.27 – 0.60</b>	<b>&lt;0.001</b>
Condition [1]	1.08	0.73 – 1.60	0.695
Condition [1] x Centered order [1]	<b>1.99</b> ***	<b>1.46 – 2.71</b>	<b>&lt;0.001</b>
Centered order [1]	<b>0.67</b> ***	<b>0.53 – 0.84</b>	<b>&lt;0.001</b>
<b>Random Effects</b>			
$\sigma^2$	3.29		
$\tau_{00}$ ID	1.10		
$\tau_{11}$ ID.condition1	0.31		
$\tau_{11}$ ID.order_cent4	0.82		
$\tau_{11}$ ID.condition1:order_cent4	0.06		
$\rho_{01}$	-0.45		
	0.89		
	-0.94		
$N_{ID}$	49		
Observations	1932		
Marginal $R^2$ / Conditional $R^2$	0.123 / NA		

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

### Résumé du Manuscrit 1

Les résultats de cette première étude confirment l'importance du poids corporel dans le processus de formation d'impressions. Plus précisément, cette étude a cherché à comparer à quel point le surpoids pouvait être une caractéristique saillante par rapport à un poids considéré comme normale vis-à-vis des définitions des agences de santé internationales. Pour cela, les participants devaient décrire à l'aide de quatre mots des personnages fictifs dont l'âge, la couleur de peau, le sexe et le poids différaient.

Les analyses multiniveaux réalisées ont mis en évidence que les mots liés au poids étaient plus de deux fois plus souvent utilisés pour décrire les personnages de la condition expérimentale, en surpoids, que pour décrire ceux de la condition contrôle, normo-pondérés. De plus, la probabilité d'utiliser un mot lié au poids pour décrire les cibles en surpoids était significativement plus élevée pour les premiers mots que pour les derniers.

Nos résultats confirment notre hypothèse et permettent de souligner l'importance du poids corporel et particulièrement du surpoids dans la formation d'impressions. Ils suggèrent également que le surpoids est particulièrement saillant, ce qui pourrait être une des raisons de l'importante stigmatisation des personnes perçues comme étant en surpoids.



## **Manuscrit 2. De l'épuisement de l'ego à la fatigue du contrôle de soi : Une revue des critiques et de nouvelles perspectives pour l'étude et la réplication d'un phénomène aux multiples composantes.**

Comme nous l'avons abordé dans les chapitres précédents, le contrôle de soi et particulièrement sous le chapeau du phénomène d'épuisement de l'ego a fait l'objet de nombreuses critiques et d'une crise de réplication notable. Dans ce deuxième manuscrit nous faisons une revue des limites de la littérature qui ont contribué à ces échecs de réplication et à la remise en question du phénomène, et nous proposons un nouveau modèle théorique permettant d'adresser ces dernières.

Ce travail ayant donné lieu à un article publié dans la revue scientifique *Motivation Science*, nous proposons ci-dessous la version publiée dans le journal.

Contribution personnelle selon la Taxonomie CRediT (Allen et al., 2019) : Investigation, Co-conceptualisation, Écriture (i.e., *Writing – review and editing*), Co-visualisation, Co-valorisation

### **Référence**

Allen, L., O'Connell, A., & Kiermer, V. (2019). How can we ensure visibility and diversity in research contributions? How the Contributor Role Taxonomy (CRediT) is helping the shift from authorship to contributorship. *Learned Publishing*, 32(1), 71–74. <https://doi.org/10.1002/leap.1210>

# From Ego Depletion to Self-Control Fatigue: A Review of Criticisms Along With New Perspectives for the Investigation and Replication of a Multicomponent Phenomenon

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The replication crisis in psychology has led to question popular phenomena such as ego depletion, which has been criticized after studies failed to replicate. Here, we describe limitations in the literature that contributed to these failures and suggest how they may be addressed. At the theoretical level, the literature focuses on two out of at least eight identified auxiliary hypotheses. Thus, the majority of the hypotheses related to the three core assumptions of the ego-depletion theory have been overlooked, thereby preventing the rejection of the theory as a whole. At the experimental level, we argue that the low replicability of ego-depletion studies could be explained by the absence of a comprehensive, integrative, and falsifiable definition of self-control, which is central to the concept of ego depletion; by an unclear or absent distinction between ego depletion and mental fatigue, two phenomena that rely on different processes; and by the low validity of the tasks used to induce ego depletion. Finally, we make conceptual and methodological suggestions for a more rigorous investigation of ego depletion, discuss the necessity to take into account its dynamic and multicomponent nature, and suggest using the term self-control fatigue instead.

**Keywords:** ego depletion, self-control fatigue, resources, willingness, capacity

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Originally, ego depletion referred to a temporary reduction in the capacity to engage in self-control (e.g., controlling behavior,

making choices, initiating an action), caused by prior self-control exertion that depleted a common resource (Baumeister et al., 1998). Ego depletion was construed as a state of impaired self-control that could evolve. This construal contrasted with approaches that considered self-control to be a trait (Tangney et al., 2004; for a discussion about self-control state and trait, see de Ridder et al., 2018)<sup>1</sup>.

Baumeister et al. tested their theory with the sequential-task paradigm. Ego depletion was indexed by comparing self-control performance in individuals who had previously performed an initial self-control act with individuals who had not. The first attempt to falsify ego-depletion theory compared three self-control conditions: high self-control, low self-control, and no self-control (Baumeister et al., 1998). After the initial self-control manipulation, participants were instructed to solve an unsolvable puzzle. Consistent with ego-depletion theory, results showed that participants in the high self-control group withdrew from the

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Cyril Forestier conceived the review and wrote the first draft of the manuscript. Margaux de Chanaleilles, Matthieu P. Boisgontier and Aina Chalabaev critically appraised the manuscript and significantly contributed to its content and structure. Data and code for the reanalysis are available on OSF [https://osf.io/4y38k/?view\\_only=6ceaa44fbc454b3798452f57e0e0acf6](https://osf.io/4y38k/?view_only=6ceaa44fbc454b3798452f57e0e0acf6).

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<sup>1</sup> The relationship between individual differences in self-control (e.g., trait self-control) and situational differences in self-control (e.g., ego depletion) is not well articulated. Yet, meta-analyses and multi-lab replications showed trait self-control seems unrelated to ego-depletion (Dang et al., 2021; Dang et al., 2017; Vohs et al., 2021), despite two studies that concluded it could be a moderator (DeWall et al., 2007; Gailliot et al., 2007).

puzzle task sooner than the participants in the other groups. However, despite a brief discussion, authors did not formulate specific propositions regarding ego-depletion mechanisms and components.

### Ego Depletion From a Resource Perspective and From Alternative Perspectives

After the first publication by Baumeister et al. researchers adopted a narrow perspective of ego depletion, by proposing that self-control exertion consumes a limited resource (Baumeister et al., 2000; Muraven & Baumeister, 2000). Baumeister had used the metaphor that self-control resembles a muscle that gets tired after an initial effort (Baumeister et al., 2007), and initially, this approach was widely supported by empirical studies. However, few studies explored what this resource could be (Friese et al., 2019), and those who did were among the most controversial. Hence, the first critics emerged in 2010; questioning Gailliot, Baumeister, et al. (2007) and rejecting the hypothesis of glucose as a marker of self-control resources (Kurzban, 2010; Molden et al., 2012; Schimmack, 2012; Vadillo et al., 2016).

At the same time, a process model of ego depletion was proposed, which suggested that an initial act of self-control impairs subsequent self-control by reducing the motivation for control and the attention to the cues responsible for triggering such control, and by increasing the motivation to act based on impulses and the attention toward rewarding cues (Inzlicht & Schmeichel, 2012). To our knowledge, only a single study found that motivation was significantly associated with an ego-depletion effect (Schmeichel et al., 2010), whereas other studies found no association (e.g., Boucher & Kofos, 2012; Clarkson et al., 2010; Muraven et al., 2008; Vohs et al., 2021).

Another approach, the opportunity cost model, proposed that an initial self-control effort induces a redirection of computational processes (i.e., a priority shift) toward a task that optimizes costs and benefits (e.g., exit a self-control task), which could explain an apparently impaired subsequent self-control act (Kurzban et al., 2013). Finally, the “reinvention” of ego depletion theory (Lin et al., 2020) proposes that a subsequent self-control decrement is explained by disengagement from the necessity to control the self, which results in a reduced response caution rather than inhibition (Baumeister, 2014).

Although promising, these alternative perspectives have rarely been empirically supported and were often considered as merely competing theories (Baumeister, 2018; Baumeister & Vohs, 2016b).

### Ego Depletion Controversies

#### Meta-Analyses, Failed and Successful Replications

In 2010; a meta-analysis concluded that the effect size of ego depletion was medium-to-large ( $d = .62$ ; Hagger et al., 2010). However, others noted that this meta-analysis relied on small-study effects and publication bias, and overestimated the aggregated effect size due to inappropriate corrections (Carter & McCullough, 2013, 2014). This led the authors to the conclusion that ego-depletion effect size was not distinguishable from zero

(Carter et al., 2015; see Friese et al., 2019; for a review of responses to these criticisms).

In an attempt to address this criticism, Hagger et al. (2016) conducted a multilab preregistered replication project, which included 2141 participants and independent tests of the phenomenon in the 23 participating labs. Results were consistent with a null effect of ego depletion “for the current paradigm” (Hagger et al., 2016, p. 556). This absence of effect was replicated in studies using frequentist statistics (e.g., Lurquin & Miyake, 2017; Radel et al., 2019; Vadillo et al., 2018) and Bayesian statistics (e.g., Etherton et al., 2018; Vohs et al., 2021). One of the most recent multilab replication (Vohs et al., 2021;  $k = 36$ ,  $n = 3,531$ ) used a “paradigmatic replication approach”, to overcome some limits of other multilab replications. Principal investigators recruited ego-depletion experts to develop the protocol and an advisory board with no involvement in past ego-depletion studies to develop preregistrations and statistical models. Finally, they randomly assigned one of two possible protocols to each lab. The first protocol used the letter-e task to induce ego depletion (i.e., participants had to cross out all “e” letters within a printed text), and persistence on unsolvable puzzles to measure it. The second protocol used a writing task to induce ego depletion (participants had to write a story with or without difficult instructions) and the Cognitive Estimation test to measure it. Despite these efforts, Bayesian and frequentist analyses did not find evidence supporting ego depletion. To defend their replication failures, the authors claimed that replicability is not central to determine if a phenomenon exists or not (e.g., “e.g.,o depletion happens sometimes but not all the time” Baumeister, 2019), which conflicts with other studies stressing that a phenomenon is not reliable if not consistently replicated (e.g., Coles et al., 2018; Ioannidis, 2005; Open Science Collaboration, 2015).

Recently, a meta-analysis (Dang Björklund et al., 2017) showed a significant ego depletion effect on the capacity to remain focused on a goal. Another “updated” meta-analysis (Dang, 2018) showed that ego-depletion effect size was smaller than originally thought, but significant ( $g = .38$ , for all depletion tasks), especially when only “reliable depletion tasks were considered” ( $g = .42$ ). Another multilab replication study (Dang et al., 2021) found a small but significant ego-depletion effect ( $d = .16$ ), especially among participants who had invested effort in the earlier depleting task. Finally, two high-powered studies supported ego depletion and suggested this phenomenon impairs attentional processes (Garrison et al., 2019; Lin et al., 2020).

#### A Statistical-Power Issue

Authors have argued that “if the true ego-depletion effect was zero, empirical studies should not consistently reveal null effects” (Friese et al., 2019, p. 9). If publication bias was the main reason for the significant ego depletion effects reported in the literature, as sometimes stated (e.g., Vadillo, 2019), there should be several significant reverse-depletion effects to support that ego depletion does not exist. If among 100 results, 50 turn out to be nonsignificant, it is tempting to think that the effect does not exist, but if the 50 remaining results show an effect in the same direction, that is unlikely to happen only by chance (Dienes, 2008). This pattern of results, observed in the ego-depletion literature (Friese et al., 2019), may instead highlight a statistical-power issue, fostered by the incorrect and overestimated effect size reported in the first

meta-analysis (Hagger et al., 2010). Indeed, if 66 participants are required to detect an effect of  $d = .62$  (Hagger et al., 2010), it would result in a power of 39%, 33%, or 10% for an effect size of  $g = .42$ ,  $g = .38$ , or  $d = .16$ , respectively. These effect sizes are those recently identified (Dang, 2018; Dang et al., 2021). In other words, with a sample size of 66 participants and updated effect sizes, the risk of finding a nonsignificant result even when the phenomenon exists would range from 61% to 90%.

In sum, ego-depletion literature is heterogeneous and inconsistent. We argue that this does not necessarily demonstrate the non-existence of the phenomenon but may rather indicate the presence of theoretical and methodological limitations. The following sections describe and discuss these potential limitations.

### Theoretical Considerations: From Ego Depletion to Self-Control Fatigue as a Multicomponent Phenomenon

Studies that have investigated the existence of ego depletion were often limited by their theoretical imprecision and by methodological issues that impaired the reliability of the results. Moreover, the term ego depletion may have been a misnomer. Originally, the word “ego” was chosen because it referred to the “part of the psyche that must deal with the reality of the external world” (Baumeister et al., 1998, p. 1253). The word “depletion” was then chosen to characterize the exhaustion of the ego. Nowadays, Freudian theories are less accepted as scientific than in the past, and ego often refers to a large set of self-identity constructs (e.g., Loevinger, 2014). To date, studies have focused on a reduction rather than a depletion (i.e., a total exhaustion) of self-control.

As stressed by some authors, the field of ego-depletion has been dominated by opposition and limitations for too long (Friese et al., 2019). We aim to provide a new theoretical model built on an integrative approach of ego-depletion perspectives. To be more accurate about the nature of the phenomenon, we propose to use new terminology. Thus, the term “self-control fatigue” will be preferred to “ego-depletion” as the latter is now often associated with the restrictive muscle metaphor, whereas “self-control fatigue” is meant to convey the multicomponent aspect of the phenomenon. The following sections will clarify the components and processes underlying self-control fatigue, as well as their interactions, present the theoretical limitations of the ego-depletion literature, and describe the self-control fatigue theory. Then, we discuss methodological issues in the ego-depletion literature, and suggest empirical lines of research to disprove, update or support this theory. In these sections, “self-control fatigue” will refer to our theoretical and empirical propositions, and “ego-depletion” will be used to discuss past studies.

### The Three Components of Self-Control Fatigue

If we gather together the scattered and conflicting ego-depletion perspectives, and consider recent promising empirical results from the mental-fatigue literature (e.g., Mlynski et al., 2021), we can propose that self-control fatigue has three main components: *self-control resources*, *self-control willingness* and *self-control capacity*. These components predict the ability to perform an initial self-control act. This initial act can temporarily affect each component, making it less efficient for a subsequent self-control

act. Our self-control fatigue theory proposes that an initial self-control act induces temporary reductions in self-control resources, willingness and/or<sup>2</sup> capacity (i.e., the three components), which lead to an impaired subsequent self-control act (i.e., the behavioral outcome). With this proposition, we formulate two hypotheses, (a) an initial self-control act impairs a subsequent one; and (b) self-control components mediate the phenomenon. Accordingly, self-control fatigue theory is falsified if an initial self-control act does not lead to a reduced subsequent self-control act, or if the phenomenon does not rely on any of the aforementioned components. Figure 1 summarizes this original two-step process (inspired by Baumeister et al., 1998; Kotabe & Hofmann, 2015).

### Self-Control Resources<sup>3</sup>

These refer to the objective and subjective amounts of energy available for the self to initiate a self-control act (Clarkson et al., 2016; Kotabe & Hofmann, 2015). These energetic markers could be psychological (e.g., captured by a self-reported questionnaire), such as perceived energy (e.g., Clarkson et al., 2010), perceived vitality (e.g., Rouse et al., 2013; Ryan & Deci, 2008), perceived depletion (e.g., Baumeister et al., 1998; Clarkson et al., 2010; 2011, 2016; Francis et al., 2018; Mead et al., 2009; Vohs et al., 2021); or physiological, such as cardiac frequency, vagal activity, and beta-adrenergic activation (Laborde et al., 2018; Wright et al., 2019; Wright & Mlynski, 2019).

### Self-Control Willingness<sup>3</sup>

This is the volition or motivation to engage in a second self-control act (Inzlicht & Schmeichel, 2012) or represents the priority of the self-control act (Kurzban et al., 2013). These concepts can be operationalized by the score on a questionnaire asking whether participants are motivated to engage in a self-control act (e.g., Muraven & Slessareva, 2003; Vohs et al., 2013, 2021).

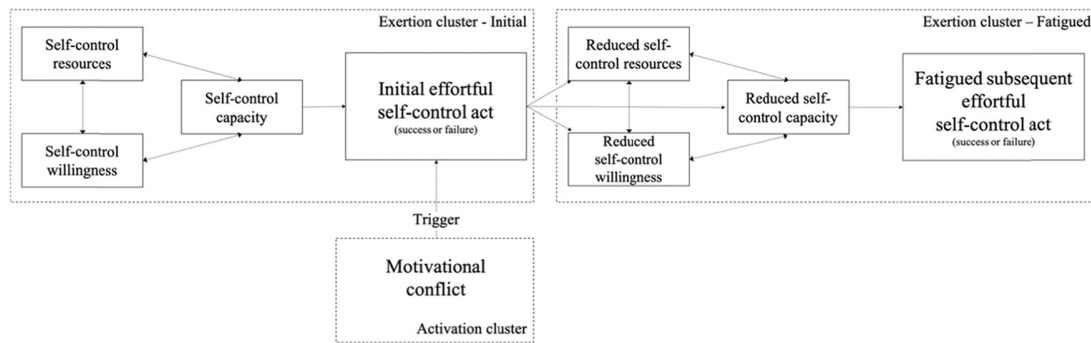
### Self-Control Capacity<sup>3</sup>

This is the top-down mental process that makes the self-control act possible (e.g., executive functions; Hofmann et al., 2012). The authors proposed that working memory, inhibition, and cognitive flexibility represent self-control capacity (Hofmann et al., 2014; Hofmann et al., 2012; Pfeffer & Strobach, 2017). Operationalizing these concepts can be done through behavioral markers such as reaction time (RT) and errors in cognitive tasks (Baumeister et al., 1998; Dang, 2018; Hagger et al., 2010; Muraven & Slessareva, 2003) and brain activity can be analyzed using neuroimaging techniques such as electroencephalography (e.g., Inzlicht & Gutsell, 2007; Wang & Yang, 2014) or functional MRI (e.g., Berkman & Miller-Ziegler, 2013; Hedgcock et al., 2012).

<sup>2</sup> Yet, it is difficult to conclude whether these three components are all involved in self-control fatigue. See section “Determining components independencies and their role in self-control fatigue” for a discussion and perspectives.

<sup>3</sup> Self-control resources, willingness, and capacity are at the cognitive level of analysis. The self-control act is the outcome at the behavioral level of analysis (Friese et al., 2019).

**Figure 1**  
Two-Step Process of the Multicomponent Self-Control Fatigue Phenomenon



*Note.* This figure is inspired from the integrative self-control model by Kotabe and Hofmann (2015) and applies this model to self-control fatigue. Self-control fatigue is the temporary reduction or shift of self-control resources, willingness and/or capacity resulting from an initial effortful self-control act and impairing a subsequent effortful self-control act. Self-control resources are the objective and subjective amount of energy available for the self to initiate a self-control act. Self-control willingness is the volition or motivation to engage in a second self-control act. Self-control capacity is the cognitive top-down mental processes (e.g., executive functions) making the self-control act possible. A self-control act is the act of self-control itself, which could be successful or unsuccessful. The double arrows suggest self-control resources, willingness, and capacity are correlated. Recently, authors have proposed that self-control effort and perceived difficulty are additional components that predict the act of self-control. However, because these potential components have not been supported by empirical evidence, they are not included in this figure.

### Self-Control Act<sup>3</sup>

Self-control act refers to the behavioral implementation of the self-control capacity (Kotabe & Hofmann, 2015) that aims to resolve a motivational conflict (de Ridder et al., 2018; Fujita, 2011; Gillebaart, 2018). The operationalization of this concept is measured by temptation yielding (Baumeister et al., 1998; Friese et al., 2015; Sellaheva & Mullan, 2015), as well as physical or cognitive performance maintenance or success on self-control tasks.

Some ego-depletion articles have suggested that particular components should be rejected, for example, “self-control depletion is not some mysterious result of lost self-control resources but rather the result of shifts in motivation” (Inzlicht & Schmeichel, 2012, p. 452). Over the years, ego depletion has been observed mainly through one marker (i.e., the self-control act), with a hypothesis related to the decrease of a single component (i.e., the self-control resource). We contend for two main reasons that this narrow characterization of ego depletion should be updated into a more comprehensive definition of self-control fatigue (e.g., de Ridder et al., 2018; Hirt et al., 2016; Kotabe & Hofmann, 2015) including the three aforementioned components. First, ego-depletion literature never addressed empirically the relative weight of these components in the process of self-control fatigue. Therefore, each of these components may be sufficient for its emergence. It follows that discarding the existence of one of the components cannot fully discard the existence of self-control fatigue. Second, these components seem theoretically interconnected, which weakens their isolation based on theoretical argument.

To clarify which processes are involved in self-control fatigue, the main ego-depletion literature limitations (i.e., a too narrow approach to the phenomenon) need to be overcome and self-control fatigue should be investigated as a multicomponent phenomenon. Based on this theoretical shift, empirical studies could focus

on evaluating the relative weight of these components and their interaction. In sum, overlooking the multicomponent nature of self-control fatigue may have resulted in a limited understanding and undue rejection of the ego-depletion theory.

### Determining Components Interdependencies and Their Role in Self-Control Fatigue

Currently, it is difficult to estimate whether the three components of self-control fatigue and the outcome are independent. For example, one may argue that self-control resources and self-control willingness are so thinly interconnected theoretically that they could refer to a single construct. First, if the authors assumed that the concept of resources has to be preferred to the concept of willingness (Inzlicht & Schmeichel, 2012), or vice versa (e.g., Baumeister & Vohs, 2007), it seems reasonable to assume that they are distinct. Then, theoretical propositions such as the integrative model of self-control (Kotabe & Hofmann, 2015), which aims to identify predictors of a self-control act, stated that self-control capacity, self-control motivation and self-control act are distinct components, independent but correlated.

At the empirical level, one study showed that self-control capacity (e.g., inhibition) was affected by a previous self-control act, suggesting that self-control capacity and self-control act are distinct, although the strength of their association remains unknown (Christiansen et al., 2012). Similarly, other authors showed that if self-control resources are increased for ego-depleted individuals, ego depletion could be counteracted, suggesting self-control resources and willingness are distinct predictors of a self-control act (Muraven & Slessareva, 2003). Recently, a study jointly assessed self-control capacity (i.e., inhibition) and self-control resources (i.e., perceived fatigue; Lin et al., 2020); and another jointly assessed self-control resources (i.e., perceived fatigue) and self-control willingness (i.e., perceived motivation);

Vohs et al., 2021). Our reanalysis of these data sets revealed that self-control capacity and resources were significantly and negatively related, but with a small effect size ( $r = -.03, p < .001$ ). Similarly, self-control resources were significantly and positively correlated with self-control willingness, but also with a small effect size ( $r = .13, p = <.001$ ), which reveals a small amount of shared variance (i.e., a small overlapping, .01% and 1.69%, respectively; see [Supplementary Material 2](#)). This preliminary evidence provides support for the assumption that the three components of self-control fatigue are distinct, but future self-control fatigue research should clarify this point.

Through the multicomponent approach, future studies could go beyond current debates that focus on which single component produces the depletion effect. Studies could consider the three components together to statistically investigate (a) the extent to which they are interconnected (e.g., correlation coefficients and shared variance); (b) whether their concurrent shifts produce the self-control fatigue effect (e.g., identify significant relations between all shifts or only one shift, and the subsequent self-control act, through regression); (c) the extent to which these shifts explain the phenomenon (e.g., explained variance comparisons between resources shift and willingness shift, through regression); and (d) whether one component could be rejected in favor of another because it is ineffective or weak (e.g., effect size comparisons between resources shift and willingness shift, through regression, null effect of resources shift when considering motivation shift through equivalence tests).

### Self-Control Fatigue Theory From a Lakatosian Perspective

Rejecting a hypothesis is different from rejecting a theory. Statistical tests provide evidence in favor of one hypothesis or another, based on data. However, results favoring or rejecting a hypothesis do not inform about the veracity of a theory. Ego-depletion theory has been tested and rejected solely based on statistical evidence against a particular hypothesis (e.g., Schimmack, 2016; Vohs et al., 2021). We propose to go further and to estimate the level of confidence that could be assigned to self-control fatigue theory through the Lakatosian approach and the systematic replications framework (Dienes, 2008; Lakatos, 1978; Uygun Tunç & Tunç, 2020; for reviews). In their method, the authors differentiate the core assumptions of a theory from auxiliary hypotheses. The core assumptions refer to the concepts. The auxiliary hypotheses represent falsifiable operationalizations of these abstract concepts. Accordingly, the three self-control fatigue components are the core assumptions of the theory and their operationalizations correspond to the falsifiable auxiliary hypotheses that can be tested. To measure theory veracity, the authors propose that researchers should accumulate evidence from direct replications (i.e., replications based on similar operationalizations) and from conceptual replications (i.e., replications based on different operationalizations). Only the accumulation of evidence related to different auxiliary assumptions (i.e., different operationalizations) of each core theoretical assumption will elucidate the veracity of the theory as a whole. [Figure 2](#) illustrates a Lakatosian perspective of the self-control fatigue theory, based on the ego-depletion literature.

### Theoretical Considerations for Future Self-Control Fatigue Research

Rejections of ego-depletion core assumptions and theory were based on rejections of isolated auxiliary hypotheses related to isolated core assumptions, contrary to recommendations (Dienes, 2008; Uygun Tunç & Tunç, 2020). For example, the glucose model rejection, an auxiliary hypothesis of the core assumption of self-control resources, led to the rejection of both the resources' core assumption (e.g., Inzlicht & Schmeichel, 2012), and the whole theory (e.g., Schimmack, 2016). Self-control fatigue studies need to overcome this systemic ego-depletion limitation by exploring a variety of auxiliary hypotheses, to draw reliable conclusions about the core assumptions and the entire theory. [Table 1](#) summarizes the theoretical limits of ego-depletion literature, and the proposed perspectives for self-control fatigue research.

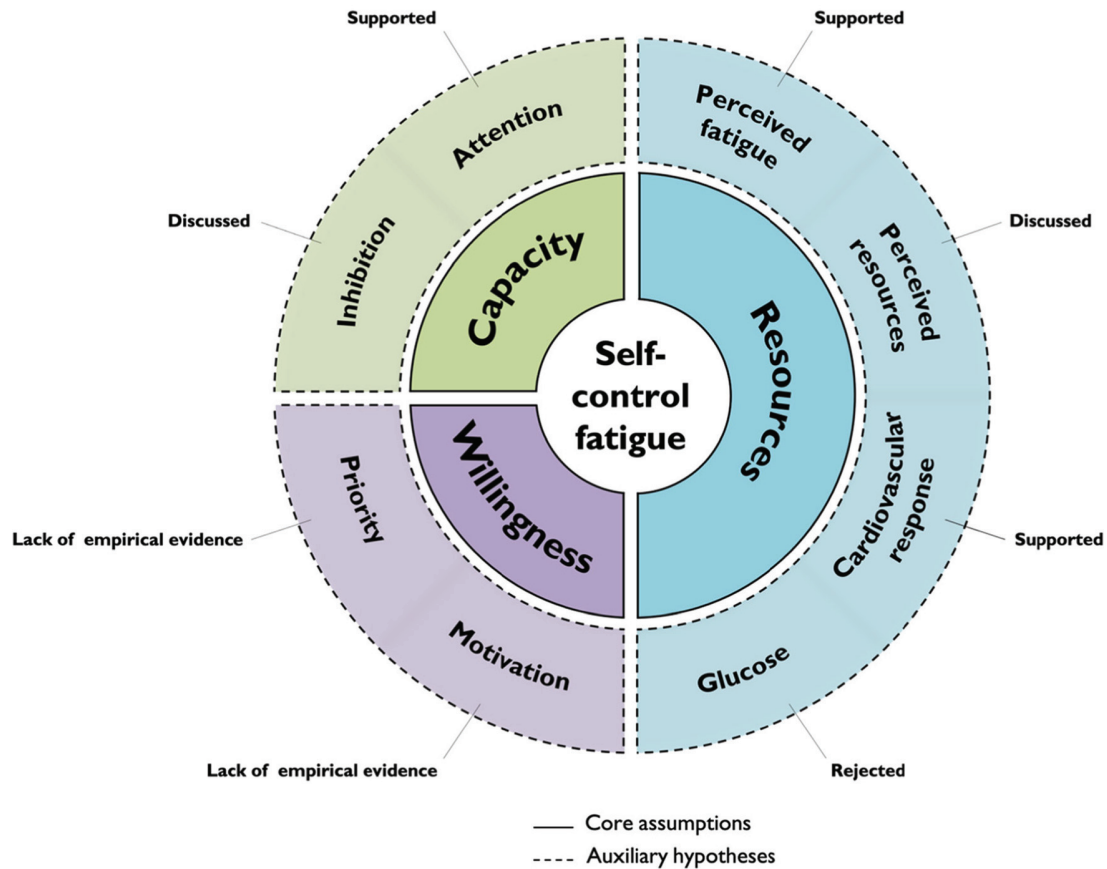
In sum, some auxiliary hypotheses have been rejected, which suggests that ego-depletion theory might be false. However, multiple auxiliary hypotheses pertaining to different core assumptions have not been investigated or have been insufficiently investigated. To move forward and conclude that self-control fatigue is a multicomponent phenomenon, a more comprehensive investigation of these auxiliary hypotheses is required. Moreover, because of methodological limitations, some ego-depletion studies could not be considered as tests of the phenomenon (e.g., Dang, 2018; de Ridder et al., 2018; Friese et al., 2019; Lurquin & Miyake, 2017).

### Methodological Limitations of Ego-Depletion Literature That Self-Control Fatigue Studies Must Overcome, and Potential Solutions

#### Limitation 1: The Need for Accurate, Comprehensive, and Falsifiable Definitions

Over the years, ego depletion definition deviated from Baumeister's original version, which referred to a temporary reduction in the self's capacity to engage in a self-control act, due to a prior self-control act (Baumeister et al., 1998). For example, Lin et al. (2020) defined ego depletion as feeling tired after a mental effort. Other referred to deficits in persistence and performance on cognitive and motor tasks after a self-regulatory effort (Segerstrom & Nes, 2007), or to impaired performance after any behavior's monitoring and modification (Vohs et al., 2005). Inaccurate definitions contributed to inaccurate conclusions that increased the confusion in the ego-depletion literature. This confusion also originated from a multitude of definitions of self-control (see Gillebaart, 2018; for a review), which has increased the likelihood of results that are invalid and lack replicability (Ioannidis, 2005). Moreover, definitions such as "monitoring and modifying behavior" to define self-control (Vohs et al., 2005) or "feeling depleted" or "a state where mental resources for self-regulation are minimal" to define ego depletion (Unger & Stahlberg, 2011; Wolff et al., 2013), are so vague that they are almost impossible to falsify, making the related theories "bad theories" (Popper, 1935).

**Figure 2**  
*A Lakatosian Perspective of the Self-Control Fatigue Theory, With Its Core Assumptions and Auxiliary Hypotheses*



*Note.* In the literature, perceived fatigue and perceived resources have mainly been assessed based on self-reported measures; cardiovascular response and glucose have mainly been assessed based on physiological measures; inhibition and attention have mainly been assessed based on behavioral markers (e.g., reaction time, accuracy), and inhibition has also been assessed based on neuroimaging markers. This figure is an epistemological representation of the literature. For information regarding core assumptions and auxiliary hypotheses interactions, see Figure 1. The conclusion regarding the current state of the literature (i.e., “discussed”, “supported” or “lack of empirical evidence”) are based on the literature. See the online article for the color version of this figure.

### ***Perspective 1: Acknowledging the Importance of Self-Control, Effortful Strategies, and Motivational Conflict in the Definition of Self-Control Fatigue***

In line with previous work (e.g., Lurquin & Miyake, 2017), we contend that accurate, comprehensive, and falsifiable definitions of self-control and self-control fatigue are required for replicable self-control fatigue research. We consider that a consensus needs to be reached for defining self-control as the self-regulation process by which an individual resolves a motivational conflict through either an effortless or effortful strategy (Fujita, 2011; Gillebaart, 2018; Milyavskaya et al., 2019). According to this definition, self-control operates only for conflict resolution, not for other regulatory processes such as goal setting. Effortless self-control strategies are automatic and do not require self-control resources or willingness (e.g., asymmetric cognitive associations, Fishbach et al., 2003). Thus, they are not related to the self-control fatigue phenomenon and will

not be discussed further. Effortful self-control strategies are reflective and rely on self-control resources and willingness (e.g., temptation avoidance, Ent et al., 2015; temptation reappraisals, Fujita & Han, 2009; effortful inhibition, Muraven & Baumeister, 2000), and are thus the only strategies that could induce self-control fatigue. This definition of self-control is specific, falsifiable, and focuses on situational conflict resolution strategies (i.e., in-situ states of self-control), unlike definitions based on general tendencies (i.e., trait self-control). Since ego depletion was considered to be a state rather than a trait of impaired self-control, we argue that it is appropriate to use a state definition of self-control to approach self-control fatigue. This could improve future research designs because it does not conflate two constructs that have similarities but are nevertheless different (for a review, see de Ridder et al., 2018). Finally, this updated definition stresses that several effortful self-control strategies exist and that only effortful strategies can induce self-control fatigue. Based on this definition, different effortful self-control

**Table 1**  
*Theoretical Considerations for Future Self-Control Fatigue Research*

Core assumptions (i.e., the components)	Theoretical limits of the ego-depletion literature	Theoretical perspectives for self-control fatigue studies
Self-control capacity	Used to draw conclusions about the whole theory. Focused on a particular auxiliary hypothesis related to a single core assumption of the theory. Dominated by behavioral studies that tested whether self-control capacity or the self-control act is different between individuals who performed an initial depleting task and individuals who did not. Often mixed results, depending on the auxiliary hypotheses considered (e.g., behavioral markers versus neural markers, Wang & Yang, 2014). Often confuses between the capacity for self-control (i.e., the process) and the self-control act (i.e., the behavior) (e.g., Hagger et al., 2016).	Test a variety of auxiliary hypotheses to draw reliable conclusions about the role of this component. Theoretically distinguish the three core assumptions (i.e., the three components) from the outcome of the processes (i.e., the reductions)
Self-control resources	Rejects the role within the phenomenon of self-control resources (i.e., the core assumption) on the phenomenon (e.g., Inzlicht & Schmeichel, 2012) and the entire ego-depletion theory (e.g., Schimmack, 2016; Vadillo, 2019) based on the rejection of the glucose model (i.e., a single auxiliary hypothesis).	Investigate other auxiliary hypotheses, such as perceived energy, perceived vitality, and cardiovascular responses, to inform this core assumption.
Self-control willingness	Core assumption that received the least consideration. Supported almost exclusively by theoretical propositions (e.g., motivation shift model, Inzlicht & Schmeichel, 2012; priority shift model, Kurzban et al., 2013) that have not been empirically tested.	Investigate the role of this core assumption on the self-control fatigue phenomenon. Investigate a variety of auxiliary hypotheses related to self-control willingness (i.e., a variety of operationalizations, such as motivation, priority).

strategies might induce self-control fatigue, such as temptation inhibition and temptation avoidance. Moreover, this definition could help task selection by considering whether a task requires an effortful self-control strategy or an effortless one, the latter making self-control fatigue unlikely.

Based on the above recommendations, we define self-control fatigue as a temporary impaired effortful self-control act caused by an initial effortful self-control act that aimed to resolve a motivational conflict and decreased self-control resources, willingness and/or capacity (see Figure 1). Several studies initially intended to investigate ego depletion are not within the scope of this definition. For example, some studies manipulated mental or cognitive effort (e.g., Englert et al., 2015; Lin et al., 2020), whereas this type of effort does not necessarily include self-control fatigue components. Others used tasks unrelated to self-control or conflict resolution, which are essential for ego-depletion investigation (e.g., Finkel et al., 2006). As such, these studies may not have actually tested ego depletion (Lurquin & Miyake, 2017). We argue that rigorous empirical studies based on this specific and falsifiable definition of self-control fatigue are required to test the phenomenon.

To our knowledge, no ego-depletion study, even ambitious projects such as the recent multilab replications (Dang et al., 2021; Hagger et al., 2016; Vohs et al., 2021), considered this updated and falsifiable definition of self-control. Instead they considered self-control to be “the extent to which an individual can override a dominant response in favor of an alternative, more effortful course of action” (Hagger et al., 2016; p. 547) or “alter a predominant response tendency, control impulses, and engage in volitional behavior” (Vohs et al., 2021; p. 3 of the preprint version). As

stressed by several authors (e.g., de Ridder et al., 2018; Duckworth et al., 2018; Fujita, 2011; Gillebaart, 2018), these definitions are too narrow, overlap with definitions of inhibition (Diamond, 2013), and ignore an important aspect of self-control: the motivational-conflict resolution.

Similarly, inaccurate definitions of self-control have contributed to the unclear definition of ego-depletion. For example, definitions such as “using self-control on an initial task renders subsequent self-control less successful than if not deployed earlier” (Vohs et al., 2021) does not permit an accurate understanding of the processes involved, or the ability to falsify them. Such limitations have weakened the validity of results of ego-depletion studies and should be overcome in the future. We recommend adopting the more accurate and up-to-date definition of self-control proposed in the recent literature, which stresses effortful self-control strategies. Finally, if researchers are interested in inducing self-control fatigue, we recommend ignoring effortless self-control strategies that are not supposed to trigger this phenomenon.

### **Limitation 2: The Need for a Clear Distinction Between Self-Control Fatigue, Cognitive Effort, and Mental Fatigue**

The original assumption of ego-depletion theory was that an effortful self-control act induces self-control impairment (Baumeister et al., 1998; Lurquin & Miyake, 2017). Some studies drifted away from this original assumption and stated that ego depletion means to “feel tired or depleted after exerting mental effort” (e.g., Lin et al., 2020; p. 1). However, as assumptions have changed, accuracy and falsifiability



may have been lost in the process. This statement implies that any task requiring cognitive effort produces ego depletion, which may not be the case when two different concepts are merged: ego depletion and mental fatigue. A meta-analysis suggested that this semantic merger was not problematic and concluded that ego depletion and mental-fatigue tasks produce similar effects on subsequent tasks (Giboin & Wolff, 2019). Yet, we contend that this conclusion should be treated cautiously for at least four reasons. First, half of the ego-depletion studies considered in the meta-analysis were based on tasks such as labyrinth, arithmetic, and mental-imagery tasks, which have been criticized due to their lack of sensitivity in capturing the ego-depletion phenomenon (Dang, 2018; Lurquin & Miyake, 2017; and see “Limitation 3” below). Second, studies unrelated to physical endurance performance were excluded, which limits the generalization of the conclusions to other domains of physical performance. Third, the effects in the ego-depletion task and the mental-fatigue task were interpreted as being similar based on a nonsignificant correlation. Yet, the absence of significance is not evidence of the absence of effect (Harms & Lakens, 2018). Fourth, recent results showed that a longer initial depletion task induced greater detrimental effects on a subsequent physical task (Boat et al., 2020). These results are not congruent with the results of Giboin and Wolff (2019) that showed no evidence of an effect of duration, which was shorter in the ego-depletion task compared to the mental-fatigue task.

In sum, empirical evidence is insufficient to conclude that ego depletion and mental fatigue are a single phenomenon.

### ***Perspective 2: Conceptualizing Self-Control Fatigue as a Specific Type of Mental Fatigue***

Mental fatigue is the feeling of tiredness or exhaustion resulting from short (e.g., minutes, O’Keeffe et al., 2020; Smith et al., 2019; Wright et al., 2013) or long (e.g., hours, Marcora et al., 2009; Van Cutsem et al., 2017) periods of cognitive activity. It is associated with tiredness, an aversion to continue the present activity, and impaired cognitive or behavioral performance (Boksem & Tops, 2008). Mental fatigue is different from self-control fatigue (see Perspective 1). Specifically, any type of cognitive activity can induce mental fatigue (e.g., memory task, Cook et al., 2007; arithmetic task, Gergelyfi et al., 2015; puzzle task, Van der Linden et al., 2003), whereas self-control fatigue is induced only by an effortful self-control act aiming to resolve a motivational conflict. While these phenomena share similarities, such as tiredness (reduced self-control resources), aversion to continue (reduced self-control willingness), or impaired performance (reduced self-control capacity), self-control fatigue should be considered as a type of mental fatigue specific to self-control and motivational conflict resolution. This distinction between mental fatigue and self-control fatigue could clarify whether previous studies should be included in the self-control fatigue literature and improve the exclusion criteria for future meta-analyses. Moreover, this distinction could improve the accuracy of future study designs by focusing on the resolution of a motivational conflict through an effortful self-control act.

### **Limitation 3: The Need for Triggering Effortful Strategies to Resolve a Motivational Conflict**

In the ego-depletion literature, depleting and measurement tasks were often chosen without strong theoretical or empirical

justification, but rather because, for example, they “have been used in the depletion literature” (Vohs et al., 2021; p. 5). Such a task identification procedure has poor scientific value and does not ensure that it actually activates the processes thought to solicit, exhaust, or capture the phenomenon of ego depletion. Often, “inappropriate depleting tasks” (Dang, 2018; p. 646) were chosen “regardless of whether they could be considered as a valid operationalization of self-control” (Carter et al., 2015; p. 15). Frequently, the tasks were “mentally demanding, requiring effort, or simply being difficult”, but it is difficult to “unambiguously determine whether or not [they] implicate self-control, and determine whether one should expect a significant ego-depletion effect” (Lurquin & Miyake, 2017, p. 2). For example, in the multilab replication by Hagger et al. (2016), the task “did not involve self-regulation” (Baumeister & Vohs, 2016a; see Drummond & Philipp, 2017 for criticisms regarding this paper). Accordingly, caution should be taken when considering letter-cancellation tasks, as they “may not be a suitable inducer of ego depletion” (Wimmer et al., 2019, p. 345), “have not been independently validated as effective measures of self-control” (Lurquin & Miyake, 2017, p. 2), and failed (through frequentist and Bayesian statistics) to induce ego depletion in two multilab studies (Hagger et al., 2016; Vohs et al., 2021).

Moreover, such task selection procedures could perpetuate tasks with low validity and reliability. For example, the letter-e task showed inefficiency across two multilab studies (Hagger et al., 2016; Vohs et al., 2021) despite criticism in the past. Specifically, the authors considered that “the e-crossing task is generally considered not” “depleting,” “thus questioning its effectiveness” (Dang, 2016, p. 1). To date, and despite empirical evidence against it, especially against its electronic versions, letter-cancellation tasks have been supported only by theoretical arguments (e.g., Hagger & Chatzisarantis, 2016), but there is still no strong empirical evidence supporting an association between performance in such tasks and any aspect of self-control. As such, using a task only because it has been used in past research may lead to a waste of resources ( $k_{\text{total}} = 59$ ,  $N_{\text{total}} = 5,672$  in the case of the letter-e task). Other examples of questionable tasks exist (e.g., symbol-counting tasks, Lin et al., 2020; labyrinth tasks, Martijn et al., 2007), and we hope the discussion proposed here could help researchers to better identify them.

Finally, from a replicability perspective, task selection based on use in the past accumulates direct replications that inform about procedure (un)reliability, instead of conceptual replications, that inform about theory reliability (Crandall & Sherman, 2016).

According to the integrative model of self-control (Kotabe & Hofmann, 2015), commonly used tasks may be suboptimal for three reasons to induce a motivational conflict resolved by a self-control act. This model proposes that three distinct motivations are involved in a self-control act: the desire (e.g., immediate motivation to think about a white bear or to eat a sweet cake) and the higher-order goal (e.g., motivation to perform well at a task or to eat healthy), which are in the activation cluster and induce a motivational conflict; and the self-control motivation (i.e., motivation to perform a self-control act to resolve the motivational conflict), which is in the exertion cluster.

First, authors (Baumeister et al., 1998; Kotabe & Hofmann, 2015) have stressed that the stronger the desire, the stronger the motivational conflict, and thus, the more effortful the self-control act. However, most studies operationalized desire with neutral

stimuli such as a letter to not cross (e.g., letter “e” if followed by a vowel, Hagger et al., 2010; 2016). Other studies aimed to trigger a motivational conflict with a neutral inducer such as tedious tasks causing a desire to stop persisting (Finkel et al., 2006). Designs based on neutral stimuli and neutral desire inducers could call into question whether participants truly experienced a desire or not. To our knowledge, no studies assessed participants’ desire (e.g., no study asked participants the extent to which they desired to cross out the letters “e” or would prefer to quit the task). Additionally, if these “neutral” designs induced a desire, we could question their validity. For example, is a desire triggered by a neutral inducer desirable enough to activate an effortful self-control act compared to a desire triggered by an effective inducer? This question is important because most ego-depletion studies, including famous replication failures (e.g., Hagger et al., 2016; Vohs et al., 2021) did use neutral inducers.

Second, in the integrative self-control model, the higher-order goal that promotes a conflict is “pursued intentionally and associated with declarative expectations of long-term benefits” (Kotabe & Hofmann, 2015; p. 619). Moreover, studies stressed that autonomous goals, which are important for the self (e.g., want-to motivation), were associated more with effortful self-control acts than with controlled goals, which are not important for the self (have-to motivation; Converse et al., 2019; Milyavskaya et al., 2015). Finally, studies on self-control excluded participants who did not report a goal that was important to them. They considered that desires proposed would not be conflictual, thus individuals might not develop a self-control act (e.g., participants who considered healthy diet or physical activity as not really important for them, Cheval et al., 2017; Fishbach et al., 2003). Despite the importance of a higher-order goal for motivational conflict and effortful self-control, ego-depletion studies usually do not consider what type of goal is endorsed by participants. If an individual experiences a desire that does not threaten a goal important for the self, an effortful self-control act may be unlikely, making self-control fatigue potentially unlikely to occur.

Third, most ego-depletion studies assumed that participants endorsed a high self-control motivation and persisted throughout the depleting tasks with the highest performance possible. Except for rare studies (e.g., Vohs et al., 2021), most research did not assess self-control motivation to verify this statement. Moreover, to our knowledge, no study investigated whether individuals truly persisted during the depleting tasks. Common manipulation checks include perceptions such as fatigue, difficulty, effort, or frustration (e.g., Dang et al., 2021; Hagger et al., 2016; Vohs et al., 2021) but not performance during the depleting tasks. Without information on self-control motivation, and the persistence of effortful self-control during the depleting tasks, it could be tricky to estimate whether ego depletion was likely or not. These factors should be controlled for in future studies.

Taken together, these limitations may have unduly contributed to reject the existence of the ego depletion phenomenon.

### ***Perspective 3.1: Pre-Tests***

To improve the validity of self-control fatigue task selection, we encourage the implementation of pretests. Some studies have already proposed solutions to improve task validity, such as using executive-function tasks (Duckworth & Kern, 2011) because

executive functions are associated with self-control (see Hofmann et al., 2012; for a review). While this first step toward choosing valid self-control fatigue tasks is important, it may not be sufficient.

To ensure that the tasks trigger an effortful self-control act to resolve a motivational conflict, we propose three approaches. The first could be to compare the performance on the task to be validated, using metrics such as RT, accuracy or errors, with self-control correlates such as the trait self-control scale (Tangney et al., 2004), the temptation-avoidance scale (Ent et al., 2015), or the effortful control scale (Atherton et al., 2020). The second could be to investigate whether performance in the tested task is associated with self-reported measures of self-control in daily life. For example, performance on a Stroop task is related to perceived resistance (Hofmann et al., 2014), which is a self-control act resolving motivational conflict in daily life (e.g., Hofmann et al., 2012; Ozaki et al., 2017). A third approach could be to investigate whether performance in the tested task is associated with performance in conflict-resolution cognitive tasks. For example, the mouse-tracking technique has been used to activate a motivational conflict and test its resolution, which has been shown to be related to self-control (Georgii et al., 2020; Stillman et al., 2018). Such preliminary validation approaches could further improve the reliability of self-control fatigue studies.

### ***Perspective 3.2: Assessing the Affective Charge of the Tasks Among Individuals With Higher-Order Goals***

According to the literature, affectively charged stimuli could increase the motivational conflict, by increasing the desire strength because of the innate motivation they carry (e.g., automatic approach-avoidance tendencies; Kemps et al., 2013; Krieglmeier & Deutsch, 2010). Studies based on affective executive-function tasks (i.e., with affectively charged stimuli) have shown that cognitive processes related to the self-control capacity (e.g., attention, inhibition) are influenced by affective stimuli. For example, stimuli associated with high-calorie food stimuli or sedentary stimuli induced slower RT, less attention bias, poorer inhibition, and a higher recruitment of inhibition processes than when associated with low-calorie food stimuli or physical activity stimuli (Carbine et al., 2017; Cheval et al., 2020; 2021; Mas et al., 2019; 2020). Accordingly, affectively charged inducers seem more likely than neutral inducers to bring about a motivational conflict, and thus, to trigger an effortful self-control act to override the default response, potentially inducing self-control fatigue. To this day, the only empirical evidence supporting the notion that affective stimuli induce stronger self-control fatigue comes from a meta-analysis showing that depleting affectively charged tasks (i.e., food-temptation task) induced the highest effect size ( $d = .63$ ; Dang, 2018), but was associated with high heterogeneity (95%CI [.29, .98],  $I^2 = 63.09$ ). The effect of affectively charged stimuli should be investigated in the future through validated self-control tasks (e.g., pretested affective executive-function tasks). This research line comparing the effect of affectively charged stimuli to that of neutral stimuli could be initiated based on validated affective executive-function tasks such as the emotional stop-signal task (Pawliczek et al., 2013), the affective set-shifting task (Mobbs et al., 2008), or the affective go/no-go task (e.g., Carbine et al., 2017).

**Table 2***Summary of the Practical Limitations of the Ego-Depletion Literature and Perspectives for Self-Control Fatigue Research*

Practical limitations of the ego-depletion literature	Perspectives for self-control fatigue research
<i>Limitation 1:</i> The need for accurate, comprehensive, and falsifiable definitions. Ego-depletion definitions are often vague. These definitions often disregard the importance of effortful self-control strategies and motivational conflict.	<i>Perspective 1:</i> Acknowledging self-control, effortful self-control strategies, and motivational conflict to define self-control fatigue. Define self-control fatigue as a temporary-impaired act of self-control caused by an initial effortful self-control act that aimed to resolve a motivational conflict and that decreased self-control resources, willingness, and/or capacity.
<i>Limitation 2:</i> The need for a clear distinction between self-control fatigue, cognitive effort, and mental fatigue. Ego depletion is often confused with mental fatigue.	<i>Perspective 2:</i> Conceptualizing self-control fatigue as a specific type of mental fatigue. Self-control fatigue is specific to motivational conflict resolution and could be induced by an initial self-control act aiming to resolve such conflict.
<i>Limitation 3:</i> The need for triggering effortful strategies to resolve a motivational conflict and observe ego depletion. The theoretical rationale underlying ego-depletion task selection is often insufficient. Ego-depletion studies often ignore, and never controlled for, the two components of a motivational conflict (i.e., desire, higher-order goal important for the self) and the self-control motivation. Studies often try to induce ego-depletion with tasks using a neutral inducer of desire (e.g., neutral stimuli), which could be suboptimal.	<i>Perspective 3.1:</i> Pretests of self-control fatigue task. Pretest the relations between selected task and self-control correlates (e.g., individual differences in self-control, daily life conflict resolution performance, performance among conflict resolution task). <i>Perspective 3.2:</i> Assessing the affective charge of the tasks, among individuals with higher-order goal. Consider the role of desire strength, the higher-order goal type (i.e., autonomous or controlled), the self-control motivation, and the self-control persistence among fatiguing tasks to understand the phenomenon. Investigate the effect of affective desire inducer (e.g., affective stimuli) threatening and autonomous goal on self-control fatigue research.

Because ego-depletion studies usually triggered a conflict with no higher-order goal, or goals that were not important for the self, they could have induced a cognitive conflict (i.e., a conflict between two cognitive processes) rather than a motivational conflict (i.e., a conflict between two motivations; Fillmore & Vogel-Sprott, 2000). The tasks used in these studies could have therefore not have required self-control. Future studies should consider what higher-order goal is threatened during the fatiguing task, and include participants who report a higher-order goal important for them, as some self-control studies did (e.g., Fishbach et al., 2003). For example, researchers could include only participants with a higher-order goal toward a healthy diet, and threaten this goal with affective executive-function tasks depicting unhealthy food (e.g., affective go/no-go with “go” stimuli associated with pictures of healthy food, and “no-go” stimuli associated with pictures of unhealthy food).

Finally, self-control fatigue studies could assess participants’ self-control motivation during or right after the fatiguing task to investigate whether performance during the fatiguing task (i.e., a persistence marker) is associated with self-control fatigue in the subsequent task. To our knowledge, few studies have investigated self-control motivation to perform a self-control act (e.g., Vohs et al., 2021) or tested if self-control during the initial task and its potential decline is related to self-control in the subsequent task. For example, future self-control fatigue studies could assess self-control motivation continuously (e.g., each minute) during the fatiguing task to estimate whether individuals remain motivated for the effortful self-control act or not, and could investigate the extent to which persistence markers of the effortful self-control act during the fatiguing task (e.g., error-rate evolution) are related to self-control fatigue on the subsequent task.<sup>4</sup> Table 2 summarizes the methodological limitation of the ego-depletion literature, and the perspectives for self-control fatigue research.

### Conclusion

When a theory is falsified, scientists can revise or reject it (Dienes, 2008; Lakatos, 1978; Popper, 1935). In past years, the low

replicability of ego-depletion has led many scientists to reject it. Yet, this low replicability applies mostly to studies suffering from theoretical and methodological limitations. To overcome them, researchers in the field need to reach a consensus on a definition. Based on a contemporary self-control definition (e.g., Gillebaart, 2018); we suggested one where self-control fatigue refers to the temporary reduction in self-control resources, willingness and/or capacity, resulting from an initial effortful self-control act, and impairing a subsequent effortful self-control act. With this innovative approach, we aim to test it as a whole, overcoming the limitations of ego-depletion literature through the investigation of the auxiliary hypotheses that are related to the three core assumptions of the theory (i.e., shift in self-control resources, willingness, and capacity). The propositions we have made are not without limitations. First, most of the ego-depletion literature is not in line with the self-control definition we propose, and few of them used methodologies consistent with our propositions (e.g., multicomponent approaches, validated affectively charged self-control tasks). Consequently, even if some studies support the self-control fatigue theory, our suggestions require extensive empirical evidence. Second, some arguments are based on propositions from a group of ego-depletion researchers who share our perspectives, but could be in opposition with other authors. Nevertheless, our theoretical perspectives are also supported by recent empirical results. For example, a promising mental-fatigue study (Mlynski et al., 2021) showed that the decrease in behavioral restraint capacity (i.e., inhibitory control, that could serve as an operationalization of *self-control capacity*) can be explained by multiple interacting mechanisms, among which the motivation to restraint, which could be considered as an operationalization of *self-control motivation*, has proven to be particularly relevant. However, the study by Mlynski et al. (2021) does not fully relate to the self-control fatigue theory. First, the study was conducted in a mental-fatigue context, not a self-control

<sup>4</sup> See “Perspective 4.1.” in the Supplementary Material 1.

one (e.g., no motivational conflict to resolve, extrinsic motivation, neutral cognitive tasks). Second, the authors stressed the importance of components such as behavioral restraint difficulty and behavioral restraint effort, which have not yet been explored in the ego-depletion literature. Finally, the authors investigated the role of the components' absolute score on fatigue rather than the role of the components' relative score (i.e., the role of the shift of these components' score between before and after the fatiguing task) as proposed here. Nevertheless, the findings from Mlynski et al. (2021) provides important perspectives that need to be investigated in future studies to further extend the self-control fatigue theory (see "Perspective 4.1." are in [Supplementary Material 2](#) for a discussion on some work from these authors).

To conclude, we consider that if researchers could reach a consensus on using an accurate, comprehensive, and falsifiable definition, conceptualizing self-control fatigue as a specific type of mental fatigue, and using tasks that have proven to trigger a motivational conflict requiring effortful strategies to be resolved, it could improve self-control fatigue studies' rigor, replicability, and falsifiability because of reduced flexibility in designs, definitions and outcomes (Ioannidis, 2005). It could also pave the way for further consensus proposals, and contribute to discussions about self-control fatigue. Ultimately, moving from narrow and limited investigations of ego depletion, toward comprehensive and more rigorous investigations of self-control fatigue can help to explore and understand this phenomenon.

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## Résumé du Manuscrit 2

Ce deuxième manuscrit a cherché à adresser les limites autour du phénomène d'épuisement de l'ego et particulièrement ses limites méthodologiques et théoriques qui ont contribué à la crise de la répliquabilité. Pour cela nous avons proposé qu'il était nécessaire d'utiliser des définitions robustes et falsifiables du contrôle de soi, qui incluent notamment la notion de conflit motivationnel. En lien la littérature récente nous proposons que la fatigue du contrôle de soi est une réduction temporaire des ressources du contrôle de soi, de la motivation au contrôle de soi et/ou de la capacité de contrôle de soi résultant en un acte de contrôle de soi subséquent altéré (et non uniquement une diminution des ressources comme cela avait été suggéré précédemment par les travaux les plus connus dans la littérature).

Finalement, ce manuscrit propose de passer d'une conceptualisation étroite et limitée de l'épuisement de l'ego à une vision plus complète et plus rigoureuse via la fatigue du contrôle de soi, pour mieux comprendre ce phénomène, et mieux l'investiguer. Ce manuscrit servira de base théorique aux manuscrits 3 et 4 présentés ci-après.



### **Manuscrit 3. Revue systématique du lien entre la stigmatisation et le contrôle de soi**

Ce troisième manuscrit présente une revue systématique faisant la synthèse de neuf articles qui ont cherché à investiguer la nature de la relation entre la stigmatisation et le contrôle de soi. Nous avons fait le choix dans cette revue de ne pas limiter notre travail à une stigmatisation d'un groupe social particulier, mais de regarder de manière générale comme la stigmatisation opère sur ce construit. Concernant le contrôle de soi, nous avons opté pour une définition récente et large du contrôle de soi (i.e., Manuscrit 2), afin de ne pas être trop restrictif vis-à-vis de ce construit. Dans les chapitres précédents, nous avons constaté que le contrôle de soi a fait l'objet de nombreuses recherches, mais malheureusement, il n'est pas toujours étudié de manière rigoureuse. Cette situation a engendré une certaine confusion autour du concept, avec de nombreuses études utilisant des définitions et des mesures différentes du contrôle de soi. Cette étude est actuellement en cours de rédaction pour publication dans un article scientifique. Nous vous proposons ci-dessous sa dernière version.

Contribution personnelle selon la Taxonomie CRediT (Allen et al., 2019): Co-conceptualisation, Méthodologie, Co-validation, Investigation, Écriture (i.e., *Writing – original draft*), Visualisation

#### **Référence**

Allen, L., O'Connell, A., & Kiermer, V. (2019). How can we ensure visibility and diversity in research contributions? How the Contributor Role Taxonomy (CRediT) is helping the shift from authorship to contributorship. *Learned Publishing*, 32(1), 71–74. <https://doi.org/10.1002/leap.1210>

## **Stigma and self-control: A systematic review**

### **ABSTRACT**

**Objectives.** This systematic review examined 1) whether exposition to stigmatization may predict state self-control, 2) whether the consequences of this association (e.g., on health-related variables), and 3) the moderators of the relationship between stigma and self-control. We investigated these questions among different stigmatized groups, without restriction on the targeted population.

**Method.** PubMed, PsycINFO, PBSC, Web of Science, and Scopus were searched to identify articles published up until 1998. Data were extracted from all articles independently and assessed for risk-of-bias using Cochrane Collaboration tools.

**Results.** Fifteen independent studies published in 9 articles met the inclusion criteria. In this systematic review, we examined self-control by looking at the measurement tool used and the theoretical dimension. We also recorded if any other behavior was assessed related to self-control variation, as well as the way stigma was induced (i.e., implicit vs explicit, and tool). Intervention structure varied substantially between studies regarding content, stigma induction, population, and self-control construct and tool used.

**Conclusions.** All studies showed that stigmatization decreases self-control, whatever the population targeted or the way that self-control was assessed and conceptualized. However, more rigorous studies are needed. Indeed, given the detrimental health effects of stigmatization, it's important to realize more robust studies to better understand the underlying process to be able to design interventions to tackle stigmatization, at both author and target levels.

**PROSPERO** Registration CRD42021279378.

**Key Words:** Stigmatization; Self-control; Systematic review; Health behaviors; Stigma

## **I. Introduction**

### **1. Stigma**

What does it mean to be different? What does it mean to be seen as deviating from a norm, or to see oneself as deviating from a norm? To answer these questions, we need to have a look at what norms are, and in particular the norms established by the society, the social norms. Indeed, unlike laws that explicitly outline prohibited behaviors and their consequences, the definition of what is considered normal, appropriate, approved, or expected behavior is shaped and understood through social engagements (Rimal & Lapinski, 2015).

Social norms are learned in many aspects of life, through direct (e.g., conversations) and indirect (e.g., observations) experiences, and are defined as characteristics that belong both to individuals, such as people's perceptions of what actions others in their social circle engaged in or expect of them, and to social groups - the connections individuals have with other group members (Yanovitzky & Rimal, 2006).

The attribute that marks this deviation from the social norms has been conceptualized by Goffman (1963) as a stigma. This author proposed three types of stigma: physical differences such as physical disability, age, or gender, assumed character traits such as drug addiction, and “tribal” characteristics such as ethnicity. In turn, characteristics that deviate from the social norms are viewed negatively in society, leading to negative stereotyping. As outlined by Goffman, a stigma is « an attribute that links a person to an undesirable stereotype, leading other people to reduce the bearer from a whole and usual person to a tainted, discounted one (p. 11)”. People who possess a stigmatized attribute also face prejudice, defined as a negative attitude toward someone solely because they belong to a particular social group (Allport et al., 1954).

A large empirical literature on weight suggests that the negative attitudes and stereotypes that are associated with stigma result in negative treatment, which can manifest as both subtle and overt forms of discrimination (Phelan et al., 2008; Stuber et al., 2008).

## **2. Consequences**

Dealing with stigma has important consequences for academic performance (e.g., Schmader et al., 2008), professional careers (Van Laar et al., 2019), and physical and mental health (e.g., Puhl et al., 2020). Another consequence of stigma on stigmatized individuals is an increased mortality risk (Muennig et al., 2010). For example, sexual minorities living in high structural stigma communities (i.e., where there is high anti-gay prejudice) have an average life expectancy 12 years shorter than sexual minorities living in low structural stigma communities (Muennig et al., 2010). Social psychology research considers that these consequences are due various psychological mechanisms that are triggered by stigma.

For example, in the context of weight, an explanatory model (see Figure 27.1 Major et al., 2018) proposed different ways in which weight stigma can harm mental and physical well-being. This model stems from the presence of societal weight stigma. One side shows that actual weight stigma (i.e., discrimination) directly harms the health of heavier individuals by altering the social and material aspects of their lives negatively. These pathways involve fostering social isolation, compromising healthcare quality, reducing socioeconomic status by limiting access to opportunities and material conditions conducive to better health (e.g., proper nutrition, safe environments, and quality healthcare), and increasing stress and negative emotions. On the other side, the model suggests that even in the absence of actual weight stigma, perceived stigma can lead to social identity threat (i.e., a situationally triggered psychological state in which individuals are concerned that they will be devalued, rejected, negatively stereotyped, or discriminated against because of their social identity), which indirectly affects health.

Mechanisms for how social identity threat impairs health include heightened stress and negative emotions, leading to increased physiological reactivity (e.g., increased cortisol and cardiac reactivity for example); impaired self-regulation and increased comfort eating to alleviate stress, both contributing to increased calories intake; and heightened engagement in stigma-avoidance behaviors with negative health consequences (e.g., avoiding public exercise, avoiding doctor visits, and withdrawing socially). This model suggests that self-stigma can escalate stress (see also Major et al., 2012) and negative emotions, and exacerbate the adverse effects of social identity threat on health. This figure also highlights that many mechanisms are bidirectional, potentially contributing to weight gain and/or impeding weight loss. Ironically, experiencing weight stigma may perpetuate the sources of stigmatization, from external actions to social identity threat (for a review see Major et al., 2018). Furthermore, a recent study investigated social identity threat as a mediator between weight stigma, maladaptive eating behaviors, and weight gain, suggesting its role via positive associations with rigid dietary restraint (Wellman et al., 2018), supporting that being afraid of being a target of weight stigma could lead to taking weight.

A common consequence of all three stigma mechanisms is the generation of stress. Besides, stress response results in coping reactions to override these negative effects of stigmatization (see Schmader et al., 2008; Van Laar et al., 2019 for reviews). For the same stressor, stigmatized individuals could cope in two different ways, as increased engagement or, conversely, by disengaging themselves from or un avoiding the stressor, resulting in a range of different coping responses, specific to each person and situation. Nevertheless, different studies on coping with stigma have been realized through the self-regulation or self-control perspective (e.g., Carver & Scheier, 1982; Inzlicht et al., 2006; Inzlicht & Legault, 2014; Scheier & Carver, 1985), which was related to subsequent difficulties in self-regulatory processes (Inzlicht &

Kang, 2010)<sup>1</sup>. Indeed, coping with the stress of negative stereotypes involves resource-consuming strategies, such as emotion regulation, for example in minimizing negative emotions following a stigmatizing event, or in reappraising the situation in neutral terms to minimize the emotional impact (Johns et al., 2008). Coping may be effective in suppressing stereotypical concerns, as it was highlighted among women facing gender stereotypes in Logel et al. (2009). Finally, dealing with different goals competing for each other, such as in situations where a stigmatization mechanism operates and where these situations face long-term goals (e.g., being concerned about going to the pool to be physically active and achieving this objective because of fear of being teased about one's weight), leads to motivational conflict, that needs to be resolved, and self-control appears to be a cornerstone in motivational conflict resolution.

### **3. Self-control**

Indeed, in the chain of explanatory mechanisms, several authors have proposed the role of self-control or related concepts (e.g., self-regulation) to explain the nature of the relationship between stigmatization and the subsequent outcomes of targeted individuals (e.g., poorer academic performance, unhealthy behaviors...). For example, in their article, Van Laar et al. (2019) proposed that coping with stigma (increased engagement or disengagement) requires resources that may be reduced or depleted due to successive attempts to cope with the stigma. Indeed, given that self-control is limited and that stereotype threat requires it, the authors proposed that stereotype threat will leaves people with fewer resources to achieve what they

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<sup>1</sup> Please note that self-regulation and self-control are two distinct constructs. Self-regulation is conceptualized as a construct that encompasses all the processes involved in maintaining a person's equilibrium, such as regulating body temperature, posture, and, of course, self-control. Whereas, self-control is a set of strategies operating in the self-regulation loop (Gillebaart, 2018)

aim to do. They hypothesized that coping with the stress of stereotype threat can have aftereffects by hurting performance on any task that requires self-control. Managing the stress of negative stereotypes involves resource-demanding coping strategies, such as emotion regulation and thought suppression (Johns et al., 2008; Logel et al., 2009), and because these resources are limited, coping could result in poorer self-control even after the stereotype stressor is no longer in the air (Inzlicht & Kang, 2010). Their study revealed that female participants in the stigma condition ate more food compared to those who were not primed with a stigma (here, gender-related).

However, the main limitation of the studies evaluating relationships between stigma and self-control is the definition of self-control. For a long time period, research involving self-control, limited this construct to inhibition, especially within the theoretical framework of ego depletion. Ego depletion was viewed as “a temporary reduction in the capacity to engage in self-control, caused by a prior self-control exertion that depleted a common resource” (Baumeister et al., 1998; Forestier et al., 2022). This model has often been tested using a sequential task paradigm in which self-control performance is evaluated by comparing two groups, one that has previously performed an initial self-control act (i.e., experimental group) and one who has not (i.e., control group). Consistent with their hypothesis, participants in experimental group performed worse on the subsequent self-control act than the control group. In further studies (Baumeister et al., 2000; Muraven & Baumeister, 2000) they proposed that this poorer performance following a first self-control act was due to a use of self-control resources that require a certain amount of time to regenerate.

A few years later, controversy arose over this theory, following the non-replication of the phenomenon and the emergence of meta-analyses concluding that the effect size was close to zero (see Forestier et al., 2022 for a review; Hagger et al., 2016). In the same period, other explanatory models of self-control emerged, proposing other explanatory factors for the decline

in self-control after initial use (such as motivation). Due to of the lack of consensus around self-control, many different definitions have been used in the past, and thus many studies have thus used different concepts to define and measure self-control, which can be felt in this study. However, broader definitions of self-control have subsequently been proposed (e.g., notably by Fujita, 2011; followed by Hofmann et al., 2012), and we will rely on them to provide a global overview of the effects of stigma on self-control, which is not limited to inhibition.

In this current work, we decided to use a very recent conceptualization of self-control that includes different self-control components, closer to recent self-control definitions. Indeed, Forestier et al., (2022) proposed that the self-control act depends on three components: self-control resources (e.g., the objective and subjective amount of energy available for the self to initiate a self-control act), self-control willingness (e.g., the volition or motivation to engage in a second self-control act), and self-control capacity (e.g., the cognitive top-down mental processes (e.g., executive functions) making the self-control act possible), all three of which are correlated. The first self-control act led to a reduction in one or more of these components, and thus to a subsequent self-control act impaired, successful or not. The idea is that the more self-control acts are realized, the more the components are depleted and the more difficult a successful self-control act will be. And so, the more difficult it would be to engage in the wanted behavior (e.g., dieting, practicing physical activity). Thus, overriding stigmatization could lead to self-control resources diminution, but also to less self-control willingness and/or self-control capacity, resulting in an impaired self-control act.

These works based on self-control fluctuations are in other words interested in self-control state. Nevertheless, another part of the literature focuses on another self-control construct, more stable over time, self-control trait (e.g., de Ridder et al., 2018; Tangney et al., 2004). Because of the stable nature over time of the self-control trait, we will not be interested in this work on this construct, and will not include studies using measuring it in our research.



#### **4. Current research**

To our knowledge, this systematic review is the first to examine the short-term effects of stigma on self-control, and to determine which components of self-control are affected by stigma. We also seek to assess the subsequent effects of these associations on other outcomes (e.g., health behaviors). Specifically, the objectives of the current research are to investigate 1) whether stigma predicts self-control, 2) whether self-control mediates the relationship between stigma and different outcomes, and 3) the potential moderators of the relationship between stigma and self-control.

## **II. Method**

The present review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). Following recommendations to minimize bias and provide evidence of a priori analysis intentions (Quintana, 2015), the study was preregistered under the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42021279378). Moreover, the preregistration, all materials and data are available on the OSF page ([https://osf.io/vdnza/?view\\_only=8454e2a615c543a0ba9d7952192e1549](https://osf.io/vdnza/?view_only=8454e2a615c543a0ba9d7952192e1549)) of the project to facilitate reproducibility and transparency of this review (Moreau & Gamble, 2022).

### **1. Search strategy and information source and eligibility criteria**

We conducted a systematic literature search, in 2021, through the electronic databases PubMed, PsycINFO, PBSC, Web of Science, and Scopus. We searched for a combination of terms related to stigma and self-control in the title and abstract in each database (for more details

see the supplementary materials in OSF). To be included, studies must have been published after 1998 and in English exclusively. We used 1998 as the beginning of the search because it corresponds to the year of publication of a series of very influential studies on a self-control theory that has rekindled the interest of psychologists in self-control (Baumeister et al., 1998; Muraven et al., 1998). Moreover, we restricted the inclusion to quantitative studies (experimental or correlational) published as peer-reviewed journal articles and interested in humans only. Finally, as we were not interested in one specific type of stigma but instead in the impact of stigma in general over self-control, we did not restrict our research to a specific population, and included all stigmatized ones (e.g., stigma related to gender, age, weight).

Moreover, studies were excluded if they were not peer-reviewed or available in English and did not report on quantitative studies (i.e., dissertations, theses, review articles, book chapters, case studies, qualitative studies, conference papers, editorials, and commentaries).

## **2. Screening**

Two authors (MdC and AC) screened independently the titles and abstracts resulting from the database search. Full texts of potential included studies were all checked before inclusion. Disagreement was resolved by discussion or by consulting a third author (AM). The complete list of screened studies (included and excluded) is available on the OSF page of the project.

## **3. Data extraction**

In the data collection process, AM and AC extracted data independently and blinded from each other using the app Rayyan (Ouzzani et al., 2016). As for screening, disagreement was resolved by discussion or by consulting a third author (AM). Extracted data by MdC included: title, publication year, authors, country, participants' characteristics and sample size,

hypotheses, stigma type, stigma prime, content of experimental and control conditions, measure of self-control, other outcomes, results and risk of bias assessment.

#### **4. Risk of bias assessment**

Two reviewers (MdC, and AM or AC) independently assessed risk-of-bias and study quality for each reported outcome measure using the ROBINS-I tool (for non-randomized studies, J. A. Sterne et al., 2016). In line with the guidance, algorithms were followed to obtain a judgment for each assessed domain using the published article and available Supplementary Material. Studies with at least one domain scored as high risk-of-bias or with four or more domains of some concerns were subsequently classified overall as high risk-of-bias. Studies were classified overall as low risk-of-bias only if all domains achieved this criterion (Sterne et al., 2019). Disagreements were resolved through discussion. No studies were excluded due to low quality or risk-of-bias; rather, all issues were considered when interpreting the results.

#### **5. Data synthesis**

A meta-analysis was originally planned. However, significant heterogeneity among studies in terms of design, interventions, and outcome measures as well as a lack of data availability, precluded meta-analysis. Therefore, we present a descriptive summary of each study. Indeed, authors of only two articles included in the quantitative analyses reported their data, and all others did not answer our request or refused to share them. The studies investigated the effect of stigmatization process over self-control or self-control-related concept. Findings are collated in a tabulated summary, grouped and synthesized according to study design and characteristics.

### III. Results

Online database searching identified 2,658 articles. Following the removal of duplicates, 2,582 articles were screened, with 2,547 that did not meet the inclusion criteria excluded. The remaining 15 articles were retrieved in full text and assessed for eligibility, with nine articles retained for the final qualitative analysis, and seven articles were identified for quantitative analyses. Nevertheless, because of the lack of data, and homogeneity between studies in terms of design, interventions and outcome measures we only conducted the qualitative analysis (see Figure 1).

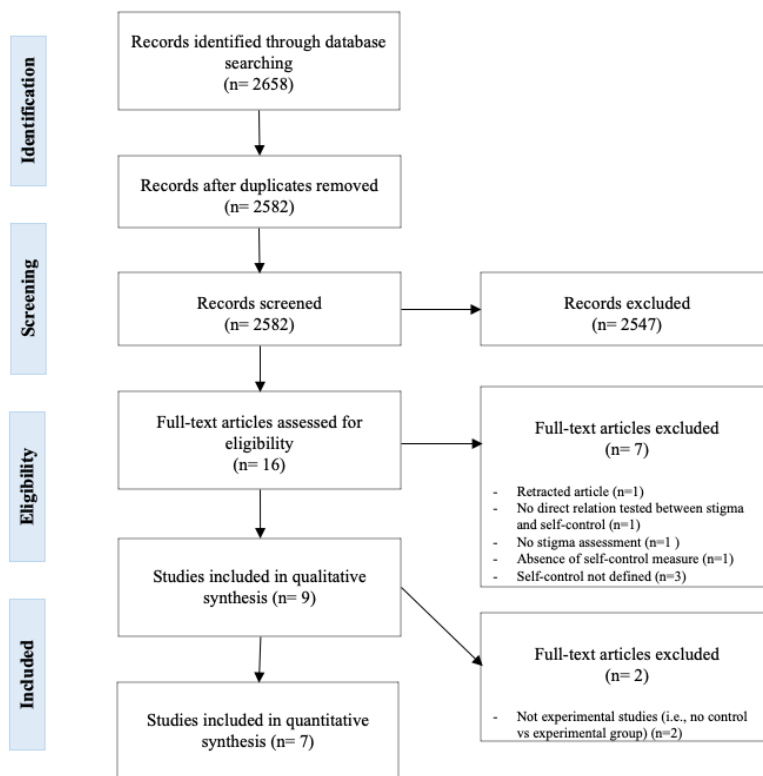


Figure 1. PRISMA flow diagram

**Table 1.** Included studies characteristics

Study	Participants	Hypotheses	Stigma type	Stigma prime	Experimental group	Control group	Measure of self-control	Other outcome
Araiza et al. (2017) (USA)	People who considered themselves to be overweight, N = 84, 90.47% women, (Mage = 21.42 years, SD = 5.38)	Participants exposed to weight stigma should perform poorer on an inhibition task and consume more calories than those in the control condition.	Weight	Explicit	Read a text about workplace discrimination against overweight people	Read a text about workplace discrimination against Inuit Canadians	Inhibitory control (Go/NoGo task)	Food selection (total of calories ordered)
Major et al. (2020) Studies 1, 2 and 3 (USA)	Study 1: Adults, N = 485, 47.00% women, (Mage = 35.10 years, SD = 11.57) Study 2: Adults, N = 302, 53.97% women, (Mage = 34.99 years, SD = 11.36)	Exposure to weight stigma should increase motivation to lose or avoid gaining weight to avoid future stigma and should decrease perceived capacity to do so, by heightening concerns about experiencing stigma and negative affect.	Weight	No manipulation in study 1 Implicit for studies 2 and 3	Viewed a stigmatizing image and a message indicating that, “nearly two in three people say they look down on people who are overweight”	Viewed a stigmatizing image and a message indicating that, “nearly two in three people say they look down on people who smoke”	Study 1: perceived capacity for weight control (Povey et al., 2000) Studies 2 and 3: State self-control (Sasaki & Vorauer, 2010)	Motivation to lose weight, unhealthy weight control behavior, motivation to avoid stigma, negative affect



	years, SD = 1.33)	retrospectively report feeling more stress-related emotions during the speech.	Weight	Explicit	Read and described an ostensible New York Times article titled either, “Lose Weight or Lose Your Job,”	Read and described an ostensible New York Times article titled either, “Quit smoking or Lose Your Job,”	Self-efficacy for dietary control (self-efficacy scale Clark et al., 1991)	Calories consumed and weight stigma concerns	
Major et al. (2014) (USA)	Students, N = 93, 100% women (Mage = 19.15 years)	Exposure to weight-stigmatizing messages should cause overweight, but not non-overweight, individuals to: (1) consume more calorie-rich snack foods, (2) feel less able to control their diet and (3) be more concerned about being a target of weight stigma. In addition, overweight individuals would display more anxiety than non-overweight individuals when describing a weight-stigmatizing (vs. non-stigmatizing) article, as reflected in their nonverbal behavior.							
Carr & Steele (2010) Study 2b (USA)	Students, N = 56, 55.36% women	Stereotype threat should negatively affect decision making among women.	Gender	Implicit	Told they would complete tasks that measure their mathematical, and logical, and rational	Told that the tasks were puzzle-solving exercises, and asked to indicate their gender after	Ego-depletion (Stroop task)	Risk aversion	

Inzlicht et al. (2006) Study 1, study 2 and study 3 (Canada)	Study 1: Black students, N = 38 Study 2: Black and White students, N = 42 Study 3: students, N = 61, 100% women	Individuals belonging to stigmatized groups should be less able to regulate their own behavior when they become conscious of their stigmatizing status or are in threatening environments, than in non-threatening environments.	Study 1 and 2: Skin color Study 3: Gender	No manipulation in study 1 Implicit for study 2 Explicit for study 3	Study 2: told that the test was diagnostic of intellectual ability. Study 3: told that the test had shown gender differences in the past.	Study 2: told that the test was nondiagnostic of intelligence. Study 3: told that the test had not shown gender differences in the past.	Study 1: self-efficacy to self-regulate (SESRL) Study 2: attentional self-control (Stroop task) Study 3: physical self-regulation (handgrip task)	-	Physical activity (short form IPAQ; Booth, 2000)
Rojas-Sanchez et al. (2021) (France / Mexico)	French sample, N = 200, 60% women (Mage = 34.71)	(1) Perceived weight should positively predict perceived discrimination; (2) perceived discrimination to positively predict weight stigma concerns; (3)	Weight	No manipulation	-	-	Self-control resources (subjective vitality scale Ryan &	-	Physical activity (short form IPAQ; Booth, 2000)



<p>Emile et al. (2015) (France)</p>	<p>years, SD=16.08)                  Mexican sample, N = 153, 58.17% women (Mage = 29.75 years, SD=10.80)                  Ntotal = 353, 59.21% women</p>	<p>weight bias internalization to positively predict motivation to avoid exercise and self-control resources; (4) these two motivational constructs to independently predict physical activity participation, with motivation to avoid exercise negatively predicting it, and self-control resources positively predicting it</p>	<p>Agging</p>	<p>No manipulation</p>	<p>-</p>	<p>-</p>	<p>Frederick, 1997)</p>	<p>-</p>
<p></p>	<p>Older people, N = 192, 87,5% women (Mage = 73.22 years, SD=7.53)</p>	<p>Endorsement of negative age stereotypes in the physical activity domain should be related to decreased subjective vitality among active older adults</p>	<p>Agging</p>	<p>No manipulation</p>	<p>-</p>	<p>-</p>	<p>Self-control resources (subjective vitality scale Ryan &amp; Frederick, 1997)</p>	<p>-</p>

## 1. Study characteristics and participants

All articles included in the review were published in peer-reviewed journals, in English language, between 2006 and 2021. In the nine articles included, a total of 15 studies were presented. Among them, 11 experimental studies and four observational, and none were randomized control trials. Six articles were realized in the USA, one in Canada, one in France and one between France and Mexico). Table 1 gives an overview of the included studies' characteristics. The 15 studies from the nine articles included in the qualitative analysis involved 2840 participants with sample sizes ranging from 38 to 698. Five studies investigated gender stigma (Carr & Steele, 2010 study 2b; Inzlicht et al., 2006 study 3; Rydell et al., 2014 studies 1, 2 and 3), seven investigated weight stigma (Araiza & Wellman, 2017; Major et al., 2012, 2014, 2020 studies 1, 2 and 3; Rojas-Sánchez et al., 2021), one investigated aging stigma (Emile et al., 2015), and two investigated skin color stigma (Inzlicht et al., 2006 studies 1 and 2). Eleven studies investigated the influence of stigmatization on self-control through an experimental design (Araiza & Wellman, 2017; Carr & Steele, 2010; Inzlicht et al., 2006 studies 2 and 3; Major et al., 2012, 2014, studies 2 and 3 2020; Rydell et al., 2014), one study through a longitudinal design (Emile et al., 2015), one study with a cross-sectional design (Rojas-Sanchez et al., 2021) and two with a correlational design (Inzlicht et al., 2006 study 1, Major et al., 2020 study 1) . Among the 11 experimental studies, five used implicit stigma primes (Carr & Steele, 2010; Inzlicht et al., 2006 study 2; Major et al., 2012, 2020 studies 2 and 3) and six explicit primes (Araiza & Wellman, 2017, Inzlicht et al., 2006 study 3, Major et al., 2014, Rydell et al., 2014 studies 1, 2 and 3).

Self-control outcomes measured were diverse: one study (Araiza & Wellman, 2017) assessed inhibitory control through a Go/No-Go task, one study assessed state self-control with a self-reported questionnaire (Studies 2 and 3, Major et al., 2020), three studies assessed the

three executive functions through cognitive tasks (Rydell et al., 2014; Inhibition with a Stroop task, updating with a Letter memory task and shifting with a number-letter task, see Forestier et al. (2023) for a study about self-control and executive functions), two studies only assessed inhibition also with a Stroop task (Study 2b in Carr & Steele, 2010 and Major et al., 2012), another study also used a Stroop task but to assessed “attentional self-control” (Study 2 in Inzlicht et al., 2006), two studies used assessed self-efficacy (Study 1 in Inzlicht et al., 2006, Major et al., 2014, study 1 in Major et al., 2020), and Inzlicht et al. (2006) also assessed physical self-regulation with a handgrip, in their study 3. Finally, two of the non-experimental studies assessed self-control resources through subjective vitality from Ryan & Frederick (1997) (Emile et al., 2015; Rojas-Sánchez et al., 2021).

## **2. Risk-of-bias**

The risk-of-bias summaries for the nine articles are presented in Figure 2. This evaluation was realized thanks to the ROBINS-I tool (see II. 4. Risk of bias assessment). The Online Supplementary Material presents the supporting justification for each study’s individual outcomes. Overall, five articles were rated as presenting a high-risk-of-bias in the selection of the reported result. More particularly, authors of three articles did not answer our request to share their data with us (Carr et al., 2010, Inzlicht et al., 2006, Rydell et al., 2014), authors from one article answered that they did not have the data anymore (Major et al., 2012), and author from one study said they did not have time to share with us their data (Major et al., 2014).

Studies	Potential confounders	Co-interventions	Bias due to confounding	Bias in selection of participants	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias due to measurement outcome	Bias in selection of the reported result	OVERALL BIAS
Araiza ( 2017)	Perceived weight stigma	None	+	+	+	+	+	+	+	+
Major (2020)	Weight stigma concerns, Motivation to lose weight, Unhealthy weight control behavior and Capacity for weight control	None	+	+	+	+	+	+	+	+
Rydell (2014)	No confounder	None	-	+	+	+	-	+	X	X
Major (2012)	Body mass index	None	+	+	+	+	+	-	X	X
Major (2014)	Self-perceived weight, body mass index, skin color (white vs. non-white)	None	-	+	+	-	+	-	X	X
Carr (2010)	Gender	None	+	+	+	+	-	-	X	X
Inzlicht (2006)	Skin color and gender	None	+	-	+	+	-	-	X	X
Rojas-Sanchez (2021)	Body mass index, Perceived weight , Perceived discrimination, Weight stigma concerns, Weight bias internalization, Country	None	+	+	-	-	+	+	+	+
Emlie (2015)	Level of general PA, Self-perception of aging, Self-determined motivation, Physical self-worth, Perceived loneliness, Self-rated health	None	-	+	-	-	+	+	-	-

**Figure 2.** Risk of bias summary. Note. Low risk of bias (+), Moderate risk of bias (-), Serious risk of bias (X).

### 3. Study description

#### *Experimental studies*

Eleven independent studies used experimental designs. Major et al. (2020, studies 2 and 3) assessed concerns about being the target of weight stigma, motivation to lose weight, and state self-control among participants recruited from Amazon’s Mechanical Turk, who were exposed to weight stigma through both stigmatizing images and messages (i.e., experimental condition) or to smoking stigmatizing messages (i.e., control condition,). Araiza and Wellman (2017) measured self-control (i.e., inhibitory control) and food selection (i.e., calories selected) among people who considered themselves to be overweight. They manipulated weight-based discrimination, by asking participants in the experimental condition to read a text about

discrimination against individuals with higher weight versus a text about discrimination against an out-group in the control group. Similarly, in Major et al. (2014), female students were asked to read and describe an ostensible New York Times article, titled either “Lose Weight or Lose Your Job” in the experimental condition or “Quit Smoking or Lose Your Job” in the control condition. Self-control was assessed as self-efficacy for controlling their diet after the manipulation. Major et al. (2012) asked female students who perceived themselves to be overweight to give a speech imagining themselves in a dating situation. They were told that their speech would be both video and audio taped (i.e., so that their physical appearance could be seen) in the experimental condition, or only audio taped in the control condition). Their blood pressure was recorded during their speech and self-control (cognitive depletion) was assessed with a Stroop task right after the manipulation.

In Rydell et al. (2014), authors also used a Stroop task to assess inhibition, in their three studies examining the effect of exposure to gender stereotypes over the three executive functions: inhibition, updating (measured by a Letter Memory task), and shifting (measured by a Number-Letter task), among female students. In the experimental condition, they explicitly said to participants that the current study investigated “why women are generally worse at math than men”, whereas no reference to gender was made in the control condition. Carr and Steele (2010, study 2b) were also interested in the effect of gender stereotypes exposure among female students, over decision making. To do so, they asked participants in the experimental condition (designed to be threatening to women), to complete tasks that would measure their mathematical, logical, and rational reasoning abilities, and to indicate their gender before beginning the tasks. In the control condition (designed to be non-threatening to women), they asked participants to complete puzzle-solving exercises and to indicate their gender after completing the tasks. They assessed self-control using a Stroop Task and as a mediator of the effect of gender stigma exposure on risk aversion. Inzlicht et al. (2006, study 2) also used a

Stroop Task to assess self-control among students exposed to skin color stereotype threat. In this study, participants were assigned to four conditions in a between-subjects design, according to their skin color (Black or White), and to stereotype threat exposure (threat vs. no threat), to explore whether “situationally activating stigma could lead to ego depletion” (i.e., self-control reduction) over Black students. In study 3 (Inzlicht et al., 2006) used a manipulation that was closed to the one used in study 2 but this time, towards women. Women were assigned to four conditions in a between-subjects design, according to the test they were supposed to complete (verbal or math), and to stereotype threat exposure (threat vs. no threat), the stigma-depletion over women in math. They assessed self-control through a handgrip task considered as a “measure of self-regulatory ability”. In these two studies, participants were told that the test they were going to take was diagnostic of intellectual ability (threat condition) or that the test was nondiagnostic of intelligence (no threat).

#### *Correlational studies*

Rojas et al. (2022) investigated through a cross-sectional design the motivational processes involved in the associations between weight stigma (perceived discrimination, weight stigma concerns, and weight bias internalization) and physical activity (motivation to avoid exercise and self-control resources), among a White, Educated, Industrialized, Rich, and Democratic (WEIRD) country (France), and a non-WEIRD country (Mexico) with different obesity prevalence. In this study, self-control was assessed by self-control resources with the subjective vitality questionnaire (Ryan & Frederick, 1997). Finally, Emile et al. (2015) examined in a longitudinal design (three measurement times over a 9-month period), whether endorsement of negative age stereotypes in the physical activity domain could decrease subjective vitality among active older adults, illustrating ego depletion (i.e., reduced self-

control). As in Rojas et al. (2022), they used the subjective vitality questionnaire (Ryan & Frederick, 1997) to measure self-control resources.

Major et al. (Study 1, 2020) investigated if experiencing stigmatization leads to greater concerns about being a target of weight stigma in the future, and if this in turn increase motivation to lose weight and decrease perceived capacity for weight control. To do so, they measured perceived capacity for weight control with a self-efficacy questionnaire (Povey et al., 2000).

Finally, Inzlicht et al. (Study 1, 2006) investigated if stigma sensitivity (i.e., vigilance towards stigma cues) is positively related to ego-depletion (i.e., poorer self-control). They reported assessing self-control using a measure of self-regulation, but actually used a self-efficacy questionnaire on learning strategies (Pajares & Valiante, 2002).

#### **4. Study findings**

Although all included studies examined the effects of stigma on self-control, there is a large heterogeneity in the type of stigma investigated, how it was manipulated or measured, and in the nature and measurement of self-control. Given the aim of this systematic review to examine which facets of self-control are altered by stigmatization, in the following section we have grouped the results according to the three self-control components proposed in the self-control fatigue model (Forestier et al., 2022): self-control capacity, self-control resources, and self-control willingness.

##### *Self-control capacity*

Self-control capacity is defined as a top-down mental process, that can be represented by the three executive functions, working memory and cognitive flexibility (Forestier et al., 2022). In this section we bundle studies according to this definition.

Among the 15 studies included in this systematic review, six used a Stroop task to measure self-control-related capacity and more precisely inhibition but under different constructs' name (attentional self-regulation in Inzlicht et al., 2006, inhibition in Rydell et al., 2014, ego-depletion in Carr & Steele (2010) and executive control in Major et al., 2020). In a Stroop task, participants have to identify the color of a word (main task) without reading the word itself. There are usually two conditions, one congruent, when the target presented is the word representing the color of which is it displayed (e.g., the word "red" written in red), and one incongruent, when the target presented is a word representing another color than the one in which the word is displayed (e.g., the word "red" written in blue). There is, therefore, a semantic interference effect, or Stroop effect, caused by automatic word reading, resulting in faster reaction time in congruent conditions than in incongruent conditions. Thus, because reading is an automatic process and naming a color in which a word is printed is not, inhibitory control is required to override the former automatic response.

Stroop tasks were used to investigate whether participants exposed to stigma performed more poorly (e.g., in terms of latency, errors, or Stroop effect or Stroop Interference) than those in the control condition. Inzlicht et al. (2006, study 2) investigated reaction time on incongruent trials on a Stroop task (presented as an index of attentional self-regulation) in Black and White students exposed or not to race-based stigma. The results showed that Black students in the stigma condition performed more poorly than Black students in the control condition ( $F(1, 36)=6.27$ ,  $p_{\text{rep}}=.93^2$ ,  $d=0.84$ ). Moreover, White students in the experimental condition did not have lower performance than White students in the control condition ( $F(1, 36) < 1$ ).

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<sup>2</sup> Inzlicht et al. (2006) and Carr & Steele, (2010), instead of using a null-hypothesis significance test, used an alternative statistic called  $p_{\text{rep}}$ , which is the probability of replicating an effect of the same sign (Killeen, 2005).



Similarly, Rydell et al. (2014) found in study 1 that women exposed to gender stigma performed poorer in the Stroop task (through a Stroop Score<sup>3</sup> presented as a measure of inhibition) than women non-exposed to gender stigma ( $F(1, 164) = 7.95, p = .005, \eta_p^2 = .046$ ). Men exposed to the same message did not show performance differences between the control and experimental groups. This study assessed two other executive functions, shifting and updating. Results concerning updating are in line with those observed on inhibition, with women exposed to gender stigma performing poorer than women non-exposed to stigma ( $F(1, 164) = 20.89, p < .001, \eta_p^2 = .113$ ), and with men exposed to the same message showing no performance difference between the control and experimental groups. Nevertheless, shifting was not affected by exposure to gender stigma, neither among women, neither among men. In study 2, results showed a negative effect of stigmatization over inhibition ( $\beta = -.22, p < .05$ ) and updating ( $\beta = -.31, p < .01$ ) but not over shifting ( $\beta = .09, p = .42$ ). Results also shown a positive effect of updating over task performance (i.e., percentage of correct response,  $\beta = .54, p < .01$ ). Finally, the findings of study 3 partially replicated these results, with stigmatization having a negative effect on inhibition ( $\beta = -.25, p < .05$ ) and updating ( $\beta = -.25, p < .05$ ) but not on shifting ( $\beta = .10, p = .39$ ). Results of this study showed a significant effect of updating over task performance ( $\beta = .45, p < .01$ ). Finally, a direct effect of exposure to gender stigma was found over risk-taking in study 3, which was mediated by inhibition ( $\beta = -.25, p < .05$  and  $\beta = -.27, p < .05$ ), but not by updating nor shifting.

Carr and Steele (2010, study 2b) also found a significant negative effect of exposure to gender stigma on women's Stroop task performance (i.e., the mean difference in time taken to

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<sup>3</sup> Stroop score was calculated among correct trials with a reaction time between 300ms and 2000ms. Reaction time for the remaining incongruent trials were then averaged, as well as the remaining congruent trials. The average reaction time for the incongruent trials was subtracted from that of the congruent trials, with greater scores indicating greater inhibition.

identify the color between compatible trials and incompatible trials, and presented as a measure of ego depletion, ( $t(29) = 2.47$ ,  $p_{rep} = .95$ ,  $d = 0.92$ ). This poorer performance predicted increased risk aversion ( $\beta = 0.559$ ,  $t(29) = 3.63$ ,  $p_{rep} = .99$ ). Also, Stroop task performance mediated the effect of stereotype threat on risk aversion. These effects were non-significant for men.

Finally, Major et al. (2012) found that women perceiving themselves to be overweight in the experimental condition where their weight was visible to others performed poorer in the Stroop task (i.e., Stroop interference, presented as a measure of executive control) than those in the control condition where their weight could not be seen by others. Moreover, the higher the weight of women in the experimental condition, the poorer they performed on the Stroop task ( $\beta = .29$ ,  $p = .025$ ), and the bigger their stress emotions ( $\beta = .39$ ,  $p = .016$ ). Results also showed that women in the experimental condition expressed more physiological stress and that this increase in stress was correlated with the Stroop performance ( $r = .25$ ,  $p = .025$ ). Taken together, results from these four studies, all go in the same direction, so that exposure to in-group stigmatization led to reduced self-control.

Araiza and Wellman (2017) used a Go/No-Go task to assess inhibitory control among women perceiving themselves to be overweight, in a study examining whether exposition to weight stigmatizing message and perceived weight stigma interacted in predicting inhibitory control and food selection. In this Go/No-Go task (from Langenecker et al., 2007), participants had to perform an action for Go stimuli (e.g., pressing the space bar when they saw a X, Y or Z on the computer screen), and to inhibit any action, when they saw a No-Go stimulus (e.g., do not press the space bar when they saw a Y on the computer screen). Their study revealed that the higher participants perceived weight stigma, the more poorly they performed on the Go/No-Go task (i.e., they made more errors) and the more calories they ordered, when they first read about discrimination against individuals with higher body weight. These relationships were not

observed when participants read about discrimination against an out-group (i.e., against Inuits, control condition). These findings support that exposition to in-group stigmatizing messages leads to poorer self-control as well as unhealthy behavior. However, these results do not establish a causal link between impaired self-control and the adoption of the behavior (i.e., food selection).

### *Self-control resources*

The two studies using self-control resources assessed with a subjective vitality questionnaire (Ryan & Frederick, 1997) are the two that used a correlational design. In their longitudinal study among active older adults, Emile et al. (2015) investigated whether endorsement of negative age stereotypes in the physical activity domain predicted self-control resources (i.e., subjective vitality) during a 9-month period, in older adults engaged in a physical activity program. The results showed that within-person variation in endorsement of self-efficacy-related stereotypes (i.e., the belief that older adults feel capable of being physically active) positively predicted self-control resources, over the 9-month period ( $b = .17, p < .01$ ). Results also showed that between-person differences in endorsement of benefits-related stereotypes (i.e., the belief that physical activity is beneficial for older adults) positively predicted self-control resources ( $b = .21, p < .05$ ). This suggests that the less participants believed in older adults' self-efficacy to stay physically active and in the benefits of physical activity for this population, the less they experienced vitality, in a period during which they were themselves engaged in a physical activity program. Rojas-Sánchez et al. (2021) showed in a cross-sectional study conducted in France and Mexico that the higher participants experienced weight stigma (perceived discrimination, weight stigma concerns, and weight bias internalization), the higher their motivation to avoid exercise ( $\beta = -.33, p < .001$ ), and

the lower their self-control resources ( $\beta=.31$ ,  $p<.001$ , indexed by subjective vitality), which both resulted in lower physical activity (see Figure 2, Rojas-Sánchez et al., 2021).

In Major et al. (2020), state self-control was assessed. We considered this construct as a measure of self-control resources, as the questionnaire referred to the use of energy (e.g., “I feel mentally exhausted” and “My mental energy is running low”), which is in line with the definition of self-control resources, which refer to the objective and subjective amounts of energy available (Forestier et al., 2022). Results from the studies 2 and 3 from Major et al. (2020) revealed that participants in the weight-stigma condition reported significantly lower state self-control than participants in the control condition, reducing in turn their capacity for weight control. These results also showed that participants in the experimental condition reported greater weight stigma concerns, greater motivation to lose weight and unhealthy weight control behavior. To sum up, these results support the idea that exposure to weight stigmatizing messages reduces state self-control and at the same time increases motivation to lose weight, but leads to unhealthy weight control behavior and reduced capacity for weight control.

#### *Self-control willingness*

Self-control willingness refers to the volition or motivation to engage in a second self-control act or represents the priority of the self-control act (Forestier et al., 2022). Nevertheless, none of the included studies used this component to assess self-control.

#### *Other measure used to assess self-control: Self-efficacy to self-regulate*

Three studies investigated self-control using a measure of self-efficacy to self-regulate. Self-efficacy refers to beliefs in one’s own ability to organize and carry out certain actions to achieve certain results (Bandura, 1978). Some studies assessed one specific facet of this construct, namely self-efficacy to regulate or control one’s behaviours. We did not include this

construct in one of the three components of self-control proposed by Forestier et al. (2022), because the perception of one's ability to self-regulate could reflect one's level of self-control capacity, but also of self-control resources or willingness. Given that it is not possible to disentangle which of these components contribute to self-efficacy to self-regulate, findings regarding the relation between stigma and this construct are described in a separate part.

Major et al. (2014) investigated the influence of weight stigma over women's self-efficacy for dietary restraint and calories consumed, among other constructs that are not reliable for the current work and therefore not described here. The results showed an effect of the experimental manipulation on self-efficacy for dietary control ( $\beta = -.50$ ,  $p = .001$ ) in self-perceived overweight women only, meaning that women who perceived themselves to be overweight were less confident in their capacity to regulate their eating behaviors when they were exposed to weight stigma than when they were not. Results also revealed an effect of the experimental manipulation on the calories consumed by these women ( $\beta = .29$ ,  $p = .058$ ). These effects were not significant in women who did not perceive themselves as overweight. Nevertheless, exposure to weight stigmatizing messages increased concerns about being a target of stigma both in self-perceived overweight and non-overweight women.

In the study 1 of Major et al. (2020), people who reported experiencing more weight-based discrimination reported lower perceived capacity for weight control ( $\beta = -.484$ ,  $p < .001$ ). Perceived capacity for weight control was measured using a self-efficacy questionnaire for weight control (Povey et al., 2000).

Finally, Inzlicht et al. (2006) in their correlational study 1, reported that stigma sensitivity (measured using the Race-Based Rejection Sensitivity Scale) negatively predicted self-regulation ( $r = -.41$ ,  $p_{rep} = .95$ ). Self-regulation was assessed using a self-efficacy questionnaire toward learning (SESRL, Pajares & Valiante, 2022).

*Other outcomes*

Seven articles were interested in other outcomes than self-control. In Araiza and Wellman (2017) assessed food selection and highlighted a negative effect of stigmatization due to weight over calories consumption for participants in the experimental condition ( $F(3, 80) = 2.91, p = 0.04, \Delta R^2 = 0.05$ ) but not for participants in the control condition. However, they did not report a mediating effect of self-control between these two constructs.

Taken together, the path models in Major et al. (2020) reported 1) a negative effect of stigma exposure over weight stigma concerns which in turn, 2) increased motivation to avoid stigma, which increased motivation to lose weight, and to unhealthy weight control behaviors. They also reported that 3) weight stigma concerns increase negative affect, which in turn decreases state self-control, increasing capacity for weight control.

In Rydell et al. (2014), they reported a direct effect of stigma over math performance ( $\beta = -.29, p < .01$ ) as well as two mediations through inhibition and updating (see Figure 1, Rydell et al., 2014). In their study 2 they reported a significant negative effect of stigma on math performance ( $\beta = -.32, p < .01$ ) and a mediation through updating. In their study 3, they reported a direct and negative effect of stigma on math performance ( $\beta = -.34, p < .01$ ), as well as a mediation through updating. In the same study, they reported a direct and positive effect of stigma on risk preference ( $\beta = -.27, p < .01$ ), and a mediation through inhibition.

In Major et al. (2012), they found that participants experienced more negative emotions ( $\beta = .39, p = .016$ ) in the experimental condition than in the control condition. In addition, their findings highlighted a correlation between self-control and physiological stress assessed by blood pressure ( $\beta = .25, p = .070$ ).

In Major et al. (2014), for women in experimental condition, they found that perceived weight was positively related to calories consumed ( $\beta = .29, p = .058$ ). They also revealed that

women in the experimental condition were significantly more concerned about being a target of weight stigma than women who read the control article ( $\beta = .24, p < .05$ ).

In their Study 2b, Carr and Steele (2010) showed that women in the experimental condition reported more risk aversion than those in the control condition ( $F(1, 52) = 5.41, p_{rep} = .95, \eta_p^2 = .09$ ). They also reported a mediating effect of self-control between condition and risk aversion for women.

Finally, in Rojas-Sanchez (2021), weight stigmatization was significantly and positively associated with motivation to avoid exercise ( $\beta = .68, p < .001$ ) but also with physical activity through two full mediations, by motivation to avoid exercise and by subjective vitality.

#### **IV. Discussion**

This systematic review examined the effect of stigmatization over different targeted groups (i.e., overweight, race, gender, and age) on self-control, a central element in the process of maintaining and adopting health behaviors. Of the 15 studies included in this review, six of them used a Stroop Task to assess self-control (Carr & Steele, 2010; study 2 in Inzlicht et al., 2006; Major et al., 2012; studies 1, 2 and 3 Rydell et al., 2014). They all reported significant negative effects of stigmatization over self-control. Moreover, Araiza & Wellman (2017) also found a negative effect of weight stigmatization over self-control, measured by a Go/No-Go task as well as higher calories consumption in people perceiving themselves to be overweight. Similarly, Major et al. (studies 2 and 3, 2020) found among women, that exposure to weight stigmatizing messages led to poorer self-control (i.e., state self-control) as well as increased motivation to lose weight, in turn, predicting increased willingness to engage in unhealthy weight-loss behaviors and decreased perceived capacity for weight control, respectively. Then, the six last studies included also found a negative effect of stigma over self-control, whether measured by self-control resources (i.e., subjective vitality, Emile et al., 2015, Rojas-Sánchez

et al., 2021), state self-control (Major et al., 2020) or self-efficacy (Major et al., 2014, study 1 Major et al., 2020, study 1 in Inzlicht et al. 2006). Overall, all results from these studies go the same way, as exposure to stigma seems to decrease self-control, regardless of the measurement tool used, or the population targeted by stigmatization.

Moreover, studies on the influence of stigmatization on subsequent behavior have shown that the behavior adopted by people targeted by stigmatization was less appropriate. More specifically, different studies showed a direct effect of stigmatization on subsequent outcomes (Major et al. 2012, Araiza & Wellman, 2017, Major et al., 2020, studies 2 and 3, Rydell and al., studies 1, 2 and 3, Major et al., 2012, and Carr et al., study 2b). In addition, some studies showed a mediating role of self-control between stigmatization and the other outcomes, as in the three studies from Rydell et al. (2014), in Carr et al., (2012) with partial mediations and in Rojas-Sanchez (2021) with a full mediation.

This alteration of self-control and self-regulation behaviors is in line with self-control models as the two-step process of the multicomponent self-control fatigue phenomenon model (see Figure 1, Forestier et al., 2022). Indeed, as proposed in the initial self-control cluster, a first self-control act reduces self-control components (in the subsequent cluster), leading in turn to a fatigued - or altered self-control act - which in the case of failure can lead to the adoption of undesirable behavior (e.g., eating more calories). Indeed, facing stigma seems to be an effortful process, that can depleted self-control components (Chalabaev et al., 2023).

Specifically regarding the three self-control components (Forestier et al., 2022), the results of this systematic review showed that stigmatization negatively affects both self-control resources and self-control capacity. However, no conclusion can be drawn regarding self-control willingness as none of the included studies investigated a construct related to this component.



## 1. Limitations, strengths and future directions

Nevertheless, there are limitations to this study, even though a rigorous, systematic approach, following a predefined protocol and using validated risk-of-bias tools, was used in this review. Although every effort was made to identify all relevant articles during the screening process, a lack of standardization within the nomenclature of terms used by authors when describing self-control constructs, and the diversity of potential ‘health-related’ outcomes, may have resulted in some studies not being captured. It is also important to acknowledge that only studies published in English were included. Furthermore, most of the included articles were evaluated as having a high risk of bias (Rydell et al., 2014, Major et al., 2012, Major et al., 2014, Carr et al., 2010, Inzlicht et al., 2006) or moderate risk of bias (Emile et al., 2015), leaving only three studies with low risk of bias (Araiza & Wellman, 2017, Major et al., 2020, Rojas-Sánchez et al., 2021). Another issue is that most included studies used different concepts and definitions of self-control, as well as different tools to assess it, and different ways to activate or generate stigma among participants, resulting in a certain lack of methodological consistency. Although these results are promising, they must to be considered with caution.

Despite these limitations, this systematic review highlights a direct negative effect of stigmatization, whatever the group it targets, on self-control, particularly on self-control resources and self-control capacity. Indeed, all included studies reported a deleterious effect of stigmatization on the measured constructs. Nevertheless, due to the significant limitations of this study, we will not draw any conclusions, but we would like to make some recommendations for researchers who would like to investigate this topic.

First, it would be important to use precise definitions (Forestier et al., 2022; Fujita, 2011; Gillebaart, 2018; Kotabe & Hofmann, 2015) for further studies, to ensure authors that there are really investigating this ability. In addition, it would be crucial to use tools that are consistent with these definitions and based on previous rigorous research, to ensure that their results are

accurate, and that they don't inadvertently measure another dimension that could be related, such as mental fatigue. Moreover, as was the case in the studies included in this review, it seems more relevant to focus on costly (i.e., non-automatic) self-control, as non-costly strategies seem to be present in people who are more successful at controlling their behaviors in relation to their long-term goals. Following this line of reasoning, one might think that the people who are targeted by stigmatization and whose behavior is altered by this phenomenon are unfortunately not among those for whom automatic self-control strategies work.

Finally, we can only recommend that researchers wishing to investigate this topic follow a robust methodology, and consider good research practices (Boisgontier, 2022; Caldwell et al., 2019). For example, in pre-registering the study and basing the sample size on an a priori power analysis.

## **V. Conclusion**

To conclude, stigmatization appears to be a source of self-control alteration. This results in maladaptive behaviors, such as increased calories consumption, physical activity avoidance, and risk taking. However, if the effect of stigmatization is present in all the included studies, most of them had important bias. The investigation of the influence of stigmatization on self-control should be pursued using more rigorous methodologies and should use tasks and tools that are reliable to the definition of self-control.

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### Résumé du Manuscrit 3

Cette troisième étude a examiné dans quelle mesure la stigmatisation pouvait altérer le contrôle de soi et être négativement liée à ce construit. Pour cela nous avons identifié 2658 articles correspondants à nos équations de recherche, au sein de cinq bases de données.

Seulement neuf d'entre eux, incluant 15 études, se sont avérés pertinents pour cette revue systématique. Comme nous nous y attendions, il existait une grande hétérogénéité entre les articles que ce soit au niveau des groupes sociaux ciblés par la stigmatisation, ou que ce soit au niveau des définitions du contrôle de soi et des outils de mesure utilisés. Une autre limite importante de ce travail est la qualité des études incluses, en effet les auteurs de six d'entre elles n'ont pas reporté correctement les résultats dans leurs articles scientifiques et ont soit pas répondu à nos demandes de partage de données, soit annoncé qu'ils n'avaient plus en leur possession les données, soit indiqué qu'ils ne souhaitaient pas les partager avec nous.

Malgré ces importantes limites, toutes les études incluses dans cette revue reportent un effet délétère de la stigmatisation envers le contrôle de soi, conformément à notre hypothèse. Cependant il est nécessaire d'être prudent avec les résultats de cette présente étude à la vue des limites soulevées.

## **Manuscrit 4. Résultats préliminaires - Le contrôle de soi coûteux et l'activité physique : le rôle de la stigmatisation liée au poids**

Cette quatrième étude a pour objectif d'évaluer l'effet de la stigmatisation liée au poids envers le contrôle de soi coûteux, mesuré selon le modèle de la fatigue du contrôle de soi (Manuscrit 2, Forestier et al., 2022). Nous avons dans cette étude suivi une approche psychophysiological, nous permettant d'indexer de manière directe les ressources de contrôle de soi et la motivation au contrôle de soi habituellement en plus des mesures auto-rapportées usuelles. Ce travail étant toujours actuellement en cours, nous vous présentons ici les résultats préliminaires sur les données disponibles.

Contribution personnelle selon la Taxonomie CRediT (Allen et al., 2019) : Conceptualisation, Méthodologie, Programmation, Validation, Analyses, Écriture (i.e., *Writing – original draft*), Visualisation, Supervision, Financement, Gestion des ressources.

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## **Preliminary results of effortful self-control and physical activity:**

### **The role of weight stigma concerns**

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## Abstract

Weight stigma is related to reduced self-control as well as a range of unhealthy behaviors. Nevertheless, only rare studies investigated the direct effect of weight stigma on self-control and subsequent behaviors, and even fewer on physical activity behavior. This study aimed to overcome these limitations by investigating the effect of weight stigmatizing messages on self-control, as defined in Forestier et al. (2022), using a psycho-physiological approach. To this end, 40 participants concerned about their weight, were allocated to the two conditions (control vs. weight stigmatizing messages), one week apart. They were invited to complete the study which included self-control resources assessed by both self-reported and physiological measures, willingness also assessed by self-reported questionnaire and physiological measures, and capacity measured with a cognitive task. In the present study, which presents preliminary results, only data from 14 participants were exploitable. Preliminary results did not show a significant difference relative to the condition on self-control components, which did not support our main hypothesis.

**Keywords:** self-control; self-control fatigue; weight stigmatization; physical activity

## **I. Introduction**

### **1. Weight stigma**

Being overweight is associated with a range of unhealthy behaviors, such as physical activity avoidance (Vartanian & Novak, 2011) or unhealthy diet (Gautier et al., 2020). The adoption of these undesirable behaviors is partly a consequence of the common and banal stigmatization of overweight individuals (Puhl & Heuer, 2009). Indeed, being different and having an attribute that marks a gap with the social norms, could lead other people to reduce one to undesirable stereotypes and thus to be reduced to that attribute, to this stigma. Stigma due to weight is one of the most common forms of stigma (Bucchianeri et al., 2013; Puhl et al., 2013; Puhl & Brownell, 2008), and perhaps more these days with the expansion of social media and all the images of lean and thin women and men that are conveyed every day. One particular thing about weight stigma is that being overweight is seen as something that depends on one's will and actions, and thus on one's responsibility (Grannell et al., 2021), which lead stigmatized individuals to be considered as having a lack of willingness and being lazy or even undisciplined (Crandall & Schiffhauer, 1998; Puhl & Heuer, 2009). Weight stigma processes, such as perceived stigma, stigma internalization, and social identity threat (also known as weight stigma concerns when related to weight), may reinforce these behaviors in overweight individuals, leading them, for example, to avoid going to the gym or swimming pool, for fear of being the target of adverse conducts or mockeries because of their body weight (Cardinal et al., 2014).

Among these three weight stigma mechanisms, social identity threat, or weight stigma concerns, appears to have detrimental effects on physical and physiological health (e.g., Hunger et al., 2015). Furthermore, this construct is predicted by the self-perception of being overweight (Romano et al., 2018), meaning that the more people perceive themselves to be overweight, the more they fear of being subjected to weight-based rejection, avoidance, and devaluation (i.e.,

weight stigma concerns; Major et al., 2017), and thus independently of their actual body weight. Being concerned about being the target of stigmatization based on one's body weight (i.e., weight stigma concerns), is associated with maladaptive coping mechanisms (Puhl & Brownell, 2006), as well as reduced self-control (Inzlicht et al., 2006; Major et al., 2014).

## **2. Self-control**

Self-control is defined as the operationalization of self-regulation (Gillebaart, 2018), and as a set of psychological strategies, effortful or effortless, and include three components, self-control resources, self-control willingness, and self-control capacity that predict a self-control act (i.e., the behavior; see Forestier et al., 2022), and enable the resolution of motivational conflict in favor of the long-term goal (Forestier et al., 2022; Fujita, 2011). Motivational conflict results from the opposition of two motivations, one for a long-term goal (e.g., I want to be physically active) and one for a short-term rewarding motivation (e.g., resting on the couch after work).

From a weight stigma perspective, the goal to practice physical activity might be in conflict with the weight stigma concerns expressed (e.g., "I'm scared of being stigmatized at the gym because of my weight, thus I'll stay home to avoid this situation"). The first use of self-control to overcome a motivational conflict could lead to self-control fatigue, a temporary reduction in self-control resources, self-control willingness, and/or self-control capacity, resulting in a less effective subsequent self-control act, and thus in the non-adoption of the behavior in line with the long term goal (Forestier et al., 2022). Self-control seems to be a cornerstone in the field of health behaviors' adoption and maintenance, and its alteration due to weight stigma concerns would lead people to poorer health habits, such as avoiding physical activity, even if those who have high intention to practice (Pearl et al., 2015). This difference between the intention and the ultimately achieving the behavior is commonly referred to the



intention behavior gap in the literature. Indeed, the intention could be difficult to translate into the intended behavior, and no less than 46% of people fail to achieve their long-term goals in terms of physical activity (Rhodes & De Bruijn, 2013; Sheeran & Webb, 2016).

### **3. Present study**

The purpose of the present study was to investigate whether exposure to weight-stigmatizing information might be a barrier to physical activity in individuals who are concerned about their weight (Fishbach et al., 2003), and thus negatively predict physical activity through self-control fatigue. Specifically, we examined if self-control fatigue components, as defined by Forestier et al. (2022), shifted more after the exposure to weight-stigmatizing information (i.e., experimental condition), than in the control condition (H1).

Self-control resources and willingness were measured by both self-reported questionnaires and physiological parameters, including cardiac function regulation. For the psychological measures, we hypothesized a bigger shift in self-control components (i.e., a bigger reduction in the self-control act, self-control resources, and self-control willingness) after exposure to weight stigma, compared to the control condition. However, we aimed to address potential limitations of self-report measures, by examining possible direct measures of these self-control components.

For the physiological measures of self-control resources, we relied on a recent model proposed by Laborde et al. (2018) which suggested to use different markers of heart rate variability (HRV) as indicators of changes in self-control resources. Specifically, we were interested in the difference in means between the baseline period and the recovery period corresponding to a rest period after the control or experimental prime. A return to baseline (i.e., no difference between baseline and recovery values) would illustrate adaptive self-control.

Regarding self-control willingness, we rely on a recent article that aimed to synthesize the literature on effortful self-control training. In their review, they highlighted that the pre-ejection period (PEP) could be used as an indicator of effort engagement, which we can relate to self-control willingness component (i.e., the motivation to engage in a self-control act). As with HRV, we were interested in the change from baseline to final rest period, and hypothesized that a greater change would result in a greater use of self-control due to the prime.

Similarly, we hypothesized a bigger shift in the cardiac responses (i.e., HRV and PEP) following exposure to weight stigma, compared to the control condition. However, we do not make directional assumptions about the direction of these shifts throughout the manipulation (i.e., how cardiac responses will evolve during each condition, reduction, or augmentation) because of the bi-directionality of the literature when it comes to cardiac physiological responses following weight-stigmatizing information exposure (e.g., Dorr et al., 2007; Lacombe et al., 2018; Schrimpf et al., 2019).

In addition, for an exploratory purpose, we measured the intention for physical activity before and after the manipulation in both conditions. We aimed to explore if the weight-stigmatization information exposure reduces the intention for physical activity throughout the experimental condition, compared to the control condition (H2.1). As well, for an exploratory purpose, we examined if the physical activity-related intention-behavior gap would be affected by the experimental manipulation (H2.2). In other words, we investigated if the condition (i.e., control or experimental) predicts the physical activity-related intention-behavior gap (i.e., the experimental condition will be related to a bigger intention-behavior gap than the control condition).

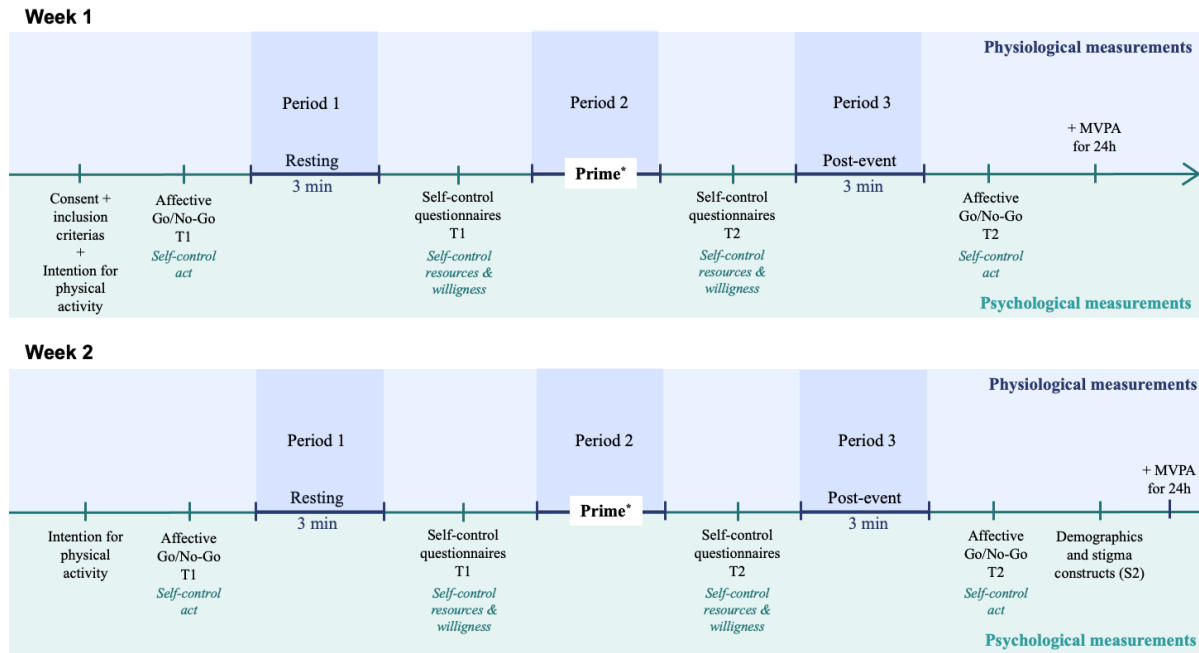
## **II. Method**

### **1. Overview and procedure**

Participants were undergraduate physical education students recruited through professional mailing lists and direct advertisements during class. Upon arrival, participants were invited to take place in a quiet room dedicated to the experiment. An experimenter explained the study procedure and prepared the participant for cardiac measurements. Then participants completed the study on a dedicated computer on Inquisit 6 Lab (Millisecond, 2022), involving short self-reported questionnaires, two cognitive tasks (i.e., Go/No-go, see below), and a text reading representing the control or experimental prime. The texts were originally from Araiza and Wellman (2017) and were translated for the study. Each session lasted approximately 1 hour. Participants completed two sessions, in a random order, once for the experimental condition and once for the control condition, one week apart (Deshayes et al., 2019). During both sessions, parasympathetic (i.e., HRV) and sympathetic (i.e., PEP) cardiac activities were recorded through an ECG and an ICG using the Biopac MP36R Data Acquisition system (Biopac Systems Inc., CA, USA), and processed with Acknowledge 5 software. The day following each session, participants were asked to complete a short survey on their phone about their physical activity during the previous 24 hours.

All procedures contributing to this study adhered to the APA ethical principles. Informed consent forms were obtained from all participants before the study began ,and participants who did not agree with the informed consent and who did not meet the inclusion criteria were not invited to complete the study.

Figure 1 – Timeline of the study. Note: Primes are control or related to weight stigma



## 2. Participants and sample size estimation

We estimated the sample size based on an a priori power analysis for the confirmatory hypothesis we formulated (hypothesis H1, related to self-control components shift and conditions). Precisely, to estimate the sample size required for sufficient power (90%) with an alpha level of 5% for a repeated measures multivariate analysis of variance (MANOVA), we used the effect size found in Araiza and Wellman (2017), which used the same experimental and control manipulation. Thus, we converted the  $R^2$  reported in this study into a Cohen's  $f$  for our calculation using G\*Power ( $R^2 = .08$  to  $f = .295$ ). The power analysis revealed that 34 participants were needed to reach the expected power. To anticipate any problem with data collection, we planned to recruit a minimal sample size of  $N=40$  participants, and a maximal sample size of 50 participants based on the amount of material resources.

To be included in the present study, participants must be 18 or older and be concerned about their weight (i.e., express concerns about maintaining their weight or gaining weight (Fishbach et al., 2003).

### **3. Measures**

#### **Self-control resources**

##### **i. Psychological self-control resources**

Psychological self-control resources were measured by two items issued from the subjective vitality scale (Ryan & Frederick, 1997): “*At this moment, I feel alive and vital*” and “*I have energy and spirit*” on a 7-point Likert scale from “*Not at all agree*” to “*Completely agree*” (Forestier et al., 2022). The shift in self-control resources will be assessed by subtracting the pre-manipulation score from the post-manipulation score.

##### **ii. Physiological self-control resources**

Physiological self-control resources were indexed through heart rate variability (HRV), and more particularly through two indicators of parasympathetic activity, the root mean square of the successive differences (RMSSD) in time-domain, and high-frequency power (HF) in the frequency-domain (Laborde et al., 2018).

#### **Self-control willingness**

##### **iii. Psychological self-control willingness**

Self-control willingness was assessed with a questionnaire measuring motivation to engage in the task (Forestier et al., 2022), with two items on a 7-point scale: “*To what extent are you motivated to do the task well?*” and “*To what extent will you put effort into the task?*” (1 = *Not at all*; 7 = *Totally*). The shift in self-control willingness was assessed by subtracting the pre-manipulation score from the post-manipulation score.

##### **iv. Physiological self-control willingness**

Self-control willingness was indexed through impedance cardiography (ICG) an index of sympathetic activity, with the pre-ejection period (PEP) as a physiological marker of task engagement (Audiffren et al., 2022; Gieseler et al., 2021).

### **Self-control capacity**

Self-control capacity was measured with an affective Go/No-go task where Go stimuli represented physical activity behaviors and No-Go stimuli represented physical inactivity behaviors. The Go/No-Go Task used the exact same parameters as described in Cheval et al. (2020) with the stimuli from Cheval et al. (2018). Each condition had 208 trials, 75% of which were go trials and 25% of which were no-go trials. Each trial began with an image presented for 500 ms followed by an inter-trial interval that randomly varied between 1200 and 1400 ms during which a fixation cross was presented.

Particularly, self-control capacity was assessed as the number of errors on the No-Go trials (i.e., participants must not press the response key because of the physical inactivity nature of the stimuli, thus errors in a No-Go trial mean that the participant pressed the response key when she/he should not to). The shift in self-control act was assessed by subtracting the pre-manipulation proportion of success from the post-manipulation proportion of success.

### **Intention behavior-gap**

The intention-behavior gap was measured using two questionnaires. At the end of each experimental session, participants indicated how much moderate to vigorous physical activity (MVPA) they planned to do during the following 24 hours using the short version of the IPAQ (Craig et al., 2003). After these 24 hours, they indicated how much MVPA they did during the previous 24 hours still through a short IPAQ version, online using the LimeSurvey platform (Limesurvey GmbH, 2022). The intention-behavior gap was measured as the difference between the level of physical activity planned by the participants and what they actually performed.

### **Weight stigma variables**

**v. Weight concerns**

Weight concerns were measured with a 2-item questionnaire from Fishbach et al., (Fishbach et al., 2003), where participants indicated 1) to what extent they are preoccupied by their weight and 2) how important it is for them to be thin on a 7-point scale ( 1= *Not at all*; 7 = *Extremely*).

**vi. Weight stigma concerns**

Weight stigma concerns were measured with a 3-item questionnaire from Hunger et al., (2015), where participants indicated 1) to what extent they are concerned about being unfairly treated because of their weight, 2) to what extent they are concerned about being rejected because of their weight and 3) to what extent they are concerned about being negatively judged because of their weight on a 7-point Likert scale ( 1= *Not at all agree*; 7 = *Completely agree*).

**vii. Weight perception**

Weight perception was measured with one item from (Major et al., 2014), where participants indicated how they perceived their weight at the moment, from (1) very underweight to (7) very overweight.

**viii. Body discrepancy**

Body discrepancy was measured with a 2-item questionnaire where participants had to choose between 9 figures, 1) which figure represents the best how they look, and 2) which figure represents the best how they want to look like (items and figures for women came from Ralph-Nearman & Filik, 2020; figures for men came from Talbot et al., 2019)

### **III. Results**

Between February 2022 and June 2023, 25 participants were recruited and enrolled in the study. In the second batch of recruitment, where 10 participants were recruited, different events, due to social unrest, prevented the smooth running of the assessment, and these data were thus

not retained. Thus, the sample size analyzed for the current manuscript of preliminary results contained 15 participants. Moreover, a participant was excluded from the study, because she admitted to investigators that she did not read the instructions. The final sample included for these preliminary analyses included 14 participants ( $N_{\text{women}} = 13$ ).

### **1. Correlations**

We can note that all variables are correlated between them from pre to post prime. Nevertheless, correlational analyses show no significant correlation between self-control resources measured by self-reported questionnaire and self-control resources assessed by HRV (i.e., RMSSD and HF). The same lack of significant correlation is found in the case of self-control willingness, between direct and self-reported measures (see Table 1 at the end of this manuscript for all values).

### **2. Main hypothesis**

A multivariate analysis of variance (MANOVA) was realized to assess the statistical differences between self-control components shift depending on the condition, with time (first condition realized, control or experimental) as a fixed factor. We first calculated a shift value (i.e., difference score) for the three self-control components (i.e., self-control resources, self-control capacity, and self-control willingness) and compared these shifts between conditions (i.e., control vs. experimental). The result of the MANOVA revealed a non-significant effect of the condition over the three components ( $F(6, 20) = .58, p = .74$ ), evaluated by both direct and indirect measures. Moreover, this analysis did not revealed an effect of the first condition realized by participants ( $F(6, 20) = .79, p = .59$ )

### **3. Exploratory hypotheses**



### **Intention for physical activity hypothesis**

Our first exploratory hypothesis (H2.1) explored whether intention for physical activity could be influenced by the condition. To do so, we realized an ANOVA, and its results revealed a non-significant effect of the condition toward the intention for physical activity ( $F(1, 13) = 0.82, p = .38$ ).

### **Intention behavior gap hypothesis**

Our second exploratory hypothesis (H2.2) explored whether the intention behavior gap regarding physical activity could be influenced by the condition. To do so, we realized an ANOVA, and its results revealed a non-significant effect of the condition toward the intention behavior gap related to physical activity ( $F(1, 13) = 1.13, p = .31$ ).

## **4. Sensitivity analysis**

To ensure the statistical power of our preliminary results we conducted a series of sensitivity power analyses using G\*Power (Faul et al., 2009). We found that with our sample we have 90% power to detect effect sizes of Cohen's  $f = .20$ . This corresponds to a small effect for self-control capacity measure. Concerning self-control willingness, our sample should have 90% power to detect effect sizes of Cohen's  $f = .33$  (i.e., moderate effect) for self-reported measures and 90% power to detect effect sizes of Cohen's  $f = .09$  (i.e., small effect) for physiological measure. Finally, regarding self-control resources, our sample we have 90% power to detect effect sizes of Cohen's  $f = .23$  (i.e., small effect) for self-reported measures and, effect sizes of Cohen's  $f = .14$  (i.e., small effect) and Cohen's  $f = .12$  (i.e., small effect) for RMSSD and HF measures, respectively.

## **IV. Discussion**

This study aimed to evaluate the impact of weight stigma exposure over self-control components (Forestier et al., 2022). The results of the preliminary analyses did not support our main and exploratory hypotheses. Indeed, results showed a non-significant effect of the condition over self-control components (i.e., H1; self-control resources, self-control capacity, and self-control willingness), as well as a non-significant effect of the condition over intention for physical activity (i.e., H2.1), and toward the intention behavior gap concerning physical activity (i.e., H2.2). They suggest that exposition to weight stigmatization in people concerned by their weight does not seem to negatively affect their self-control, neither their intention for physical activity and actual physical activity behavior.

If these results are confirmed by the complete analyses, we might think that effortful self-control is not indeed altered by weight-related stigma. Nevertheless, they would be contrary to the current literature on stigmatization and self-control. For example, Araiza and Wellman (2017) found a negative effect of weight stigmatizing messages toward self-control capacity (named inhibitory control in their study) and assessed with a Go/No-Go task. Still concerning self-control capacity, four studies reported a negative effect of stigma (due to skin color in Inzlicht et al., 2006 study 2; due to gender in Rydell et al., 2014 studies 1, 2, and 3) toward this self-control component. Both researches used a Stroop task to measure self-control capacity. Also, several studies reported a negative effect of stigmatization due to weight (studies 2 and 3 Major et al., 2020; Rojas-Sánchez et al., 2021) and age (Emile et al., 2015) toward self-control resources, indexed by self-control state (Major et al., 2020) and subjective vitality (Emile et al., 2015; Rojas-Sánchez et al., 2021). Nevertheless, to our knowledge, none have investigated the effect of stigmatization over self-control.

Moreover, we did not find any studies that reported opposite evidence or an absence of the effect of stigma on self-control.

Another interesting point to discuss is that we can compare the effect size we can find with our limited sample size to another study that used the same tool as we did for self-control capacity. We can see that our sample has sufficient power to detect the effect size found in Araiza and Wellman (2017, which also used a Go/No-Go Task) of  $r^2=.05$  (corresponding to a Cohen's  $f=.23$ ). Indeed, our sensitivity analysis showed that we have 90% power to detect an effect size of Cohen's  $f=.20$ . This means that with our full sample, we will likely be able to detect even smaller effect sizes and thus increase the effect of weight-related stigmatization on self-control components, if, in line with our hypotheses, it operates.

Lastly, we can notice that self-reported and direct measures of self-control resources (i.e., questionnaires and HRV) were not correlated, and the same for self-control willingness (i.e., questionnaires and PEP). Due to the preliminary nature of our results, we cannot draw any conclusions about this lack of correlations at this time, but it may raise a methodological point that should be investigated directly. Namely, whether it's possible to correlate these direct and self-reported measures of self-control, and ultimately whether they measure the same dimension.

### **1. Limitations and strengths**

This study has limitations. First, we can wonder if being concerned by one's weight, i.e. expressing concerns about maintaining their weight or gaining weight (Fishbach et al., 2003), is enough of a perception to possibly feel like being the target of weight-related stigmatization. Should this inclusion criterion be the reason for our lack of results, it might be interesting to replicate this study with overweight people or people who consider themselves overweight (Romano et al., 2019). Second, the self-reported measurement of physical activity may not precisely reflect the real activity level of the participants. When relying on self-reported questionnaires, participants tend to exaggerate their reported level of physical activity (e.g.,

Celis-Morales et al., 2012). Thus, the use of direct measures, such as accelerometers could avoid this limitation.

However, these limitations can be balanced by at least one major strength. Indeed, our study was based on a recent and falsifiable self-control model that aimed to address previous limitations on self-control literature (Forestier et al., 2022). Self-control literature especially around ego-depletion was largely criticized and questioned. So, based on this model, we wanted to use a better, less restrictive, and more robust approach of self-control.

## **V. Conclusion**

We cannot conclude on the effect of weight stigma exposure on the different facets of self-control, because the sample included in these preliminary analyses is more than half smaller than the one allowing us to reach a statistical power of 90%. We can only observe that the preliminary results are contrary to our hypotheses and to the literature on this subject.

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**Table 1.** Correlation table

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. SC Capacity - Errors No-Go <i>pre</i>	6.82	6.54											
2. SC Capacity - Errors No-Go <i>post</i>	7.00	7.05	<b>.87**</b> [.73, .94]										
3. SC Willingness - questionnaire <i>pre</i>	6.82	0.37	-.22 [-.54, .18]	-.21 [-.54, .18]									
4. SC Willingness - questionnaire <i>post</i>	6.88	0.32	-.13 [-.48, .25]	-.13 [-.48, .26]	<b>.75**</b> [.52, .88]								
5. SC Resources - questionnaire <i>pre</i>	5.57	1.18	.04 [-.34, .40]	-.03 [-.40, .35]	.16 [-.23, .50]	-.02 [-.39, .35]							
6. SC Resources - questionnaire <i>post</i>	5.73	1.01	.16 [-.23, .50]	.05 [-.33, .41]	.14 [-.24, .49]	.15 [-.24, .49]	<b>.88**</b> [.76, .94]						
7. SC Resources - RMSSD <i>pre</i>	58.81	30.68	-.03 [-.40, .35]	.07 [-.31, .43]	.10 [-.29, .45]	-.17 [-.51, .22]	.08 [-.30, .44]	-.05 [-.41, .33]					
8. SC Resources - RMSSD <i>post</i>	60.06	28.54	-.00 [-.37, .37]	.10 [-.28, .46]	.03 [-.35, .40]	-.23 [-.56, .15]	-.01 [-.38, .37]	-.12 [-.47, .26]	<b>.95**</b> [.89, .98]				
9. SC Resources - HF <i>pre</i>	1829.5 8	1822.58	.21 [-.18, .54]	.28 [-.10, .59]	.11 [-.28, .46]	-.06 [-.42, .32]	.09 [-.29, .45]	-.00 [-.37, .37]	.89** [.77, .95]	<b>.85**</b> [.69, .93]			
10. SC Resources - HF <i>post</i>	1838.1 6	1781.92	.24 [-.14, .57]	.34 [-.04, .63]	.10 [-.28, .46]	-.05 [-.41, .33]	.07 [-.31, .43]	-.01 [-.38, .36]	<b>.84**</b> [.67, .92]	<b>.85**</b> [.70, .93]	<b>.97**</b> [.93, .99]		
11. SC Willingness - questionnaire <i>post</i> PEP <i>pre</i>	0.08	0.02	.21 [-.17, .54]	.23 [-.16, .55]	-.16 [-.50, .23]	-.29 [-.60, .09]	-.08 [-.44, .30]	-.07 [-.43, .31]	-.22 [-.55, .17]	-.22 [-.55, .17]	-.36 [-.64, .02]	<b>-.38*</b> [-.66, -.00]	
12. SC Willingness - questionnaire <i>post</i> PEP <i>post</i>	0.08	0.02	.19 [-.20, .53]	.19 [-.19, .53]	-.13 [-.48, .26]	-.26 [-.58, .12]	-.06 [-.42, .32]	-.04 [-.41, .34]	-.22 [-.55, .16]	-.21 [-.54, .18]	-.37 [-.65, .00]	<b>-.38*</b> [-.66, -.01]	<b>.98**</b> [.97, .99]

*Note.* *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

#### **Résumé du Manuscrit 4**

Les résultats préliminaires de cette quatrième étude ne confirment pas notre hypothèse principale ni nos hypothèses exploratoires. Plus précisément, la MANOVA ne montre pas de différence significative de la condition envers les différentes composantes de contrôle de soi mesurées de manière directe et indirecte. Si ces résultats se confirment avec des analyses sur l'échantillon complet nous pourrions nous demander si la stigmatisation liée au poids agit bien sur ce processus. Nous pourrions aussi revoir l'outil utilisé pour induire de la stigmatisation et aussi, reconsidérer les critères d'inclusion avant de réfuter l'effet de la stigmatisation liée au poids envers le contrôle de soi, du moins, mesuré de cette manière.

Il est cependant difficile de conclure sur ces résultats car la taille de l'échantillon incluse est largement inférieure à ce que nous avons estimé avec une analyse de puissance à priori.

## **Manuscrit 5. La stigmatisation liée au poids empêche-t-elle l'activation automatique des buts d'activité physique face à des tentations sédentaires ?**

Si le contrôle de soi coûteux a largement été étudié dans la littérature de manière générale et dans le cadre de la stigmatisation, par rapport au contrôle de soi non coûteux, les stratégies de contrôle de soi dites automatiques ne méritent pas moins d'intérêt. Dans cette étude nous avons voulu mettre l'accent sur une de ces stratégies dites non-coûteuses, l'asymétrie cognitive, qui avait été mise en évidence notamment dans le cadre de l'activité physique. Dans cette perspective nous avons répliqué et étendu l'étude de Cheval et al., (2017), à notre problématique.

Ce travail ayant donné lieu à un article publié dans la revue scientifique *Motivation Science*, nous proposons ci-dessous la version publiée dans le journal. Veuillez noter que nous avons initialement soumis dans le journal une version longue du manuscrit dont l'introduction et la discussion portaient plus largement sur la stigmatisation liée au poids. Cette version longue est disponible sur l'OSF dédiée de l'étude, à ce lien : <https://osf.io/gax7j/> et en annexes de ce manuscrit, à la suite de celui-ci. Dans cette version longue nous souhaitons adresser comment la stigmatisation liée au poids pouvait être un obstacle aux stratégies automatiques de contrôle de soi.

Contribution personnelle selon la Taxonomie CRediT (Allen et al., 2019) : Conceptualisation, Méthodologie, Programmation, Validation, Analyses, Écriture (i.e., *Writing – original draft*), Visualisation, Supervision, Gestion des ressources, Valorisation

### **Références**

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# Motivation Science

## **Does Exposure to Sedentary Temptations Activate Physical Activity Goals? A High-Powered Replication Study**

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BRIEF REPORT

## Does Exposure to Sedentary Temptations Activate Physical Activity Goals? A High-Powered Replication Study

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Cognitive asymmetry is an effortless self-control strategy observed in successful self-regulators, for whom exposure to temptations (e.g., sedentary [SED] opportunities) increases the cognitive accessibility of long-term goals (e.g., physical activity [PA]), whereas exposure to goals should not increase the cognitive accessibility of the temptations. However, this mechanism has rarely been observed in the context of PA, and a recent high-powered study did not replicate it in the academic context. Therefore, additional replication studies are needed to support the existence of the phenomenon, or not. The present study attempted to replicate the cognitive asymmetry mechanism in the PA context based on a high-powered design. To do so, 257 participants completed a primed lexical decision task including PA-related (i.e., goal) and SED-related (i.e., temptation) stimuli target words preceded by a relevant SED-related and PA-related prime, respectively, or an irrelevant-related prime (i.e., neutral words). Results showed significant priming effects—SED-related primes increased the cognitive accessibility of PA-related words and PA-related primes increased the cognitive accessibility of SED-related words. However, we did not replicate the hypothesized cognitive asymmetry pattern between temptations and goals. These findings were consistent with a recent replication study by demonstrating that the automatic associations between goals and temptations were more likely to be symmetric (i.e., bidirectional linkage facilitation) than asymmetric (i.e., activation of the goal by temptations, but inhibition of the temptations by goals).

**Keywords:** automatic goal activation, goals, temptations, prime, physical activity

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Margaux de Chanaleilles, Aïna Chalabaev, Hervé Dubouchaud, and Boris Cheval designed the study protocol. Margaux de Chanaleilles designed the analyses. Boris Cheval, Cyril Forestier, Margaux de Chanaleilles, and Alexandre Mazéas collected the data. Margaux de Chanaleilles analyzed the data. Boris Cheval, Margaux de Chanaleilles, and Aïna Chalabaev drafted the article. Aïna Chalabaev, Margaux de Chanaleilles, and Boris Cheval critically appraised the article and significantly contributed to its content and structure. All authors approved the final version of the article.

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Self-control is the ability to resolve motivational conflict between competing goals (e.g., Fujita, 2011; Gillebaart, 2018) through effortful (e.g., inhibition) or effortless (e.g., habits) strategies (e.g., Gillebaart, 2018; Gillebaart & de Ridder, 2015). One effortless strategy is the temptation-elicited goal activation process.<sup>1</sup> According to Fishbach et al. (2003), repeated success in overcoming tempting situations competing with a long-term goal leads to the development of automatic mental associations between the temptations and the long-term goal representation. In this case, a temptation-related cue automatically activates the long-term goal in successful self-regulators. In contrast, goal-related cues are not supposed to activate the mental representation of temptations. This unidirectional association between temptation cues and long-term goals, called the cognitive asymmetry mechanism, is thought to play a key role in successful self-regulation.

Cognitive asymmetry has been observed in a variety of contexts, such as dieting (Fishbach et al., 2003; Papies et al., 2008) or physical activity (PA; Cheval et al., 2017). Using a primed lexical decision task, Cheval et al. (2017) showed that temptation primes related to sedentary (SED) behaviors facilitated the recognition of goal-related target words related to PA in successful exercisers. In contrast, exposure to goal-related or neutral primes did not affect the cognitive accessibility of temptation-related constructs.

Although cognitive asymmetry is often considered as illustrating effortless self-control, very few studies, with small sample sizes, have replicated it (Cheval et al., 2017; Papies et al., 2008), and a recent high-powered study failed to replicate the phenomenon (Francis et al., 2022). In this recent replication failure, a priming effect was instead observed, where both temptation and goal primes facilitated the recognition of subsequent target words. This calls into question the existence of the phenomenon.

## The Present Study

This study examined whether the cognitive asymmetry process would be replicated in the context of PA, using a high-powered design as in Francis et al. (2022).

It should be noted that this study was originally designed to investigate whether exposure to weight stigma prevents the cognitive asymmetry process from occurring in people concerned about their weight. However, because we did not replicate the cognitive asymmetry process, this hypothesis was not testable, and only the cognitive asymmetry results are presented. However, the original complete rationale and analyses are available in the online supplemental materials.

## Method

The present study was preregistered on AsPredicted (#52738). Data and supplementary materials are available on the Open Science Framework ([https://osf.io/gax7j/?view\\_only=8a445aab14004937b7df8e1f8e7e98d0](https://osf.io/gax7j/?view_only=8a445aab14004937b7df8e1f8e7e98d0)). All procedures adhered to APA ethical principles. Informed consents were obtained from all participants before the start of the study, who were informed that the study was anonymous and confidential: only a self-generated code allowed their identification.

## Participants and Power Analysis

We conducted at first an a priori power analysis to estimate the sample size required to detect the initially hypothesized three-way interaction between Goal-Target Words (Within Factor: PA vs. SED Words) ×

Temptation-Prime (Within Factor: Relevant vs. Neutral Prime) × Weight Stigma Exposure (Between Factor: Yes vs. No), which was tested using linear mixed-effects modeling (MEM), with a 90% power and an alpha level of 5%. The analysis showed that the sample size needed to reach 90% statistical power for the three-way interaction was 72 participants per condition. To anticipate any problems with data collection, we planned to recruit at least 180 participants (see more details in the online supplemental materials). We recruited more participants to ensure that at least 180 of them met all the inclusion criteria, which were restrictive. Because we looked only at the Goal-Target Words (Within Factor: PA vs. SED Words) × Temptation-Prime (Within Factor: Relevant vs. Neutral Prime) interaction in the current article, our study should have more power than expected (see the section Sensitivity Analyses).

## Procedure and Data Collection

Three hundred fifty-five participants were recruited at Le Mans University and Grenoble Alpes University, via mailing lists, university classes, and social media over a 3-month period, and were compensated with course credit. Two participants were excluded because they did the study two times. Two hundred fifty-four participants ( $M_{\text{age}} = 19.70$  years; 119 women) met the inclusion criteria. Specifically, seven participants were excluded for not giving enough importance to PA (i.e., it was not a goal for them), 91 in this new subsample were not sufficiently active and three participants did not fully complete the study. The entire study was conducted online on Inquisit Web (Inquisit 6, 2021) (e.g., the study of Francis et al., 2022, used a half online and half in-person design, and found no difference in results across these two samples). Participants were first invited to read and sign an informed consent form before performing the lexical decision task. They were then randomly assigned to one of two conditions (weight stigma exposure vs. control), by reading either a text exposing them to weight-stigmatizing information or the control text (see the online supplemental materials), based on Araiza and Wellman (2017). The texts discussed workplace discrimination against overweight individuals (weight stigma condition) or against Inuit Canadians (control condition). This manipulation did not moderate the reported cognitive asymmetry results and is not discussed further here (but see the online supplemental materials). Finally, they completed a questionnaire measuring the variables described below.

## Measures

### Inclusion Criteria

**PA Goal Value.** The value of PA goal was measured with a three-item questionnaire (Cheval et al., 2017). Participants answered to what extent they (a) avoid SED behaviors, (b) are concerned about the importance of adopting PA on a regular basis, (c) make an effort to adopt PA behaviors, and (d) feel guilty if they consistently adopt SED behaviors, on a 7-point scale (1 = *not at all* to 7 = *extremely*).

<sup>1</sup> Currently, there are discussions about positioning cognitive asymmetry as a self-control strategy. Effortless strategies, even if they require automatic and unreflective processes, are considered “strategies” in some of the literature (see, e.g., Fujita & Han, 2009; Gillebaart, 2018; Gillebaart & de Ridder, 2015). Note, however, that the term “effortless strategies” refers to automatic processes that require no effort to engage.

Participants were included only if they reported at least a score of 4 on the scale. This ensured that PA was at least moderately important for them, to optimize conditions of occurrence of the cognitive asymmetry process.

**PA and SED Behaviors.** PA and SED behaviors were measured using a self-reported questionnaire (short International Physical Activity Questionnaire adapted from Craig et al., 2003), where participants were asked to indicate how many times (in minutes) they spent the last 7 days in vigorous and moderate physical activities, walking, and sitting. Participants were included only if they reported at least 150 min of moderate to vigorous PA per week, thus achieving the minimum health recommendations guidelines (World Health Organization, 2019). This ensured that participants were successful exercisers, to optimize conditions of occurrence of the cognitive asymmetry process.

**Other Measures.** Participants also completed weight concerns, weight stigma concerns, weight perception, and PA beliefs measures. However, these measures did not significantly moderate the results (see the online supplemental materials).

### Outcome

**Lexical Decision Task.** The task was the same as in Cheval et al. (2017), with a Target (PA vs. SED Words)  $\times$  Prime (PA and SED vs. Neutral-Primes) within-subject design. Participants were asked to indicate as accurately and quickly as possible, whether the letter string presented on the screen was an existing word or not, by pressing specific keys on their keyboard. Targets included PA and SED-related words. Primes included neutral, PA, and SED-related words. Primes were characterized as relevant when a temptation (SED) primed the goal (PA), or when the goal (PA) primed the temptation (SED), and as irrelevant when neutral. At first, a fixation cross appeared for 1 s and was followed by the 50-ms prime presentation, and then by the target word that remained on the screen until the participant responded. Targets were related to PA or SED behaviors. Participants performed a 10-trial practice before completing the 256 experimental trials. In these trials, items of interest were assessed both 36 times (i.e., PA targets primed by SED words and SED targets primed by PA words). Other trials composed the control condition (e.g., neutral primes and nonwords targets combinations).

### Demographics

Participants answered sociodemographic items about their sex (male; female; I prefer to not answer), age, height, weight, how many persons lived with them, their mother's and father's level of education (compulsory schooling; apprenticeship; secondary school or baccalaureate; higher professional school; university education; and Don't know), their financial status (I can't cope; I have to be careful; I'm fairly comfortable; and I'm very comfortable), and income (1,000 euros or less; 1,000–2,500 euros; 2,500–5,000 euros; more than 5,000; and don't know).

### Data Analysis

#### Reaction Time Data Exclusion

Trials with nonwords, trials resulting in incorrect responses, and responses below 200 ms and above 1,500 ms were not included in the analyses (Cheval et al., 2017), leaving a total of 34,720 trials.

### Statistical Models

We followed the procedure described in the preregistration and analyzed reaction times in the lexical decision task following the procedure described in Cheval et al. (2017), using linear MEM. We conducted a MEM using the package lmerTest in R-Studio (RStudio Team, 2015). Target  $\times$  Prime interaction was specified as a fixed factor and participants as a random factor, and we included, at the level of the participant, the random effects Target  $\times$  Prime interaction.

## Results

### Sensitivity Analyses

To ensure our study was sufficiently powered to detect the main interaction effect of interest, we conducted a sensitivity power analysis with the SIMR R package (Green & MacLeod, 2016) as described in Francis et al. (2022). We found that our sample had more than 96% power (lower bound = 0.964; upper bound = 1) to detect an interaction effect of 20 ms ( $r = .04$ ) in the two-way analysis; this effect size is the one found by Cheval et al. (2017) and is four times smaller than the effect size found in Study 1 of Fishbach et al. (2003).

### Analysis of the Three-Way Interaction

Contrary to our hypothesis that temptation-related primes should lead to faster recognition of goal-related target words, and that goal-related primes should not lead to faster recognition of temptation-related targets (asymmetrical activation pattern), the results revealed a nonsignificant Target  $\times$  Prime interaction (Table 1;  $b = -0.98$  ms,  $p = .775$ ), indicating that no cognitive asymmetry occurred.

Further analyses showed that the nature of target words significantly predicted reaction time, which was faster for words related to PA than SED ( $M = 670_{PA}$  vs.  $682_{SED}$  ms; Table 1;  $b = 11.68$  ms;  $p < .001$ )—participants responded  $\sim 12$  ms faster to PA targets than

**Table 1**

*Results of the Linear Mixed Models Predicting the Reaction Time Required to Recognize SED- and PA-Related Words*

Predictors	Reaction time		
	Estimates	CI	<i>p</i>
Intercept	<b>681.98</b>	<b>[669.75, 694.22]</b>	<.001
Target	<b>11.68</b>	<b>[6.66, 16.71]</b>	<.001
Prime	<b>-12.23</b>	<b>[-16.99, -7.47]</b>	<.001
Target $\times$ Prime	-0.97	[-7.66, 5.72]	.775
Random effects			
$\sigma^2$	25,223.88		
$\tau_{00}$ ID	9,151.70		
$\tau_{11}$ ID.target	183.38		
$\tau_{11}$ ID.prime	26.15		
$\tau_{11}$ ID.target:prime	4.32		
$\rho_{01}$	0.29		
	0.46		
	0.78		
$N_{ID}$	254		
Observations	34,720		
Marginal $R^2$ /conditional $R^2$	.003/NA		

*Note.* Bold values highlight significant effect  $p < .05$ . SED = sedentary; PA = physical activity; CI = confidence interval; NA = not applicable.

to SED targets. Primes also significantly predicted reaction time, which was faster for relevant prime words than for irrelevant ones ( $M = 670_{\text{relevant}}$  vs.  $683_{\text{irrelevant}}$  ms; Table 1;  $b = -12.23$  ms;  $p < .001$ )—participants responding  $\sim 13$  ms faster when targets (either PA or SED words) were preceded by relevant prime words.

## Discussion

This preregistered study aimed to replicate the cognitive asymmetry process in the PA domain found in Cheval et al. (2017).

Despite a high power (with more than 96% power to detect an effect size one quarter smaller than the one found in Study 1 of Fishbach et al., 2003), the temptation-elicited goal activation process was not observed. Instead, two main effects of prime and target on reaction time were found. Specifically, participants were faster to detect PA goal-related words after being primed by SED temptations and were also faster to detect SED temptations after being primed by PA goals. This finding is consistent with the recent well-powered replication study by Francis et al. (2022), which found no evidence for the temptation-elicited goal activation pattern, but rather observed that both goal and temptation-related primes facilitated recognition of temptation- and goal-related target words, respectively. The current study replicated and extended the prime effect found by Francis et al. in the academic context to the PA domain. As proposed in Francis et al., “the asymmetry between temptations and goals may not exist at the most automatic level of processing, even for those individuals high in self-regulatory success” (Francis et al., 2022, p. 8). Nevertheless, it is possible that the asymmetric activation is observed when inhibitory processes are at work. One way to test it is to manipulate the duration of the stimulus onset asymmetry (SOA; i.e., the time between the onset of two stimuli), which determines the amount of processing and cognitive accessibility of the prime. Papies et al. (2008, Study 1) showed that primes facilitated goal activation in successful self-regulators only when the SOA duration was 540 ms, which relatively long. In our study, the SOA duration was 80 ms, based on the only study conducted in the PA context (Cheval et al., 2017), which may be too short to allow the activation of inhibitory processes. Future studies manipulating the SOA duration are warranted to test this possibility.

Moreover, we found a main effect of target, with participants being faster to detect PA-related words (e.g., “effort”) than SED-related words (e.g., “rest”). This suggests that the cognitive accessibility of the PA goals was higher than the SED temptations one. This observation may be explained by our sample’s characteristics. Indeed, inclusion criteria were to be physically active and consider PA as important. Previous studies showed that PA-related cues could be particularly relevant for active participants (Cheval et al., 2020; Pool et al., 2016), resulting in an automatic tendency to approach PA (e.g., Bluemke et al., 2010; Calitri et al., 2009; Eves et al., 2007), and thus in faster recognition of PA targets versus nonrelevant targets (Cheval et al., 2017, Study 1). This explanation is supported by a review of literature, which highlights that people pay more attention to the stimuli that are relevant to them than to nonrelevant ones (e.g., PA stimuli for physically active participants; Cheval et al., 2020; Corbetta & Shulman, 2002). This finding suggests that goal accessibility may be stronger than temptation accessibility in successful self-regulators.

## Limitations and Strengths

This study has limitations. First, although validated in pilot studies, the words used to describe SED temptations and PA goals were generic,

and therefore may not always have been meaningful to participants (Maltagliati et al., 2023, under review). Second, the self-reported measure of PA may not accurately capture the actual PA level of the participants. Indeed, using self-reported questionnaires participants have a tendency to overstate their PA level (e.g., Celis-Morales et al., 2012).

However, these limitations are outweighed by at least two major strengths. First, our study was well-powered. The sensitivity analyses revealed that our study has more than 96% power to detect an effect size similar to that found in Cheval et al. (2017), and our study has much more trials included in the analyses than the two studies we relied on (Cheval et al., 2017; Fishbach et al., 2003). In fact, 34,720 were included in our study versus 2,751 trials and a maximum of 5,538 trials (the number of trials excluded was not reported) in Cheval et al. (2017) and Fishbach et al. (2003), respectively. Second, we set up practices considered as good research practices (Boisgontier, 2022; Caldwell et al., 2019). Specifically, the study was preregistered and our sample size was based on an a priori power analysis.

## Conclusion

To conclude, our results are in line with the recent study of Francis et al. (2022), which did not replicate the asymmetric phenomenon despite a robust design. We also found evidence that participants recognized goal-target (i.e., related to PA) faster than temptation-target (i.e., main effect of the target). In addition, participants recognized words faster after priming, regardless of whether they were related to a goal or a temptation, suggesting a symmetrical pattern of the automatic associations between goals and temptations representations. Finally, further studies should be conducted to better identify the conditions that favor the occurrence of the temptation-elicited goal, even if at the most automatic level cognitive asymmetry seems unlikely to occur.

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## **Matériel supplémentaire du Manuscrit 5**

Manuscrit original soumis dans la revue Motivation Science

**Does weight stigma exposure affect temptation-elicited goal activation  
process? An experiment in physical activity**

Submission date: 12/04/2023

## **Abstract**

Cognitive asymmetry is a mechanism suggesting that, in successful self-regulators, exposure to temptations (e.g., sedentary (SED) opportunities) increases the cognitive accessibility of intended goals (e.g., physical activity (PA) behaviors), while exposure to goals reduces the cognitive accessibility of the temptations. The boundary conditions in which this effortless self-control mechanism can be (in)effective in favoring the self-regulation of health-related behaviors remained poorly understood. Here, we investigated whether weight stigma may disrupt this cognitive asymmetry mechanism in PA among people concerned about their weight. To do so, 357 participants completed a primed lexical decision task including PA-related (i.e., goal) and SED-related (i.e., temptation) stimuli target words preceded by a relevant (i.e., SED-related prime (i.e., temptation) and PA-related prime (i.e., goal), respectively) or an irrelevant-related prime (i.e., neutral words). Results showed significant priming effects – SED-related primes increased the cognitive accessibility of PA-related words and PA-related primes increased the cognitive accessibility of SED-related words. However, we found neither evidence for the asymmetry pattern nor evidence that it can be moderated by weight stigma. The current study did not replicate the hypothesized priming asymmetry pattern between temptations and goals. These findings were consistent with a recent replication study that has demonstrated that the automatic associations between goals and temptations were more likely to be symmetric (i.e., bi-directional linkage facilitation) than asymmetric (i.e., activation of the goal by temptations, but inhibition of the temptations by goals). The current findings suggest that temptations and goals are more likely to be intertwined at such initial automatic level.

## **I. Introduction**

Physical appearance is a major element in the impression formation process (Fiske et al., 1999). One of the first things perceivers notice about target persons is how they look, and more particularly, what their weight status is (Knapp & Hall, 1972). In contemporary western societies, a weight deviating from the social norm is often negatively judged, especially when it is above this norm (Major, Tomiyama, et al., 2017; Palmeira et al., 2020). Such negative judgment is related to the stereotypes according to which obese and overweight people lack of self-discipline, are lazy and self-indulgent (Major et al., 2012; Puhl et al., 2020), and would therefore be responsible for their weight status (Grannell et al., 2021). The social devaluation of people because of their weight, called weight stigma, is a major cause of rejection among both youngsters and adults (e.g., Bucchianeri et al., 2013; Puhl et al., 2008).

### **Weight Stigma and health outcomes**

Weight stigma represents a major issue because of its negative consequences on multiple health outcomes (Hunger & Major, 2015; Puhl & Suh, 2015; Wu & Berry, 2018). For example, studies have shown that weight stigma is significantly correlated with depression, stress, and anxiety in overweight and obese individuals (e.g., Hayward et al., 2018), and is associated with weight gain over a 10-week period among slightly overweight female students (Wellman et al., 2018). Moreover, a recent meta-analysis showed that weight stigma was associated with a lower engagement in physical activity (Pearl et al., 2021). Overall, these findings suggest that weight stigma is related to mental and physical health, as well as the probability to engage in health behaviors such as physical activity.

### **Weight based social identity threat**

One of the main processes that have been identified in the literature to explain the relationship between weight stigma and health outcomes is the weight-based social identity threat (or weight stigma concerns) (e.g., Major et al., 2018). It refers to a situationally-



triggered psychological state in which individuals are concerned that they will be devalued, rejected, negatively stereotyped or discriminated against because of their social identity as an overweight person (Hunger et al., 2015; Major, Dovidio, et al., 2017). Weight-based social identity threat can arise when stereotypes are made salient in one's immediate environment, such as when the media disseminate information that devalues overweight people (e.g., by covering the costs to society of obesity). This exposition may in turn trigger negative emotions (e.g., anxiety) and increased physiological stress responses (e.g., increased blood pressure and cortisol levels) in people who believe they are overweight or who think that other people see them as overweight (Major et al., 2018). For example, in Himmelstein et al. (2015), 110 non-overweight female students were exposed (vs unexposed) to weight stigma through a stigmatizing event where participants received oral criticism on their weight. Participants stress responses were recorded using saliva cortisol at baseline and 30 minutes post-manipulation. Results revealed that, compared to the control condition, exposure to weight stigma increased cortisol levels, but only among women who perceived themselves to be overweight.

Weight-based social identity threat is associated with unhealthy behaviors, such as increased calorie intake (e.g., binge eating) and physical activity avoidance (e.g., Major et al., 2018, Rojas-Sánchez et al., 2021; Vartanian & Novak, 2011). For example, overweight women exposed to weight-stigmatizing information expressed physiological and perceived stress (Schvey et al., 2014), and consumed more calories (Schvey et al., 2011). Noteworthy, this effect was also observed in non-overweight women, but to a lesser extent. Noteworthy, other studies support that weight stigma does not only concern overweight people, but also people who perceive themselves to be overweight more generally (Major et al., 2014; Romano et al., 2018). In addition, although most studies have been conducted on women,

some studies suggest that men may also experience weight-based social identity threat (e.g., Himmelstein et al., 2018).

### **Weight-based social identity threat and self-control**

These relationships between weight-based social identity threat and unhealthy behaviors may be explained by an impairment in people's ability to self-regulate. For example, Major et al. (2014) showed that, compared to women unexposed to weight-stigmatizing messages, women exposed to such messages experienced higher weight stigma concerns, felt less capable of controlling their eating behavior (i.e., self-efficacy for dietary control). Of note, these effects were only observed in women who perceived themselves to be overweight, but not in women who did not feel overweight. Likewise, another study revealed that exposure to weight-stigmatizing messages reduced inhibitory control in both men and women who reported regularly experiencing weight stigma, as compared to those who did not report such experience (Araiza & Wellman, 2017). In addition, participants who reported experiencing weight stigma ordered higher-calorie food when exposed to weight-stigmatizing messages, as compared to participants who did not report experiencing weight stigma. These results may suggest that weight stigma exposure decreased participants' capacity to override short-term temptations. In line with these findings, Major et al. (2020) observed that people exposed to a weight-stigmatizing (vs. control) message showed increased weight stigma concerns, which in turn decreased their perceived energy to self-regulate and their perceived capacity for weight control. Overall, these results suggest that weight stigma exposure may deteriorate self-control.

Self-control is defined as the ability to resolve a conflict between a distal and a proximal motivation (e.g., Fujita, 2011; Gillebaart, 2018). The conflict resolution may occur through different strategies: effortful strategies (e.g., inhibition), which are reflective and require effort, and effortless strategies (e.g., habits), which are automatic and require few

effort (e.g., Gillebaart, 2018; Gillebaart & de Ridder, 2015). Based on this conceptualization of self-control, it can be argued that research on weight stigma exposure has exclusively focused on effortful self-control strategies, such as inhibition (Araiza & Wellman, 2017), or self-control resources availability (Major et al., 2020), while its influence on effortless self-control was overlooked. Yet, weight stigma exposure could also deteriorate effortless self-control strategies. Indeed, Hutchison et al. (2013) observed that inducing negative stereotypes reduced task goal accessibility in working memory (i.e., by impairing participants' ability to stay focused on their task goal of naming colors on a Stroop task). Interestingly, self-control research has identified an effortless self-control strategy that involves this goal accessibility process – the asymmetric associations between goals and temptations (Fishbach et al., 2003)

### **Temptation-elicited goal activation process**

This strategy, called the temptation-elicited goal activation process, refers to the automatic associations formed in successful self-regulators between short-term motives (e.g., temptations) and the overriding goals with which they interfere (e.g., behaving healthily). Specifically, Fishbach et al. (2003) argued that repeated success in overcoming tempting situations in opposition to a long-term goal, may lead to the development of automatic (asymmetric) mental associations between the temptations and the long-term goal representation. Notably, when successful self-regulators were exposed to temptations in their environment, this automatically activated their long-term goal. On the opposite, when long-term goals are induced by environmental cues, there are not supposed to activate the mental representation of temptations and, in contrast, are even expected to inhibit the cognitive accessibility of the temptations. This one-way association between temptation cues and long-term goals is called the cognitive asymmetry mechanism and is thought to play a key role in the successful self-regulation of people behaviors. At the conceptual level, this asymmetric

association represents an effortless self-control strategy as it does not involve the effortful inhibition of temptations.

This cognitive asymmetry was observed in different contexts, as in dieting among people concerned about their weight (i.e., who watch their weight or go on diet) (Fishbach et al., 2003), or more recently in physical activity (Cheval et al., 2017). Specifically, using primed a lexical decision task, results showed that tempting-related primes (e.g., chocolate), facilitated the recognition of goal-related target words (e.g., weight control) in people perceiving themselves as successful in regulating their weight, but not in people who perceived themselves as unsuccessful in controlling their weight. In contrast, the exposition to goal-related or neutral primes did not impact the cognitive accessibility of the temptations-related cognitive constructs. These results were supported by another study where goal accessibility was increased when tempting food items were primed in successful dieters but not in unsuccessful dieters (Papies et al., 2008). In addition, the same cognitive asymmetry was evidenced in physical activity among successful exercisers (Cheval et al., 2017), using sedentary-related words as temptations (Cheval, Radel, et al., 2018; Cheval & Boisgontier, 2021). The tempting nature of sedentary behaviors being accounted by suggestion that individuals are automatically attracted toward effort minimization (Cheval, Tipura, et al., 2018). For example, Cheval et al. (2018; see also Cheval et al., 2021) showed using electroencephalography, that people who intended to be active were automatically attracted by sedentary-related stimuli in a cognitive task (i.e., approach-avoidance task), and needed to activate cortical resources to counteract this automatic attraction. An effect that has been replicated in an independent sample with another task designed to directly probe inhibitory control.

### **The present study**

The present study aims to integrate the literature on effortless self-control (i.e., cognitive asymmetry strategy) with weight stigma in order to provide more information about the process involved in physical activity (non) engagement in people with weight issues.

The main goal of this study was to investigate whether exposure to weight-stigmatizing information (vs. non-stigmatizing information) influence the temptation-elicited goal activation process in the context of physical activity. We examined this question in people who intended and were successful at being physically active, and who believed that being physically active helps to control weight. Indeed, the temptation-triggered goal activation process is thought to occur only in successful self-regulators who value the target domain (Cheval et al., 2017; Fishbach et al., 2003). Indeed, these individuals would be more likely to exercise self-regulation when the goal is important to them. In addition, based on previous research (e.g., Himmelstein et al., 2015; Major et al., 2014; Romano et al., 2018), we did not consider objective weight as an inclusion criterion, but instead included individuals who were concerned about their weight. In other words, people who were afraid of gaining weight and considered it as important to be thin. Thus, if weight stigma exposure reduces the accessibility of goals related to health behaviors, this could impair the temptation-elicited goal activation process in initially successful self-regulators, and prevent the goal from being achieved. We hypothesized that, as compared to the control condition, exposing individuals to weight-stigmatizing information would decrease the cognitive accessibility of physical activity goals following activation of sedentary-related stimuli. To do so, we followed the protocol developed by Fishbach et al. (2003) in the diet context, which was adapted to physical activity by Cheval et al. (2017). Specifically, we used a primed lexical decision task to test if the subliminal exposure to sedentary-related (SED) prime words differently affected the cognitive accessibility of physical activity-related (PA) target words in a weight stigma (vs control) condition.

The main expected effect of interest was the following 3-way interaction: Weight Stigma Condition x Prime x Target. In other words, 1) we predicted that the interaction effect between prime words and target words on reaction time (i.e., Prime x Target), indicating cognitive asymmetry, would be moderated by exposure to weight stigmatizing information (i.e., Weight Stigma Condition). Specifically, we predicted 2) that SED primes would lead to faster recognition of PA target words than in the other conditions (i.e., PA primes and SED targets; neutral primes and PA targets; neutral primes and SED targets; non-word targets). In contrast, we did not expect PA primes to significantly decrease the time to recognize SED target words, regardless the conditions. Such interaction would mean that SED primes activate PA goals, but that PA primes do not activate SED goals. Nevertheless, we expected this 2-way interaction effect to be moderated by exposure to weight-stigmatizing information, with the activation of the PA goals by the SED temptations being more pronounced in the Control Condition than in the Weight Stigma condition.

INSERT FIGURE 1 HERE

## **II. Method**

The present study was preregistered on the open-access platform AsPredicted (#52738), and all data and supplementary materials are available in OSF ([https://osf.io/gax7j/?view\\_only=8a445aab14004937b7df8e1fbe7e98d0](https://osf.io/gax7j/?view_only=8a445aab14004937b7df8e1fbe7e98d0)). All procedures in this study complied with APA ethical principles. Informed consents were obtained from all participants before the beginning of the study. It should also be noted that the participants were informed that the online study was anonymous and confidential: only a self-generated code allowed their identification.

### **Participants and power analysis**

An a priori power analysis was conducted to estimate the sample size required to detect the 3-way within-between interaction: Target (within factor: PA vs. SED words) x Prime

(within factor: relevant vs. neutral prime) x Weight Stigma Condition (between factor: yes vs. no), which was tested using linear mixed effects modeling (MEM), with a 90% power and an alpha level of 5%. Sample size calculation is difficult and sensitive with MEM, as it depends on the values of all the parameters included in the models (i.e., fixed and random). However, in a fully balanced case as here, with 36 reaction times per condition (for the Target x Prime combination), repeated measures ANOVA and linear MEM are nearly identical. Using the Superpower R package (Lakens & Caldwell, 2019), we ran a Monte Carlo simulation-based power analysis for a within-between ANOVA with 1000 samples. To take realistic values, we specified the patterns of means consistent with the cognitive asymmetric pattern typically found in prior studies (Cheval et al., 2017; Fishbach et al., 2003; Stroebe et al., 2013), a correlation between repeated measurements of  $r = 0.5$ , and a conservative medium effect size (i.e., Cohen's  $D = 0.42$ , mean effect size in social psychology, Richard et al., 2003).

The analysis showed that the sample size necessary to reach 90% statistical power for the 3-way interaction is 72 participants per condition. To anticipate any problem with data collection, we planned to recruit at least 180 participants. In addition, because we expected a high number of exclusions due to our restrictive inclusion criteria (i.e., being physically active, valuing physical activity, believing that physical activity helps to control weight, being concerned about one's weight), exploratory analyses were run on the entire sample. For these exploratory analyses, an a priori power analysis was conducted to estimate the sample size required to test the 4-way interaction between Weight Stigma Concerns (between and continuous factor: 1 to 7) x Weight Stigma Condition x Target x Prime, and the 4-way interaction between Weight Concerns (between and continuous factor: 1 to 7) x Weight Stigma Condition x Target x Prime with 90% power and an alpha level of 5%. Results revealed that the sample size necessary given these criteria is 239 in total.

### **Procedure and data collection**

Three hundred fifty-five participants were recruited at Le Mans University, and Grenoble Alpes University, via mailing lists, university classes, and social media over a three months period. Two participants were excluded because they did the study two times. 171 participants ( $M_{age} = 19.84$  years; 88 women) met the inclusion criteria for the main analyses and 254 ( $M_{age} = 19.70$  years; 119 women) for the exploratory ones. Specifically, for main analyses, seven participants for not giving enough importance to physical activity (i.e., it was not a goal for them), 56 in this new subsample for not believing that physical activity allows to regulate their weight, 65 in this new subsample were not sufficiently active and 53 did not have any weight concerns. Finally, three participants did not fully complete the study. The entire study was conducted online on Inquisit Web<sup>1</sup>.

Participants were first invited to read and sign an informed consent form. Then, they were randomly assigned to one of two conditions (weight stigma exposure vs. control), by reading either a text exposing them to weight-stigmatizing information or the control text (see Supplementary Materials), based on the ones used by Araiza & Wellman (2017). The texts discussed workplace discrimination against overweight individuals (Weight Stigma Condition) or against Inuit Canadians (Control Condition), the latter population being very underrepresented in France. Finally, participants completed a questionnaire measuring the variables described below.

## **Measures**

### ***Inclusion criteria***

#### **Weight concerns**

Weight concerns were measured with two items (Fishbach et al., 2003) assessing: 1) to what extent participants were concerned by their weight and 2) how important it was for them to be

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<sup>1</sup> Inquisit 6 [computer software] (2021). Retrieved from <https://www.millisecond.com>.



thin, on a 7-point scale (1= *not at all*; 7= *extremely*). Participants were included only if they reported a score of at least 2 (i.e., participants who answered 1 were not included). This threshold was chosen for two reasons. First, although a score of 2 means that participants experience weight concerns only a little bit, this indicates that they still experience such concerns. Second, this measure is likely to be influenced by social desirability bias. Second, this measure is likely to be influenced by social desirability bias, given the prevalence of weight stigma in Western societies (e.g., Puhl et al., 2020).

### **Physical activity goal value**

The value of physical activity goal was measured with a 3-item questionnaire (Cheval et al., 2017). Participants answered to what extent they: 1) avoid sedentary behaviors, 2) are concerned about the importance of adopting physical activity on a regular basis, 3) make an effort to adopt physical activity behaviors, and 4) feel guilty if they consistently adopt sedentary behaviors, on a 7-point scale (1= *not at all*; 7= *extremely*). Participants were included only if they reported at least a score of 4 on the scale.

### **Belief that physical activity helps to control weight**

The belief that physical activity helps to control one's weight was measured using a single item on a 7-point scale (1 = *not at all*; 7 = *extremely*). Participants were included only if they reported at least a score of 4 on the scale.

### **Physical activity and sedentary behaviors**

Physical activity and sedentary behaviors were measured using a self-reported questionnaire (short International Physical Activity Questionnaire adapted from Craig et al., 2003), where participants were asked to indicate how many times (in minutes) they spent the last 7 days in vigorous and moderate physical activities, walking and sitting. Participants were included only if they reported at least 150 minutes of moderate to vigorous physical activity per

week, thus achieving the minimum health recommendations guidelines (World Health Organization, 2019).

### ***Outcome***

#### **Lexical decision task**

The task used was the same as described in Cheval et al. (2017), with a Target (PA vs. SED words) x Prime (PA and SED vs. neutral primes) within-subject. Participants were asked to indicate as accurately and quickly as possible, whether the letter string presented on the screen was an existing word or not, by pressing specific keys on their keyboard. Targets included PA and SED-related words, and primes included neutral, PA and SED-related words. Primes were characterized as relevant when a temptation (SED) primed the goal (PA), or when the goal (PA) primed the temptation (SED), and as irrelevant when neutral. At first, a fixation cross appeared for 1 second and was followed by the 50-ms prime presentation, and then by the target word that remained on the screen until the participant responded. Targets were related to physical activity (PA) or sedentary behaviors (SED). Participants performed a 10-trial practice before completing the 256 experimental trials. In these trials, items of interest were assessed both 36 times (i.e., PA targets primed by SED words and SED targets primed by PA words). Other trials composed the control condition (e.g., neutral primes and non-words targets combinations).

### ***Exploratory variables***

#### **Weight Perception**

Weight perception was measured by one item often used in past research (e.g., Major et al., 2014) assessing how participants perceived their weight at the moment, from (1) very underweight to (7) very overweight.

#### **Weight Stigma Concerns**

Weight Stigma Concerns were measured with a 3-item questionnaire ( $\alpha = .92$ ,  $\omega = .93$ ) from Hunger et al. (2015), where participants indicated to what extent 1) they were concerned about being unfairly treated because of their weight, 2) they were concerned about being rejected because of their weight and 3) they were concerned about being negatively judged because of their weight, on a 7-point Likert scale (1= *not at all agree*; 7= *totally agree*).

### **III. Results**

#### **Data analysis**

##### ***Descriptive analyses and correlations between the variables of interest***

INSERT TABLE 1 HERE

The correlation analyses on the whole sample included in the exploratory analysis showed significant relationships between several dimensions: a) women (vs. men) exhibited higher Weight Concerns, Weight Stigma Concerns and Perceived Weight (respectively  $r = .30$ ,  $p < .01$ ;  $r = .37$ ,  $p < .01$ ;  $r = .23$ ,  $p < .01$ ), b) BMI was positively correlated with Weight Concerns, Weight Stigma Concerns, and Perceived Weight (respectively  $r = .18$ ,  $p < .01$ ;  $r = .35$ ,  $p < .01$ ;  $r = .54$ ,  $p < .01$ ), c) Weight Concerns were positively correlated with Weight Stigma Concerns and Perceived weight (respectively  $r = .42$ ,  $p < .01$ ;  $r = .35$ ,  $p < .01$ ), and d) Weight Stigma Concerns were positively correlated with Perceived Weight ( $r = .41$ ,  $p < .01$ ).

##### ***Reaction time data exclusion***

Trials with non-words, trials resulting in incorrect responses, and responses below 200 ms and above 1500 ms were not included in the analyses (Cheval et al., 2017), leaving a total of 34720 trials in exploratory analyses and 23262 trials in main analyses.

##### ***Statistical models***

We followed the procedure described in our preregistration and we analyzed reaction times in the lexical decision task following the same procedure as described in Cheval et al. (2017), using linear mixed effects modeling (MEM). We built a MEM using the package lmerTest in R-Studio (Team, 2015) and specified the interaction Condition x Target x Prime interaction as fixed factors. Moreover, participants were specified as a random factor, and we included random effects Target x Prime interaction at the level of the participant.

### ***Main analysis***

INSERT FIGURE 2 HERE

Contrary to our hypothesis, 1) results revealed a non-significant Weight Stigma Condition x Target x Prime interaction (Table 1;  $b = -3.90\text{ms}$ ,  $p = .645$ ), thereby suggesting that the potential cognitive asymmetry was not moderated by exposure to weight stigma. Moreover, 2) the cognitive asymmetry was not replicated as indicated by a non-significant Target x Prime interaction (Table 1;  $b = 3.47\text{ms}$ ;  $p = .559$ ).

Further analyses showed that the nature of target words significantly predicted reaction time, which was faster for target words related to PA than SED ( $M = 670_{\text{PA}}$  vs.  $682_{\text{SED}}$  ms; table 1;  $b = 12.94\text{ms}$ ;  $p = .003$ ) – participants responded ~13ms faster to PA targets than to SED targets. Primes also significantly predicted reaction time, which was faster for relevant prime words than irrelevant ones ( $M = 669_{\text{relevant}}$  vs.  $683_{\text{irrelevant}}$  ms; table 1;  $b = -16.32\text{ms}$ ;  $p < .001$ ) – participants responded ~16ms faster when Targets (either PA or SED words) were preceded by relevant prime words.

INSERT TABLE 2 HERE

### ***Exploratory results***

Two exploratory analyses were performed to further investigate the interaction between weight stigma exposure and the cognitive asymmetry process, by examining if the non-

significant 3-way interaction between Weight Stigma Condition, Target and Prime was moderated by participants' level of Weight Stigma Concerns and Weight Concerns.

#### **4-way interaction with Weight Stigma Concerns**

Results revealed a non-significant Weight Stigma Concerns x Weight Stigma Condition x Target x Prime interaction (Table 2;  $b = -7.32\text{ms}$ ,  $p = .086$ ) and a non-significant Target x Prime interaction (Table 2;  $b = -3.48\text{ms}$ ;  $p = .466$ ). In addition, target words significantly predicted reaction time, which was faster for target words related to PA than SED ( $M = 670_{\text{PA}}$  vs.  $682_{\text{SED}}$  ms; Table 2;  $b = 15.21\text{ms}$ ;  $p < .001$ ). Likewise, these results were identical to the main analysis' models.

#### **4-way interaction with weight concerns**

Results also revealed a non-significant Weight Concerns x Weight Stigma Condition x Target x Prime interaction (Table 3;  $b = -7.30\text{ms}$ ,  $p = .087$ ), and a non-signification Target x Prime interaction (Table 3;  $b = -3.48\text{ms}$ ;  $p = .466$ ). Similarly, to the results described above, they are identical to the main analysis' models.

INSERT TABLES 3 AND 4 HERE

#### ***Sensitivity analyses***

To ensure our study was sufficiently powered to detect the main effect of interest, we conducted a sensitivity power analysis with the *SIMR* R package (Green & MacLeod, 2016) as described in Francis et al. (2022). We found that our sample for the main analysis had more than 94% power (lower bound = .946; upper bound = 1) to detect an interaction effect of 20 ms ( $r = .03$ ); this effect size is the one found by Cheval et al. (2017) and is four times smaller than the effect size found in study 1 of Fishbach et al. (2003). Additionally, we conducted the same sensitivity analysis with the sample for exploratory analysis, which revealed that we had more than 96% power (lower bound = .964; upper bound = 1) to detect an interaction of 20 ms ( $r = .03$ ).

## Discussion

The present pre-registered study examined whether exposure to weight-stigmatizing information may moderate the temptation-elicited goal activation process, which is thought to represent an effortless self-control strategy that has been identified in successful self-regulators (Cheval et al., 2017; Fishbach et al., 2003).

Our results suggest that, in our well-powered study (with more than 95% power to detect an effect size one-quarter smaller than the asymmetry effect size found in Study 1 of Fishbach et al., 2003), the temptation-elicited goal activation process was not observed, and thus, we did not confirm our two main hypotheses. Instead, we found two main effects, one of the Prime and one of the Target on the reaction time in the decision lexical task. Specifically, we observed that participants were faster to detect PA goals after being primed by SED temptations and were also faster to recognize SED temptations after being primed by PA goals (i.e., main effect of Prime). This finding is consistent with a recent well-powered replication study, which did not find evidence for the temptation-elicited goal activation pattern, but rather observed that goal and temptation-related prime words both facilitated recognition of temptation and goal-related target words, respectively (Francis et al., 2022). The current study not only replicated the symmetrical activation pattern found in Francis et al. in the academic context, but also extended it to the physical activity domain. As explained in Francis et al., “the asymmetry between temptations and goals may not exist at the most automatic level of processing, even for those individuals high in self-regulatory success” (p.8; Francis et al., 2022) toward physical activity. Nevertheless, it is possible can be argued that the asymmetrical activation may still be observed when inhibitory processes fall into place. As such, the observation of this asymmetric pattern could be dependent on the duration of the stimulus-onset asymmetry (SOA) (Papies et al., 2008). More precisely, the SOA is the

time elapsed between the apparition of one stimulus (e.g., Prime) and the start of a second stimulus (e.g., Target). Thus, the SOA duration determined the amount of processing and influences the accessibility of the prime of related concepts. The duration of the SOA could play a key role in moderating the type of activation pattern observed – shorter SOA would favor symmetric activation while longer SOA would favor longer asymmetric activation. Consistent with this suggestion, Papiés et al. (2008) showed in their study 1, that Primes were facilitatory in successful self-regulators for goal activation only when the SOA duration was 540 ms, thus relatively long. In our study, the time between the Prime presentation and the Target was 80 ms, which could be too short to allow inhibitory processes activation. Future studies manipulating the SOA duration are warranted.

Moreover, we also found a main effect of the Target. We observed that participants were faster to detect words related to PA (e.g., “effort”) than words related to SED (e.g., “rest”). These findings may suggest that the cognitive accessibility of the PA goals was higher than the cognitive accessibility of the sedentary temptations. This observation could be explained by the characteristics of our sample. Indeed, to be included in the study, participants had to be physically active (i.e., achieving at least 150 minutes of moderate to vigorous physical activity per week) and consider physical activity as important for them. Previous studies have shown that cues associated with physical activity could be particularly relevant for active participants (Cheval et al., 2020; Pool et al., 2016), translating into an automatic tendency (e.g., Bluemke et al., 2010; Calitri et al., 2009; Eves et al., 2007) to approach physical activity, and thus into faster recognition of physical activity targets versus non-relevant targets (Cheval et al., 2017, study 1). This explanation is corroborated by a review of the literature highlighting that people draw their attention more to the stimuli that are relevant for them than to non-relevant ones (e.g., physical activity stimuli for physically active participants) (Cheval et al., 2020; Corbetta & Shulman, 2002), facilitating recognition of the

former. This suggests that, in successful self-regulators, the goals accessibility could be stronger than the temptations accessibility.

### **Limitations and strengths**

The present study has potential limitations. First, our sample included people who were concerned about their weight and who believed that physical activity helps to control weight. It could imply that the main goal of our participants was to watch their weight (e.g., maintain or lose weight). In this case, doing physical activity could be considered as a way to achieve this main goal of controlling weight. Thus, the long-term goal of our participants might be to watch their weight and this goal could not be in opposition with the tempting sedentary. Indeed, practicing physical activity could be for participant a way among different possibility to control their weight (e.g., dieting). If they do not consider physical activity as a long term goal in opposition with physical activity, this opposition should not lead to a motivational conflict (i.e., essential for self-control operationalization; Forestier et al., 2022), and thus self-control should not be used to resolve it.

Second, the data were collected online, and even if participants were asked to perform the study alone, in a quiet room without any distractions, there are still concerns about gathering reaction-time data and concerns about participants' involvement in the study, even if some methods could be used to verify participant's commitment to the task (e.g., accuracy). Third, although validated in pilot studies, the words used to describe sedentary temptations and physical activity goals were generic and not personalized for each participant, which could make the words less relevant to the participant (Silvio et al., 2023). Fourth, the measure of usual physical activity was self-reported, which may not accurately capture the actual physical activity level of the participants.

However, these limitations are counterbalanced by at least two main strengths. First, our study was well-powered. The sensitivity analyses revealed that our study has more than



95% power to detect an effect size similar to the one found in Cheval et al. (2017). In addition, our study has much more trials included in the analyses than the two studies we relied on (Cheval et al., 2017; Fishbach et al., 2003). Indeed, 23262 trials for the main analysis and 34720 trials for exploratory were included in our study vs 2751 trials and a maximum of 5538 trials (the number of trials excluded was not reported) in Cheval et al. (2017) and Fishbach et al. (2003), respectively. Second, we set up practices considered as good research practices (Boisgontier, 2022; Caldwell et al., 2019). Specifically, our study and its hypotheses were preregistered and our sample size was based on an a priori power analysis.

## **Conclusion**

To conclude, our study has more implications for the cognitive asymmetry process literature than for the weight stigma one. Indeed, despite a well-powered design, we were not able to replicate the cognitive asymmetry process. This prevented us from accurately evaluating the possible moderating influence of exposure to weight-stigmatizing information on this cognitive asymmetry. Our results are, however, in line with a recent study that did not replicate the asymmetric phenomenon neither despite a robust design (Francis et al., 2022). In contrast, we found evidence that participants recognized more quickly goal-related words (i.e., related to physical activity) than temptation-related words (i.e., main effect of the Target). We also found evidence that participants recognized more quickly words, irrespective of whether related to a goal or a temptation, after being primed, suggesting a symmetrical pattern of the automatic associations between goals and temptations representations. Finally, our findings suggest that we were not able to find the temptation-elicited goal process effect, and that further studies on this topic might investigate which conditions should favor the observation of the temptation-elicited goal process.

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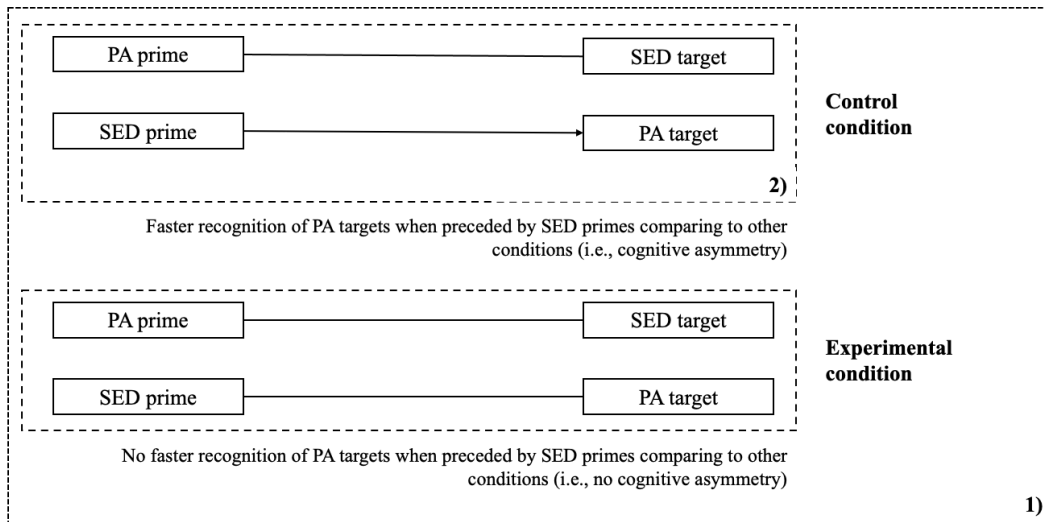
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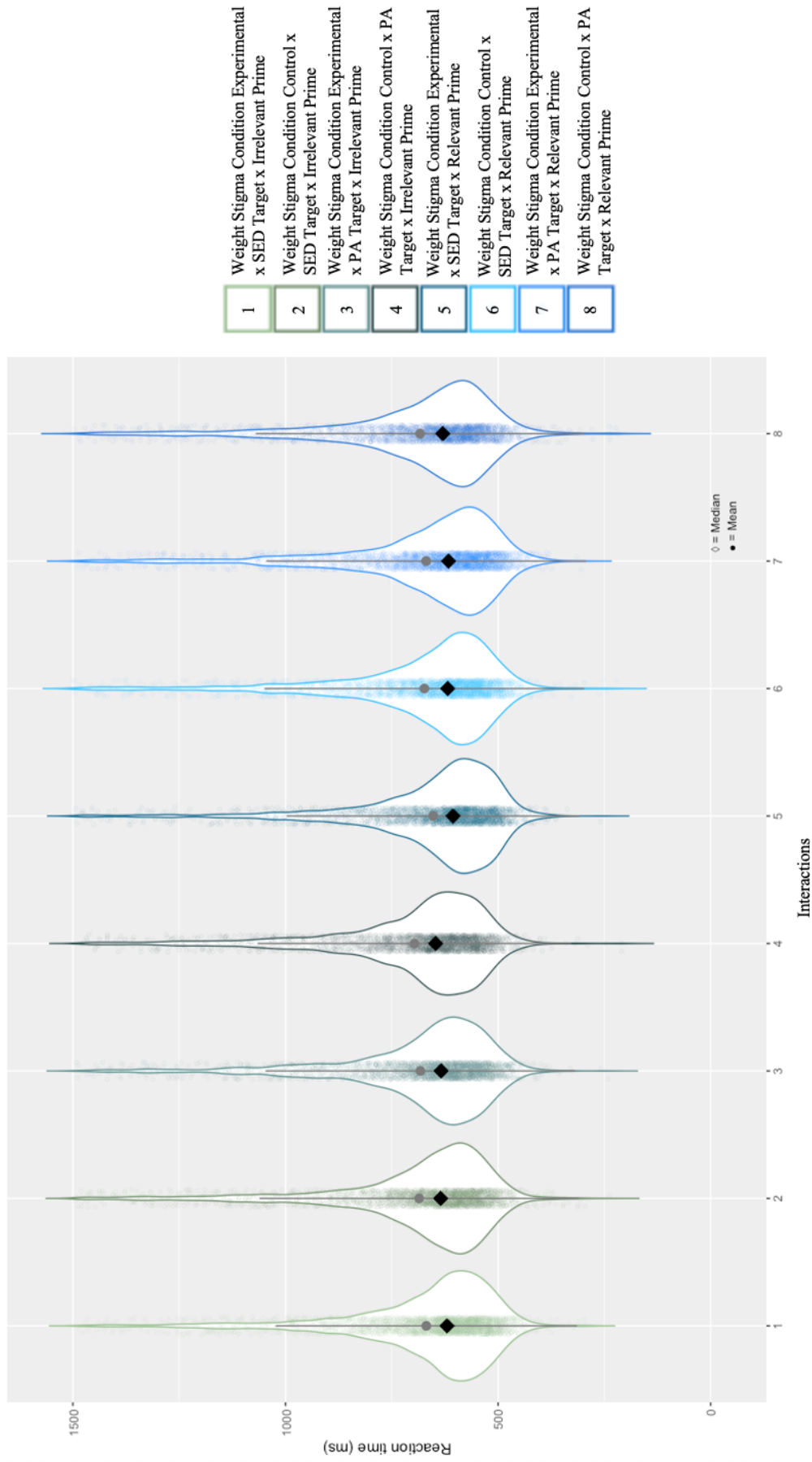


**Figure 1.**

Visual representation of the main hypotheses, thus of the hypothetical interaction effect between prime words and target words on reaction time, indicating the cognitive asymmetry and its hypothetical moderation by exposure to weight stigmatizing information (Weight Stigma Condition).



**Figure 2.** Reaction time for the recognition of target words related to SED and PA in main analyses. Note. PA = physical activity; SED = sedentary



**Table 1.**  
Correlation Table

Variable	M	SD	1	2	3	4	5
1. Age	19.68	3.59					
2. Sex	0.47	0.50	<b>.33**</b> [.22, .44]				
3. BMI	21.67	2.93	<b>.19**</b> [.07, .30]	.04 [-.08, .16]			
4. Weight concerns	3.57	1.60	<b>.14**</b> [.02, .26]	<b>.30**</b> [.19, .41]	<b>.18**</b> [.06, .30]		
5. Weight Stigma Concerns	2.01	1.40	<b>.17**</b> [.04, .28]	<b>.37**</b> [.26, .47]	<b>.35**</b> [.24, .45]	<b>.42**</b> [.31, .51]	
6. Perceived Weight	4.07	0.72	<b>.22**</b> [.09, .33]	<b>.23**</b> [.11, .34]	<b>.54**</b> [.45, .63]	<b>.35**</b> [.23, .45]	<b>.41**</b> [.30, .50]

*Note.* *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .  
For the sex variable men = 0 and women = 1.

**Table 2.**

Results of the linear mixed models predicting the reaction time required to recognize SED-related and PA-related words, in main analysis.

<i>Predictors</i>	<b>Reaction Time</b>		
	<i>Estimates</i>	<i>CI</i>	<i>p</i>
Intercept	<b>675.99</b>	<b>655.29 – 696.69</b>	<b>&lt;0.001</b>
Weight Stigma Condition	13.99	-15.21 – 43.20	0.348
Target	<b>12.94</b>	<b>4.30 – 21.57</b>	<b>0.003</b>
Prime	<b>-16.32</b>	<b>-24.49 – -8.14</b>	<b>&lt;0.001</b>
Weight Stigma Condition x Target	-2.65	-14.91 – 9.62	0.672
Weight Stigma Condition x Prime	4.35	-7.27 – 15.97	0.463
Target x Prime	3.47	-8.18 – 15.12	0.559
Weight Stigma Condition x Target x Prime	-3.90	-20.46 – 12.67	0.645
<b>Random Effects</b>			
$\sigma^2$	25324.35		
$\tau_{00}$ Participants	8743.20		
$\tau_{11}$ Participants.Target	175.68		
$\tau_{11}$ Participants.Prime	16.48		
$\tau_{11}$ Participants.Target:Prime	70.42		
$\rho_{01}$	0.16		
	-0.31		
	0.80		
N Participants	171		
Observations	23262		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.005 / NA		

**Table 3.**

Results of the linear mixed models predicting the reaction time required to recognize SED-related and PA-related words, and depending on the Weight Stigma Condition and Weight Stigma Concerns, in exploratory analysis.

<i>Predictors</i>	<b>Reaction Time (ms)</b>		
	<i>Estimates</i>	<i>CI</i>	<i>p</i>
Intercept	<b>672.17</b>	<b>654.97 – 689.36</b>	<b>&lt;0.001</b>
Weight Stigma Condition	19.45	-4.88 – 43.77	0.117
Target	<b>15.21</b>	<b>8.20 – 22.22</b>	<b>&lt;0.001</b>
Prime	<b>-12.55</b>	<b>-19.21 – -5.89</b>	<b>&lt;0.001</b>
Weight concern	5.11	-5.50 – 15.73	0.345
Weight Stigma Condition x Target	-7.05	-17.06 – 2.95	0.167
Weight Stigma Condition x Prime	0.65	-8.87 – 10.16	0.894
Target x Prime	-3.48	-12.84 – 5.88	0.466
Weight Stigma Condition x Weight concern	-5.04	-20.24 – 10.16	0.516
Target x Weight concern	0.23	-4.10 – 4.55	0.919
Prime x Weight concern	-2.62	-6.73 – 1.48	0.210
Weight Stigma Condition x Target x Prime	4.83	-8.54 – 18.21	0.479
Weight Stigma Condition x Target x Weight concern	2.36	-3.89 – 8.61	0.459
Weight Stigma Condition x Prime x Weight concern	1.00	-4.94 – 6.94	0.741
Target x Prime x Weight concern	2.95	-2.82 – 8.73	0.316
Weight Stigma Condition x Target x Prime x Weight concern	-7.32	-15.67 – 1.04	0.086
<b>Random Effects</b>			
$\sigma^2$	25216.49		
$\tau_{00}$ ID	9034.66		
$\tau_{11}$ ID.target0.5	170.39		
$\tau_{11}$ ID.prime0.5	24.67		
$\tau_{11}$ ID.target0.5:prime0.5	1.52		
$\rho_{01}$	0.34		

	0.48
	0.93
N Participants	254
Observations	34720
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.007 / NA

**Table 4.**

Results of the linear mixed models predicting the reaction time required to recognize SED-related and PA-related words, and depending on the Weight Stigma Condition and Weight Concerns, in exploratory analysis.

<i>Predictors</i>	<b>Reaction Time (ms)</b>		
	<i>Estimates</i>	<i>CI</i>	<i>p</i>
Intercept	<b>672.17</b>	<b>654.97 – 689.36</b>	<b>&lt;0.001</b>
Weight Stigma Condition	19.45	-4.88 – 43.77	0.117
Target	<b>15.21</b>	<b>8.20 – 22.22</b>	<b>&lt;0.001</b>
Prime	<b>-12.55</b>	<b>-19.21 – -5.89</b>	<b>&lt;0.001</b>
Weight concern	5.11	-5.50 – 15.73	0.345
Weight Stigma Condition x Target	-7.05	-17.06 – 2.95	0.167
Weight Stigma Condition x Prime	0.65	-8.87 – 10.16	0.894
Target x Prime	-3.48	-12.84 – 5.88	0.466
Weight Stigma Condition x Weight concern	-5.04	-20.24 – 10.16	0.516
Target x Weight concern	0.23	-4.10 – 4.55	0.919
Prime x Weight concern	-2.62	-6.73 – 1.48	0.210
Weight Stigma Condition x Target x Prime	4.83	-8.54 – 18.21	0.479
Weight Stigma Condition x Target x Weight concern	2.36	-3.89 – 8.61	0.459
Weight Stigma Condition x Prime x Weight concern	1.00	-4.94 – 6.94	0.741
Target x Prime x Weight concern	2.95	-2.82 – 8.73	0.316
Weight Stigma Condition x Target x Prime x Weight concern	-7.32	-15.67 – 1.04	0.086
<b>Random Effects</b>			
$\sigma^2$	25216.49		
$\tau_{00}$ Participants	9034.66		
$\tau_{11}$ Participants.Target	170.39		
$\tau_{11}$ Participants.Prime	24.67		
$\tau_{11}$ Participants.Target:Prime	1.52		
$\rho_{01}$	0.34		

	0.48
	0.93
N Participants	254
<hr/>	
Observations	34720
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.007 / NA



### Résumé du Manuscrit 5

Les résultats de cette dernière étude ont mis en évidence une difficulté majeure à répliquer le phénomène d'asymétrie cognitive. Malgré une méthodologie rigoureuse et une très haute puissance statistique à plus de 96% qui nous aurait permis de détecter une taille d'effet quatre fois plus petite que celle trouvée dans l'étude initiale sur ce phénomène, nous n'avons pas réussi à observer le phénomène.

Néanmoins, nos résultats sont alignés avec ceux d'une étude récente qui a également échoué à répliquer ce phénomène d'asymétrie cognitive. A la place d'un effet asymétrique, nous soulignons un effet symétrique des amorces congruentes tant bien sur les cibles en lien avec les buts que sur les cibles en lien avec les tentations. Cette absence de réplification ne rend pas possible la réalisation d'analyses qui auraient pu placer la stigmatisation liée au poids comme frein à l'utilisation de cette stratégie.

## **PARTIE 3**

### Discussion générale

## Chapitre 4. Discussion générale

De nos jours, la pratique d'activité physique est largement insuffisante, et pour rappel, près d'un quart des adultes ne sont pas suffisamment actifs au niveau mondial. Cela est d'autant plus vrai chez les personnes en surpoids et obèses (Cassidy et al., 2017). Dans cette perspective, plusieurs recherches se sont intéressées au rôle de la stigmatisation liée au poids sur le comportement d'activité physique (Phibbs et al., 2019; Puhl et al., 2013). Globalement, leurs résultats mettent en évidence un effet négatif de la stigmatisation sur la pratique d'activité physique chez cette population (voir Partie V, Chapitre 1, Pearl et al., 2021). Toutefois, que peu d'études se sont intéressées aux mécanismes explicatifs de cette relation (e.g., Rojas-Sánchez et al., 2021).

L'enjeu central de ce travail doctoral était d'investiguer quels sont les mécanismes explicatifs de la relation négative existant entre la stigmatisation liée au poids et le comportement d'activité physique. En d'autres termes, par quels mécanismes la stigmatisation liée au poids empêche ou limite la pratique d'activité physique des personnes qui sont la cible de ce préjudice social et sociétal. Pour cela, nous nous sommes appuyés sur les modèles contemporains d'auto-régulation issus de la psychologie sociale qui s'intéressent au processus post-intentionnels, et plus particulièrement au contrôle de soi. Deux questions de recherche permettent d'explicitier les objectifs de ce travail : 1) Dans quelle mesure l'attribut du surpoids est important dans le processus de formation d'impressions ? 2) Quelle est la nature de la relation entre la stigmatisation liée au poids et différentes stratégies de contrôle de soi, coûteuses et non coûteuses ?

Dans cette discussion générale nous apporterons des éléments de réponses aux questions de recherche présentées ci-dessus, en nous appuyant sur les contributions théoriques et empiriques de ce travail, et nous présenterons les implications de cette thèse. Enfin, nous

discuterons des forces et limites de ce travail doctoral avant de procéder à la conclusion générale.

### **I. Dans quelle mesure l'attribut du surpoids est important dans le processus de formation d'impressions ?**

Nous avons dans un premier temps cherché à déterminer à quel point l'attribut du surpoids pouvait peser dans le processus de la formation d'impressions, cette question de recherche n'ayant, à notre connaissance, pas été investiguée par le passé. Si de nombreuses études se sont intéressées aux croyances véhiculées sur le stigmatisme du poids et à la stigmatisation liée au poids, aucune ne semble avoir investigué la saillance de cet attribut dans la formation d'impressions. Autrement dit, à quel point le surpoids est une caractéristique visible et accessible par autrui, par rapport à un point considéré comme normal vis-à-vis des définitions des agences de santé internationales. Pour répondre à cette problématique, la première contribution empirique de ce travail doctoral (Manuscrit 1) visait à estimer la saillance de cet attribut du surpoids en comparaison avec un poids normal.

Nous nous sommes appuyés sur le protocole expérimental d'une étude qui investiguait la saillance du handicap physique (Louvet & Rohmer, 2006), au surpoids. Nous avons pu montrer que les personnages en surpoids (i.e., condition expérimentale) étaient plus souvent décrits par leur poids que les personnages normo-pondérés (i.e., condition contrôle, 25.41% contre 11.83% ; OR=1.56, 95% CI 1.24–1.96,  $p<0.01$ ). Des analyses complémentaires ont révélé que la probabilité de l'utilisation de mots relatifs au poids pour décrire des personnages en surpoids, était significativement plus élevée pour les premiers mots utilisés que pour les derniers, mettant en avant un effet de l'ordre des mots (i.e., premier, deuxième, et troisième mot) en plus de l'effet simple de la condition.

En accord avec les travaux précédents sur la formation d'impressions, le surpoids, qui est une caractéristique physique, pourrait ainsi être un élément majeur dans ce processus (Fiske et al., 1999; Knapp & Hall, 1972). Il pourrait aussi être particulièrement saillant de par sa nature non normative (e.g., Klauer et al., 2003). Les catégories non-naturelles sont considérées comme résultant de choix individuels, et affichent une forte entitativité. En d'autres termes, les individus faisant parti d'un groupe social choisi (i.e., non-normatif) sont perçus comme partageant des caractéristiques communes importantes qui les unissent au sein d'un même groupe. Dans le cadre du surpoids, il pourrait être pensé que les personnes en situation de surcharge pondérale sont arrivées à ce statut à cause de l'adoption de mauvais comportements de santé (i.e., en lien avec les nombreux stéréotypes envers ce groupe social, voir Chapitre 1). De plus, la saillance de la non-normativité des attributs a été mise en évidence dans les études sur le handicap physique (Louvet & Rohmer, 2006; Rohmer & Louvet, 2009), ce qui renforce la robustesse de nos résultats.

Néanmoins, même si l'accessibilité d'un attribut ou d'un concept est importante, cela ne signifie pas nécessairement qu'il sera utilisé, car des concepts peuvent nous venir à l'esprit sans que nous les utilisions pour autant (Higgins, 1996). C'est ce qui se passe, par exemple, lorsque le concept en question est lié à des stéréotypes négatifs et que nous estimons que son utilisation pour juger une personne n'est pas socialement acceptable (Gilbert & Hixon, 1991). Cela pourrait expliquer pourquoi, dans le cas du surpoids dans cette étude, malgré une plus grande différence relative dans les premiers mots utilisés (voir II.c du Manuscrit 1), la probabilité absolue d'utiliser un mot en lien avec le poids est plus grande dans les derniers mots utilisés que dans les premiers, ce qui pourrait illustrer un certain biais de désirabilité sociale.

Pour conclure, l'attribut du surpoids semble être important dans le processus de formation d'impressions, et davantage qu'un poids considéré comme normal.

## **II. Comment s'exprime la relation entre la stigmatisation liée au poids et différentes stratégies de contrôle de soi, coûteuses et non coûteuses ?**

Même s'il semble exister d'importants stéréotypes sur le fait que les personnes en surpoids ont un faible contrôle de soi (e.g., Schwartz et al., 2006), peu d'études ont investigué directement la relation entre la stigmatisation et le contrôle de soi ainsi que sa résultante sur l'activité physique. Et malheureusement, quand cela a été fait, cela n'a pas toujours été via des outils valides (e.g., Major et al., 2014). Pour dépasser ces limites, nous avons fait le choix d'appréhender le contrôle de soi par des définitions récentes et élargies, qui proposent que le contrôle de soi est l'habileté qui permet la résolution d'un conflit motivationnel entre deux motivations opposées, qui peut s'exercer par différentes stratégies qui nécessitent ou pas des efforts (de Ridder, et al., 2012; Fujita, 2011). Pour répondre à la problématique de ce deuxième axe de recherche, nous avons mis en place une série de quatre études. L'une théorique (Manuscrit 2), proposant un modèle qui vise à dépasser les limites de la littérature sur le contrôle de soi coûteux, qui a également servi de base à une revue systématique (Manuscrit 3), et à une étude empirique qui applique ce modèle en lien avec le comportement d'activité physique et la stigmatisation liée au poids (Manuscrit 4). La dernière étude de cet axe investigate quant à elle l'effet de la stigmatisation liée au poids envers une stratégie non coûteuse de contrôle de soi, en lien avec l'activité physique (Manuscrit 5).

### **1. Un nouveau modèle théorique du contrôle de soi**

La synthèse de la littérature réalisée dans la Manuscrit 2 (Forestier et al., 2022), conduit à la proposition un modèle en deux étapes, fondé sur un modèle théorique robuste et falsifiable. Ce modèle de la fatigue du contrôle de soi comprend trois composantes principales, à savoir les ressources de contrôle de soi, la motivation au contrôle de soi et la capacité de contrôle de soi, qui prédisent simultanément un acte de contrôle de soi initial. Cet acte initial peut affecter

temporairement chaque composante, les rendant moins efficaces pour un acte de contrôle de soi ultérieur. Ainsi, la théorie de la fatigue du contrôle de soi propose qu'un acte initial de contrôle de soi induit des réductions temporaires des ressources, de la motivation et/ou de la capacité de contrôle de soi, qui conduisent à un acte de contrôle de soi ultérieur altéré (i.e., le résultat comportemental). Pour rappel, les ressources de contrôle de soi font référence à une quantité objective ou subjective d'énergie disponible et ces ressources peuvent être psychologiques comme physiologiques. La motivation au contrôle de soi est la volonté de s'engager dans un acte de contrôle de soi, ou la priorisation de l'acte de contrôle de soi et peut être mesuré avec un questionnaire auto-rapporté. Enfin la capacité de contrôle de soi est un processus mental descendant qui rend possible l'acte de contrôle de soi, et qui peut être représenté par les fonctions exécutives (mémoire de travail, inhibition et flexibilité mentale).

Ainsi, ce modèle nous permet d'investiguer avec un socle plus robuste notre question de recherche, notamment dans les Manuscrits 3 et 4 qui s'intéressent aux stratégies coûteuses de contrôle de soi.

## **2. Première étape d'analyses de la relation entre la stigmatisation et le contrôle de soi**

De nombreuses études rapportent des conséquences négatives de la stigmatisation chez les personnes qui ciblées en raison de leur groupe social d'appartenance, et ce dans différents domaines. Des conséquences similaires sont rapportées auprès de différents groupes stigmatisés (e.g., comportements de santé, réussite scolaire, réussite professionnelle, bien-être, voir Chapitre 2) (Puhl et al., 2020; e.g., Schmader et al., 2008; Van Laar et al., 2019). Dans la chaîne de mécanismes explicatifs du lien entre la stigmatisation et ses conséquences comportementales, plusieurs auteurs ont proposé le rôle central du contrôle de soi pour expliquer cette relation délétère. Pour investiguer cette perspective, nous avons conduit une

revue systématique afin de faire la synthèse des travaux ayant examiné le lien entre la stigmatisation et le contrôle de soi (Manuscrit 3).

Les résultats de cette troisième contribution empirique semblent aller dans une même direction : que la stigmatisation soit due au genre, à la couleur de peau, au poids ou à l'âge, qu'elle soit induite de manière implicite ou explicite, elle semble altérer négativement le contrôle de soi. Toutes les études incluses (15 études au sein de neuf articles) dans notre revue rapportent un effet négatif de la stigmatisation envers le contrôle de soi et cela, peu importe l'outil utilisé pour le mesurer, où le construit pour le conceptualiser.

Huit des études incluses dans la revue systématique ont utilisé des mesures d'inhibition pour mesurer le contrôle de soi, que l'on pourra rapprocher d'une mesure de la capacité de contrôle de soi (voir Manuscrit 2; Forestier et al., 2022), et six d'entre elles ont utilisé une tâche de Stroop (étude 2b Carr & Steele, 2010; étude 2 Inzlicht et al., 2006; Major et al., 2012; études 1, 2 et 3 Rydell et al., 2014), tandis qu'une d'entre elles a utilisé une tâche de Go/No-Go (Araiza & Wellman, 2017), et une dernière une mesure de *handgrip* (étude 3 Inzlicht et al., 2006). Le *handgrip* était utilisé afin de connaître la durée maximale de préhension des participants, ce qui devait d'après les auteurs, représenter une mesure d'auto-régulation physique (i.e., *physical self-regulation*, Inzlicht et al., 2006). Mis commun, les résultats de ces cinq études indiquent que les participants des groupes expérimentaux avaient des performances réduites de leur capacité inhibitrice par rapport aux groupes contrôles (i.e., capacité de contrôle de soi).

Il en est de même pour les études qui se sont intéressées aux ressources de contrôle de soi. C'est le cas de quatre des études incluses dans la revue, dont deux ont utilisé une mesure de vitalité subjective (Emile et al., 2015; Rojas-Sánchez et al., 2021) et deux, une mesure de l'état de contrôle de soi (études 2 et 3, Major et al., 2020). Les deux seules études de cette revue systématique s'étant également intéressées au comportement d'activité physique, sont les deux qui ont utilisé une mesure de la vitalité subjective. Elles reportent toutes deux un effet négatif

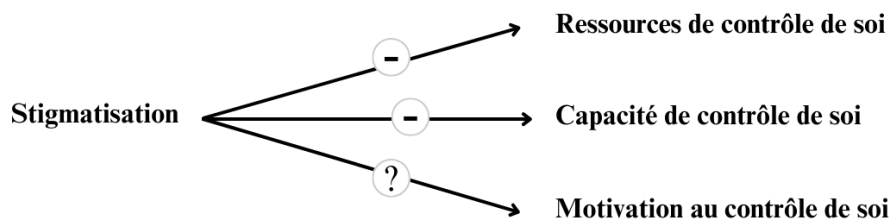


de la stigmatisation sur les ressources de contrôle de soi. De plus, l'une montre une corrélation positive entre les ressources de contrôle de soi et le niveau d'activité physique (Emile et al., 2015). La seconde (Rojas-Sánchez et al., 2021) rapporte également un effet positif du contrôle de soi sur l'activité physique via un modèle d'équation structurelles, ce qui pourrait suggérer que la stigmatisation diminue les ressources de contrôle de soi qui à leur tour réduisent le niveau d'activité physique.

Enfin, les trois dernières études incluses dans cette revue ont indexé le contrôle de soi à l'aide d'une mesure de l'auto-efficacité, et plus spécifiquement pour la capacité à maintenir un régime (Major et al., 2014, 2020), ou envers sa propre capacité à atteindre des objectifs scolaires (étude 1, Inzlicht et al., 2006). Leurs résultats rapportent également un effet négatif de la stigmatisation sur cette composante. Néanmoins, nous ne pouvons pas rapprocher l'auto-efficacité d'une des facettes de contrôle de soi présentées dans le Manuscrit 2 et dans Forestier et al (2022). Il semblerait que dans ces trois études, cette mesure se rapprochait davantage d'auto-efficacité à l'action (e.g., « *Je pense que j'ai la capacité d'atteindre le poids que je souhaite* » Major et al., 2020, « *Je me sens confiant.e. à contrôler ce que je mange* » Major et al., 2014, ou l'utilisation d'une échelle mesurant la confiance des participants étudiants en leur capacité à réguler leurs stratégies d'apprentissage, Inzlicht 2006 étude 1, traductions libres).

Cette mesure d'auto-efficacité à l'action serait davantage une mesure de pré-intentionnelle que post-intentionnelle comme l'est le contrôle de soi. En effet, cette facette de l'auto-efficacité renvoie aux croyances dans ses propres capacités à organiser et exécuter certaines actions pour obtenir certains résultats (Bandura, 1978). Ce qui démontre bien que dans ces études, l'auto-efficacité opère pendant une phase où l'intention pour un comportement se développe, et non dans une phase post-intentionnelle.

Il est aussi intéressant de souligner qu'aucune de ces études, parmi toutes celles incluses dans la revue systématique, ne s'est intéressée à la motivation au contrôle de soi. Aussi, nous devons prendre en considération une limite de cette deuxième contribution empirique qui est l'importante hétérogénéité des conceptualisations du contrôle de soi et mesures de contrôle de soi, qui soulignent bien le bruit théorique autour de ce construit (voir Manuscrit 2, Forestier et al. 2022).



**Figure 6.** Résumé des effets mis en évidence dans le Manuscrit 3 envers les différentes composantes du contrôle de soi, du modèle de la fatigue du contrôle de soi.

### 3. La relation entre la stigmatisation liée au poids, le contrôle de soi coûteux et l'activité physique

Pour approfondir notre compréhension de la relation entre la stigmatisation liée au poids et le contrôle de soi, nous avons conduit une étude empirique (Manuscrit 4) qui investigate l'effet de l'exposition à la stigmatisation liée au poids, envers le contrôle de soi coûteux et l'activité physique, mesurés suivant le modèle présenté dans le Manuscrit 2.

Dans cette étude, nous avons recruté des personnes préoccupées par leur poids (Fishbach et al., 2003). Les participants étaient exposés à des messages stigmatisants par rapport au surpoids ou par rapport à la communauté des Inuits (i.e., condition expérimentale vs. contrôle), suivant la méthodologie employée par Araiza et Wellman (2017). Tous les participants passaient dans les deux conditions, à une semaine d'écart (Deshayes et al., 2019). Nous avons

mesuré dans cette étude les trois composantes de contrôle de soi avant et après l'exposition ou non à la stigmatisation : les ressources de contrôle de soi par une mesure auto-rapportée et directe (i.e., questionnaire de vitalité subjective et variabilité de la fréquence cardiaque, Laborde & Mosley, 2016; Ryan & Deci, 2008), la motivation au contrôle de soi par une mesure auto-rapportée et directe (Audiffren et al., 2022; Forestier et al., 2022) et la capacité de contrôle de soi par une mesure directe (Go/No-Go affective, Cheval et al., 2018; Forestier et al., 2022). Nous avons également mesuré l'intention des participants de pratiquer de l'activité physique pour les 24 heures suivant la passation et leur niveau d'activité physique mesuré de manière auto-rapportée (Craig et al., 2003).

Nous avons évalué si la condition prédisait un changement dans les composantes de contrôle de soi, et plus spécifiquement si ce changement était plus important dans la condition expérimentale que dans la condition contrôle. De même nous avons évalué si la condition avait un effet sur l'intention de pratiquer de l'activité physique et sur l'écart entre cette intention et le comportement réalisé.

Les analyses préliminaires de cette étude ne supportent pas nos hypothèses, et aucun effet de la stigmatisation liée au poids sur l'une des dimensions du contrôle de soi n'a été observé. Si ces résultats se confirment avec les analyses sur l'échantillon complet, nous pourrions penser que la stigmatisation liée au poids ne semble pas altérer cette habileté. Mais avant de conclure que la stigmatisation liée au poids n'a pas d'effet envers le contrôle de soi coûteux, nous pourrions reconsidérer l'outil qui a été utilisé pour induire la stigmatisation et répliquer cette étude avec un outil plus écologique (e.g., l'utilisation des réseaux sociaux). Aussi, nous avons inclus des personnes préoccupées par leur poids dans cette étude, cette situation ne pourrait pas être suffisante pour que les personnes puissent se sentir concernées par la stigmatisation liée au poids. Ainsi, choisir un critère d'inclusion tel que le sentiment d'être

en surpoids (i.e., poids perçu) ou le surpoids lui-même pourrait permettre une première étape à considérer pour répliquer cette étude et confirmer ou non ces résultats.

Cette série de trois manuscrits (Manuscrit 2, Manuscrit 3 et Manuscrit 4) nous offre une meilleure compréhension de l'effet de la stigmatisation et de la stigmatisation liée au poids sur le contrôle de soi coûteux. Premièrement, le Manuscrit 2, faisant la synthèse de la littérature sur le contrôle de soi coûteux, amène une nouvelle vision du contrôle de soi et des perspectives pour le mesurer. Ensuite, la revue systématique que nous avons conduite (Manuscrit 3) a mis en évidence un effet délétère de la stigmatisation de manière générale, et de la stigmatisation liée au poids, envers le contrôle de soi coûteux et particulièrement envers les ressources de contrôle de soi et la capacité de contrôle de soi. À l'inverse, les résultats préliminaires de notre étude expérimentale, présentée dans le Manuscrit 4, ne soutiennent pas cette tendance. Néanmoins, ils sont à prendre avec beaucoup de précaution, car la taille d'échantillon incluse dans ces analyses préliminaires n'atteint pas la moitié de celle que nous avons estimée afin d'obtenir 90% de puissance.

#### **4. La relation entre la stigmatisation liée au poids, le contrôle de soi non coûteux, et l'activité physique**

Si les travaux sur la stigmatisation liée au poids et le contrôle de soi coûteux ont été conduits par le passé, à notre connaissance, l'effet de la stigmatisation liée au poids sur le contrôle de soi non coûteux n'a pas été investigué. Dans ce cadre, nous avons répliqué et adapté le protocole de l'étude de Cheval et al. (2017), qui a étudié une stratégie non coûteuse de contrôle de soi, l'asymétrie cognitive, envers l'activité physique. L'asymétrie cognitive est une stratégie qui s'active automatiquement lors de la présence de stimuli lié à la tentation (i.e., désir immédiat en contradiction avec un but à long terme, Kotabe & Hofmann, 2015). Leurs présentations

activeraient la représentation mentale du but à long terme, mais l'inverse n'aurait pas d'effet (i.e., la présentation d'un stimulus lié au but à long terme n'activerait pas la représentation mentale de la tentation), d'où le modèle asymétrique de cette stratégie. Nous avons utilisé le même protocole que Cheval et al (2017), en ajoutant deux conditions, l'une induisant de la stigmatisation liée au poids et l'une contrôle (Manuscrit 5).

C'est ainsi que dans ce cinquième manuscrit nous nous sommes intéressés à l'asymétrie cognitive (voir Chapitre 2), dont l'effet devrait s'illustrer grâce à l'analyse du temps de réaction dans une tâche de décision lexicale. Pour rappel, dans cette tâche les participants doivent déterminer si le mot qui leur est présenté est un vrai mot ou non (i.e., cible), le plus rapidement possible. Les mots cibles étaient systématiquement précédés d'une amorce. Les cibles d'intérêt pouvaient être liées à l'activité physique ou à la sédentarité, de même que pour les amorces. Dans le cas où les cibles liées à l'activité physique précédées d'amorces liées à la sédentarité, étaient reconnues plus rapidement que les autres combinaisons amorces / cibles, ce temps de réaction réduit était synonyme d'asymétrie cognitive. Nous avons émis l'hypothèse que cette asymétrie ne serait pas présente chez les participants préoccupés par leur poids, de la condition expérimentale (i.e., condition stigmatisation liée au poids).

Malheureusement, nous ne pouvons pas tirer de conclusion quant à l'effet de la stigmatisation liée au poids sur cette stratégie de contrôle de soi automatique, car nous n'avons pas réussi à répliquer le phénomène lui-même malgré notre méthodologie expérimentale robuste. Malgré une puissance statistique à plus de 96% pour détecter une taille d'effet semblable à celle de Cheval et al (2017), nous n'avons pas détecté d'effet significatif de l'interaction entre l'amorce et la cible ( $b = -0.98$  ms,  $p = .775$ ). A la place nos résultats ont révélé un effet simple de l'amorce ( $b = -12.23$  ms;  $p < .001$ ), à savoir que les cibles liées à l'activité physique étaient en effet reconnues plus rapidement lorsqu'elles étaient précédées d'une amorce liée à la sédentarité, mais que les cibles liées à la sédentarité étaient également

reconnues plus rapidement lorsqu'elles étaient précédées d'amorces liées à l'activité physique (ce qui n'aura pas dû être le cas dans le cas d'une activation asymétrique). Les résultats ont aussi révélé un effet simple de la cible ( $b = -11.68$  ms;  $p < .001$ ), les cibles liées à l'activité physique étant reconnues plus rapidement que les cibles liées à la sédentarité.

Il est intéressant de noter que nos résultats supportent ceux d'une récente étude, qui n'a pas non plus réussi à répliquer l'asymétrie cognitive malgré un protocole particulièrement robuste (Francis et al., 2022). Dans cette étude les auteurs malgré une puissance statistique à plus de 95% n'ont pas trouvé de relation asymétrique mais ont comme nous, soulevé l'existence d'un effet simple de l'amorce, qu'elle soit liée à la motivation à long terme ou à court terme. Néanmoins, les résultats de notre étude (Manuscrit 5, de Chanaleilles et al., 2023) ne nous permettent pas de conclure sur l'effet de la stigmatisation liée au poids sur cette stratégie.

### **III. Implications théoriques**

Le premier intérêt de nos travaux est son apport théorique sur le plan du contrôle de soi. En effet, avant d'investiguer la relation entre le contrôle de soi, la stigmatisation liée au poids et l'activité physique, nous avons fait le choix de nous pencher sur les bases théoriques du contrôle de soi et particulièrement du contrôle de soi coûteux qui avait été largement critiquées et remises en question après l'essor du modèle de l'épuisement de l'ego (Baumeister et al., 1998). Ainsi le modèle de la fatigue du contrôle de soi présenté dans le Manuscrit 2 (Forestier et al., 2022) a cherché à outrepasser les limites de la littérature et propose une base robuste et falsifiable pour les futures études investiguant le contrôle de soi. Toujours concernant le champ du contrôle de soi, la dernière étude présentée dans cette thèse permet de renforcer la récente littérature sur l'asymétrie cognitive (Francis et al., 2022) qui ne parvient pas, non plus, à répliquer ce phénomène.

Concernant notre première question de recherche relative à l'importance de l'attribut du surpoids dans le processus de formation d'impressions, nos travaux (Manuscrit 1) laissent entendre que le surpoids est en effet un attribut saillant dans le processus de formation d'impressions, et plus saillant qu'un poids considéré comme normal. Ces résultats nous permettent d'avancer que malgré une prévalence toujours plus importante du surpoids et de l'obésité, cette caractéristique est particulièrement visible et accessible cognitivement. De plus, le surpoids et l'obésité ont des connotations très négatives et sont associés à des stéréotypes péjoratifs (e.g., paresseux, manquant de volonté, incompetent, Major et al., 2018). Nous pouvons donc suggérer que cet attribut est d'autant plus visible parce qu'il pourrait ne pas correspondre à ce qui est valorisé positivement par la société. Comme cela a été suggéré par Rohmer et Louvet (2006) pour le handicap physique, la saillance du surpoids peut s'expliquer principalement par son écart important par rapport à la norme sociale dominante dans les sociétés occidentales, qui valorisent la perfection corporelle d'une part, et la performance et la compétitivité d'autre part (e.g., Major et al., 2018).

Enfin, concernant notre deuxième question de recherche relative à la relation entre la stigmatisation liée au poids et différentes stratégies de contrôle de soi, coûteuses et non coûteuses, nos travaux permettent de mettre en avant un effet de la stigmatisation et de la stigmatisation liée au poids envers le contrôle de soi (Manuscrit 3). En revanche, nos travaux ne permettent pas d'apporter des réponses quant à l'influence de la stigmatisation liée au poids envers le contrôle de soi non coûteux (Manuscrit 5), à cause de notre incapacité à répliquer le phénomène d'asymétrie cognitive, rendant impossible l'évaluation de l'impact de la stigmatisation liée au poids sur cette stratégie. Il en est de même pour l'effet de la stigmatisation liée au poids envers la fatigue du contrôle de soi et l'activité physique (Manuscrit 4). Nos résultats préliminaires ne nous permettant pas de conclure quant à l'effet de la stigmatisation sur ces construits.

#### **IV. Perspectives empiriques**

Plusieurs perspectives empiriques se profilent suite aux contributions de nos différentes études. Pour reprendre dans l'ordre des manuscrits présentés, une première perspective empirique serait de considérer la saillance importante du surpoids et de l'obésité pour des recherches futures sur le sujet. Notre étude présentée dans le Manuscrit 1, permet d'ouvrir la voie à des études plus ambitieuses qui pourront chercher à comparer la saillance de différents attributs (e.g., sexe, âge, couleur de peau), mais aussi d'utiliser des conceptions plus écologiques avec l'utilisation de réseaux sociaux par exemple, ou encore en utilisant des mesures plus directes comme l'utilisation d'oculométrie (i.e., *eye-tracking*, *gaze-tracking* en anglais). Aussi il pourrait être intéressant, d'utiliser des cibles avec des poids qui varient de manière continue, afin de pouvoir déterminer à partir de quel IMC ou pourcentage de masse grasse une personne peut être considérée comme étant en surpoids. Nous pourrions ainsi nous demander si les cibles seront caractérisées par leur poids au regard des définitions des agences de santé, ou si leur caractérisation se rapprocherait de la norme injonctive.

Concernant notre deuxième axe de recherche, qui s'intéresse à l'effet de la stigmatisation liée au poids envers le contrôle de soi et l'activité physique, il serait dans un premier temps nécessaire de continuer les études en laboratoire afin de renforcer les résultats de la littérature actuelle. En effet si notre revue systématique (Manuscrit 3) met en évidence un effet négatif de la stigmatisation envers le contrôle de soi coûteux chez différentes populations ciblées par la stigmatisation (dont la stigmatisation liée au poids) et les comportements subséquents (e.g., consommation de calories, activité physique), un nombre considérable des études incluses comporte un biais important qui pourrait remettre en cause le résultat de notre contribution empirique. Ainsi, nous ne pouvons que suggérer aux futures recherches s'intéressant à la stigmatisation et au contrôle de soi d'utiliser des méthodologies robustes,



basées sur une définition fiable et falsifiable du contrôle de soi comme celle proposée dans le Manuscrit 2 (Forestier et al., 2022) ou par des d'autres définitions inclusives du contrôle de soi (Fujita, 2011; Gillebaart, 2018; Kotabe & Hofmann, 2015), comme nous l'avons fait dans le Manuscrit 4 de cette thèse. Enfin concernant les stratégies non coûteuses de contrôle de soi, un refondement théorique de ces stratégies serait à considérer afin de déterminer dans un premier temps chez quel type de population elles opèrent, et si elles peuvent être altérées par de la stigmatisation (liée au poids), ou non.

## **V. Perspectives pratiques**

Ce travail doctoral mets en avant principalement des perspectives empiriques, au vu de certains résultats de nos travaux comme les Manuscrits 4 et 5, qui ne permettent pas de conclure quant à l'effet de la stigmatisation liée au poids sur des stratégies coûteuses et non coûteuses de contrôle de soi, ni envers leur impact sur l'activité physique. Néanmoins, nous pouvons faire ressortir une perspective pratique majeure. La première que nous pouvons dessiner, serait de mettre en place des interventions ou des campagnes qui permettraient de rendre plus « normal » le surpoids et l'obésité, qui au final, le sont de plus en plus en termes de norme descriptive mais toujours pas en termes de norme injonctive. Nous pouvons ajouter qu'il pourrait être bénéfique de sensibiliser largement la population générale à l'effet négatif de la stigmatisation liée au poids sur les personnes qui sont concernées par celle-ci. En effet, que les proches, les professionnels de santé, les professionnels éducatifs, les possibles employeurs et collaborateurs, les institutions et plus largement toutes les personnes qui seront en lien avec des cibles potentielles de la stigmatisation liée au poids, doivent prendre conscience de l'impact que peuvent avoir leurs croyances, préjugés, mots, et comportements envers les personnes appartenant au groupe social des personnes en surpoids et obèses.

Une récente revue systématique (Talumaa et al., 2022) a fait la synthèse d'études récentes qui cherchaient à identifier des stratégies de réduction de la stigmatisation liée au poids émise par les professionnels de santé. Ce travail a mis en évidence 5 stratégies de réduction de la stigmatisation : une meilleure éducation des professionnels à ce sujet, les informer sur les causes de l'obésité et du surpoids ainsi que leur contrôlabilité (cf. Chapitre 1), les former à l'empathie, les éduquer sur les facteurs déterminants du poids, et une méthodologie mixte, basée sur plusieurs de ces stratégies.

Sur la base de ces récentes recherches, nous pourrions recommander pour des études futures d'envisager d'étendre les stratégies de réduction de la stigmatisation à d'autres acteurs impliqués dans le phénomène (e.g., famille, amis, milieu professionnel).

## **VI. Limites et forces**

Après avoir considéré les limites de chacun des Manuscrits présentés dans cette thèse, des limites plus communes de ce travail doctoral méritent d'être adressées. C'est ce que nous ferons dans cette section.

La première limite que nous pouvons soulever est l'apport majoritairement théorique et non pratique et opérationnel de cette thèse. En effet, ce travail doctoral se voulait d'explorer la relation entre la stigmatisation liée au poids, le contrôle de soi et l'activité physique. Cependant, les résultats que nous avons présenté ne permettent pas de répondre entièrement à cette problématique. Ils permettent surtout de répondre à la première partie de la relation qui est le lien entre la stigmatisation et le contrôle de soi (Manuscrit 2 et Manuscrit 3), avec un apport majoritaire des travaux sur le contrôle de soi (Manuscrit 2 et Manuscrit 5). Malheureusement, nos travaux n'apportent pas de nouvelles briques à la littérature faisant le lien entre ces trois dimensions, à cause notamment de l'impossibilité que nous avons eu à répliquer la stratégie automatique de contrôle de soi que nous souhaitions manipuler (i.e., asymétrie cognitive Cheval

et al., 2017; Fishbach et al., 2003), et le manque de données pour réaliser les analyses complètes de notre étude opérationnalisant la fatigue du contrôle de soi en lien avec la stigmatisation liée au poids et l'activité physique (Manuscrit 5 et Manuscrit 4).

Une autre limite de ce travail doctoral pourrait être le type de population que nous avons recruté. Nous pouvons nous demander si l'intention auto-rapportée des participants de pratiquer de l'activité physique, est une dimension suffisante pour que les participantes considèrent l'activité physique comme un but à long terme. En effet, au-delà d'une intention positive envers la pratique d'activité physique ou penser que faire de l'activité physique est important pour soi (i.e., *goal value* en anglais), il aurait peut-être été pertinent de recruter les participants sur la base d'actions qu'ils réalisent (e.g., être déjà inscrit dans une salle de sport, suivre un programme d'entraînement), afin de s'assurer que la phase pré-intentionnelle du comportement est franchie. Car pour rappel le contrôle de soi opère dans la phase post-intentionnelle.

Enfin, une dernière limite générale que nous pouvons adresser porte sur les mesures d'activité physique que nous avons employées. En effet, nous avons mesuré dans les Manuscrits 4 et 5 l'activité physique de manière auto-rapportée, ce qui pourrait résulter en une surestimation du niveau d'activité physique réel des participants, soit en raison d'un biais de désirabilité social soit en raison d'une mauvaise quantification des activités réalisées (Ferrari et al., 2020). Ainsi, l'utilisation de mesures directes telles que de l'accélérométrie seraient plus précis.

Néanmoins, ces limites peuvent être contrebalancées par certaines forces. Dans ce travail doctoral nous avons cherché à adopter une méthodologie rigoureuse en réalisant d'abord des revues de littérature approfondies (Manuscrits 2 et 3) pour mieux situer le sujet de cette thèse et se baser sur des fondements théoriques fiables. En appui de ce point, nous avons par exemple proposé un modèle théorique du contrôle de soi avant de baser nos études dessus car

nous connaissions les limites de la littérature et ne voulions pas nourrir ses problématiques, mais au contraire les dépasser.

Nous avons également souhaité inscrire nos travaux dans une démarche de science ouverte. Par exemple par le biais de pré-enregistrement d'étude (Manuscrit 5), de calcul de puissance a priori (Manuscrits 4 et 5), de réplifications (Manuscrits 1 et 5), et en partageant toutes nos données et matériels sur des plateformes dédiées (e.g., OSF, Manuscrit 1, 2, 3, 4 et 5). Ensuite, nous pouvons souligner un caractère ambitieux de cette thèse qui était d'articuler plusieurs champs de la littérature (e.g., contrôle de soi coûteux et non-coûteux, stigmatisation liée au poids), finalement que peu investigués ensemble par le passé.

Aussi, une dernière force de cette thèse est la diversité des mesures utilisées : des questionnaires, des tâches cognitives et des mesures physiologiques ont été employées dans les différentes études, et nous pouvons aussi noter la diversité des formats de recherche développés : modèle théorique, revue systématique et études expérimentales.

## **VII. Conclusion**

Pour conclure, ce travail doctoral permet d'apporter des éléments de réponse à nos questions de recherche, qui étaient de déterminer la saillance du surpoids dans le processus de la formation d'impressions, et de déterminer la nature de la relation entre la stigmatisation liée au poids et différentes stratégies de contrôle de soi, coûteuses et non coûteuses, et l'activité physique. Ce travail doctoral permet notamment de nourrir la littérature sur le contrôle de soi par son apport théorique sur le plan du contrôle de soi coûteux et du contrôle de soi non coûteux, et sur la formation d'impressions. Plus précisément, les contributions de cette thèse mettent en évidence la saillance particulière du surpoids dans le processus de formation d'impressions (comparé à un poids normal). De plus, cette thèse met en exergue un nouveau modèle du contrôle de soi coûteux, qui outrepassé les limites de la littérature actuelle et pourra servir de

fondement théorique aux études futures sur cette habilité, et force est de constater que nos résultats soulignent un effet négatif de la stigmatisation envers le contrôle de soi coûteux uniquement, et particulièrement envers les ressources de contrôle de soi et la capacité de contrôle de soi. Cependant, l'effet de la stigmatisation et de la stigmatisation liée au poids envers le contrôle de soi non coûteux reste encore à démontrer.

Ainsi, ce travail doctoral amène de nouvelles perspectives de recherche pour les études futures, sur le contrôle de soi et différentes de ses stratégies, et son interaction avec la stigmatisation, liée au poids ou non, comme prédicteurs potentiels de l'activité physique. A cet égard, ce travail pointe la nécessité d'un travail théorique des travaux futurs sur les stratégies de contrôle de soi non coûteuses, et souligne la nécessité de déterminer quelle population peut profiter de ces stratégies automatiques. Concernant le contrôle de soi coûteux, des études expérimentales sont à poursuivre afin de tester empiriquement le modèle de la fatigue du contrôle de soi et de déterminer si oui ou non, le contrôle de soi permet l'adoption de buts à long terme (e.g., faire de l'activité physique) faisant face à des motivations opposées (e.g., rester sur son canapé). En d'autres termes, les études à venir pourraient déterminer si le contrôle de soi est en effet une pierre angulaire de la résolution de conflits motivationnels, notamment dans le cadre de la stigmatisation liée au poids et de l'engagement dans l'activité physique.

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## Chapitre 5. Bilan du travail doctoral

### PUBLICATIONS

- de Chanaleilles, M.**<sup>+</sup>, Cheval, B., Dubouchaud, H., Chalabaev, A., (under review). The weight of weight: The salience of body weight in the information formation process. *PsyArXiv*, doi: 10.31234/osf.io/yqck6
- de Chanaleilles, M.**<sup>+</sup>, Chalabaev, A., Forestier, C., Mazéas, A., Dubouchaud, H., Cheval, B., (2023). Does Exposure to Sedentary Temptations Activate Physical Activity Goals ? A High-Powered Replication. *Motivation Science*, <https://doi.org/10.1037/mot0000308>
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<sup>+</sup>Premier(s) auteur(s)

### COMMUNICATIONS ORALES

**de Chanaleilles, M.**, Chalabaev, A., Forestier, C., Mazéas, A., Dubouchaud, H., & Cheval, B. Does exposure to sedentary temptations activate physical activity goals? A high-powered replication study. (2021) Congrès International de l'Association des Chercheurs en Activité Physique et Sportives, Montpellier, France

de Chanaleilles, M., Dubouchaud, H., Laborde, S., Forestier, C., & Chalabaev, A.  
Effortful self-control in physical activity. A psycho-physiological approach. (2022) European Congress of the European Federation of Sport psychology, Padoue, Italie

## ENSEIGNEMENT

Université	Formation	Unité d'enseignement	Heures effectuées	Équivalent TD
<b>Année 2020 – 2021</b>				
Le Mans Université	L1 STAPS	Psychologie : personnalité, motivation, émotion	20 heures TD	20 heures TD
	L2 STAPS APAS	Psychologie cognitive	12 heures TD	12 heures TD
	L2 STAPS APAS	Psychologie de l'enfant	10 heures TD	10 heures TD
<b>Année 2021 – 2022</b>				
Le Mans Université	L1 STAPS	Psychologie	24 heures TD	24 heures TD
	L2 STAPS Éducation et Motricité	Psychologie cognitive	28 heures TD	28 heures TD
	M1 STAPS APAS	Stage Professionnel et /ou initiation recherche /séminaires	10 heures TD	10 heures TD
<b>Année 2022-2023</b>				
Université Grenoble Alpes	L2 STAPS	Psychologie	7,5 heures TD	7,5 heures TD
	M1 STAPS MSTM	Stage – suivi d'étudiant	3 heures TD	3 heures TD
Nantes Université	M1 STAPS APAS	Environnement et contexte professionnel	16 heures CM	24 heures TD
		Environnement et contexte professionnel - suivi d'étudiant	16 heures TD	16 heures TD
<b>Année 2023-2024</b>				
Nantes Université	M1 STAPS APAS	Environnement et contexte professionnel	16 heures CM	24 heures TD
<b>TOTAL</b>				178,5 heures équivalent TD

## ENCADREMENT

Masters	<b>1</b> encadrement complet de niveau Master 2 <b>3</b> encadrements complets de niveau Master 1	2022 – 2022 2021 – 2023
Licences	<b>1</b> co-encadrement stage d'excellence	2022 – 2023

## REPONSE A DES APPELS A PROJETS

2022	<b>Appel à projets SAM</b> , « Générique », Réseau Santé, Activité physique, Métiers de l'Ingénierie et des Sciences humaines, Sarthe Anjou Mayenne	€10, 000
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## ACTIVITES ADMINISTRATIVES

International Workshop on Digital Interventions, Grenoble, France, 1er et 2 Février 2023

## Résumé

Malgré des bénéfices largement reconnus de la pratique d'activité physique sur la santé, ce comportement salutogène reste insuffisamment adopté par une large partie de la population mondiale. Ce manque d'activité physique est d'autant plus important chez les personnes en surpoids et obèses, alors que celle-ci permet de limiter les comorbidités associées à la surcharge pondérale. Cette pratique insuffisante pourrait être la résultante de l'importante stigmatisation liée au stigmate du surpoids qui prévaut dans les sociétés occidentales contemporaines. En effet, la stigmatisation liée au poids est une des formes les plus courantes de stigmatisation, que ce soit chez les enfants ou les adultes. Elle est associée à d'importantes conséquences sociales, telles que des stéréotypes négatifs, des préjugés et de la discrimination, mais également avec l'adoption de comportements pathogènes par les personnes ciblées, comme l'évitement de l'activité physique. Néanmoins, les mécanismes explicatifs de la relation entre la stigmatisation liée au poids et la faible pratique d'activité physique restent à ce jour inconnus. Une des pistes explicatives pourrait être par le biais du contrôle de soi, une habileté centrale dans l'adoption et le maintien des comportements de santé. Le contrôle de soi opère via différentes stratégies coûteuses ou non coûteuses, lorsque deux motivations s'opposent (e.g., faire de l'activité physique après le travail ou se reposer dans son canapé) et créent un conflit motivationnel. La résolution de ce conflit peut résulter en l'adoption du comportement souhaité (e.g., faire de l'activité physique) ou du comportement opposé (e.g., s'allonger dans son canapé). Ce travail doctoral a cherché à expliquer comment la stigmatisation liée au poids amenait à une pratique insuffisante d'activité physique des personnes qui en sont victimes, par le biais du contrôle de soi et au travers de deux questions de recherche. Premièrement nous avons souhaité 1) déterminer à quel point l'attribut du surpoids est un attribut visible est accessible cognitivement (i.e., saillant) par autrui ; et 2) étudier la relation entre la stigmatisation et le contrôle de soi, et plus spécifiquement les relations entre la stigmatisation liée au poids, l'activité physique et le contrôle de soi non-coûteux et coûteux. Cinq études ont cherché à apporter des éléments de réponse à ces questions de recherche. Une première étude a visé à répondre à la première problématique, et suggère que le surpoids est un attribut saillant, et plus saillant qu'un poids considéré comme normal. Puis une série de 4 études a été conduite pour répondre au deuxième axe de recherche. Premièrement, nous avons proposé un modèle théorique du contrôle de soi, qui vise à dépasser les limites actuelles de cette littérature, et qui a servi de base à deux des études de cet axe. Ensuite, nous avons conduit une revue systématique évaluant la nature de la relation entre la stigmatisation et le contrôle de soi, qui a révélé un effet négatif de la stigmatisation sur ce construit. Les deux dernières études, empiriques, ont investigué respectivement une stratégie coûteuse de contrôle de soi, et une stratégie non coûteuse de contrôle de soi. Les résultats de ces études ne permettent pas de conclure sur l'effet de la stigmatisation liée au poids envers le contrôle de soi et l'activité physique. En effet, la première manque de puissance statistique. La seconde, malgré une très forte puissance statistique et une méthodologie rigoureuse, n'a pas observé la stratégie de contrôle de soi non coûteuse évaluée, rendant impossible l'estimation d'un effet de la stigmatisation liée au poids sur cette dernière. L'ensemble de ces résultats apportent quelques éléments de réponse aux relations entre la stigmatisation liée au poids et le contrôle de soi, et les implications de ce travail sont discutées.

**Mots clés :** contrôle de soi, stigmatisation liée au poids, surpoids, obésité, formation d'impressions, activité physique

## Abstract

Despite the widely recognized health benefits of engaging in physical activity, this salutogenic behavior remains inadequately adopted by a large proportion of the global population. This lack of physical activity is particularly significant among overweight and obese individuals, despite its potential to mitigate comorbidities associated with excess weight. This insufficient practice may be due to the significant stigmatization attached to overweight prevailing in contemporary Western societies. Indeed, weight-related stigmatization is one of the most common forms of stigma, affecting both children and adults. It is associated with significant social consequences, such as negative stereotypes, prejudice, and discrimination, as well as the adoption of unhealthy behaviors by targeted individuals, such as avoiding physical activity. However, the explanatory mechanisms of the relationship between weight-related stigmatization and low levels of physical activity remain unknown to this day. One explanatory path could be through self-control, a central ability in the adoption and maintenance of health behaviors. Self-control operates through various effortful or effortless strategies when two motivations conflict (e.g., exercising after work or lounging on the couch), resulting in either the adoption of the wanted behavior (e.g., exercising) or the opposing behavior (e.g., lounging on the couch). This doctoral project sought to explain how weight-related stigma leads to insufficient physical activity among its victims, through self-control and by addressing two research questions. First, we aimed to 1) determine the extent to which being overweight is salient and a cognitively accessible attribute to others; and 2) examine the relationship between stigma and self-control, specifically examining the relationships between weight-related stigma, physical activity, and effortful and effortless self-control strategies. Five studies were designed to provide insight into these research questions. The first study aimed to address the first question and suggested that being overweight is a salient attribute, more than a weight considered normal. Then, a series of four studies were conducted to address the second line of research. First, we proposed a theoretical model of self-control to address the current limitations of this literature, which served as the basis for two of the studies in this axis. Second, we conducted a systematic review assessing the nature of the relationship between stigma and self-control, revealing a negative effect of stigma on this construct. The last two empirical studies investigated an effortful self-control strategy and an effortless self-control strategy, respectively. The results of these studies are inconclusive regarding the effect of weight-related stigma on self-control and physical activity. The first study lacked of statistical power, while the second, despite high statistical power and rigorous methodology, did not observe the evaluated effortless self-control strategy, making it impossible to estimate the effect of weight-related stigmatization on it. Overall, these results provide some insights into the relationships between weight-related stigma and self-control, and the implications of this work are discussed.

**Keywords:** self-control, weight stigmatization, obesity, overweight, impression formation, physical activity