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Is physical activity a part of who I am? A review and meta-analysis of identity, schema and physical activity

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ABSTRACT

Two parallel literatures on the physical activity (PA) identity and schema constructs have the potential to supplement traditional social cognitive approaches used for PA promotion. The purpose of this paper was to review schema/identity research and appraise its relationship with PA via meta-analysis followed by thematic analyses of its correlates, as well as its proposed mechanisms on PA. Eligible studies were from English, peer-reviewed published articles that examined identity and/or schema in the context of PA. Searches were completed in June 2015 in five databases. Sixty-two independent data-sets (32 available for meta-analysis), primarily of modest quality, were identified. Results of the random effects meta-analysis showed that the point-estimate between identity/schema and behaviour was $r = .44$ (CI = .39–.48), and invariant to selected study characteristics. Thematic review showed that identity/schema was associated with commitment, ability, affective judgments, identified/integrated regulation and social comparison and predicted intention, self-regulatory efficacy, and self-regulation strategy use. It had reliable evidence as a moderator of the intention–behavior relationship, was associated with increases in the speed of processing of relevant information and created negative affect under hypothetical identity–behavior discrepant situations. While this initial research is promising, more rigorous research designs, including interventions to increase identity/schema, are warranted.

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Physical activity; exercise; intention

Studies continually demonstrate that physical inactivity doubles health risks and adds a disease burden to society comparable with smoking, and appears to shorten the life span if inactivity persists into middle age (Warburton, Nicol, & Bredin, 2006). Indeed, there is irrefutable evidence that regular physical activity contributes to the primary and secondary prevention of several chronic diseases including cardiovascular disease, diabetes, cancer, obesity, and osteoporosis (Warburton et al., 2006). In addition to the direct physical health benefits of physical activity, the documented mental health benefits include the improvement of well-being, the reduction of depression and anxiety, and the enhancement of cognitive functioning (Warburton, Katzmarzyk, Rhodes, & Shephard, 2007). Furthermore, physical activity has been shown to enhance the experience of well-being and increase physical functioning in those with poor health, thereby improving overall quality of life (Penedo & Dahn, 2005; Warburton et al., 2007). Despite the overwhelming evidence that supports the beneficial effects of physical activity on overall health, less than 20% of people in developed nations engage in the recommended minimum physical activity for public health benefit (Statistics

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Canada, 2014; Troiano et al., 2008). Clearly, physical activity promotion is an essential target for preventive medicine.

Interventions to promote sustained physical activity have had very modest success (Conn, Hafdahl, & Mehr, 2011; Foster, Hillsdon, & Thorogood, 2009). Most of these interventions are founded on social cognitive models, such as social cognitive theory (Bandura, 1986), reasoned action approaches (Head & Noar, 2014) such as theory of planned behavior (Ajzen, 1991), or stage models of readiness such as the transtheoretical model (Prochaska & Velicer, 1997). The basic foundations of intervention in these models centre upon reducing barriers for action, increasing the perceived positive versus negative consequences for physical activity, and developing skills to regulate the behavior. While these approaches have some proven utility, their modest success in behavioural prediction and change shows that there is plenty of room for improvement (Hagger & Chatzisarantis, 2014; Prestwich et al., 2014; Rhodes & Nigg, 2011; Sniehotta, Pesseau, & Araújo-Soares, 2014). Thus, the exploration of other concepts and approaches beyond these contemporary models is critical.

Two very similar constructs have been circulating in distinct physical activity behavior literatures for many years that may augment and improve our understanding of interventions and theory. These represent the concept of *identity* (Stryker & Burke, 2000) and *schema* (Markus, 1977). Identities (see Stryker & Burke, 2000 for a historical overview) are considered components of a multi-dimensional self-concept, hierarchically organised by how one views themselves in a given role (Burke, 2006). These are individualised but also correspond to social structure, such as parent, employee, and spouse (Charng, Piliavin, & Callero, 1988). Identities are thought to be formed by past experiences, and serve as personal standards of behavior (Stryker & Burke, 2000). These standards act as comparators to actual behavior, and are activated in relevant situations where identities are either aligned or mismatched with one's behavior. Alignment experiences serve to strengthen the identity while discrepancies challenge an identity and provide negative affect and dissonance that serve to motivate identity consistent behavioral actions (Stets & Burke, 2000). Thus, identities have been described as dynamic, fluid, self-regulating control systems (Burke, 2006).

The schema concept (Markus, 1977) is considered a heuristic cognitive generalisation about the self, derived from past experiences and used to processes self-related information. A developed schema is considered more efficient at processing self-related information and thus producing a faster response time when encountering stimuli and behavior related to the schema (Markus, 1977). Thus, schemas help process and initiate behaviours through the efficient screening of relevant information. Clearly, by definition, the schema concept is more heavily based on information processing efficiency while identity is more focused on personal and social standards and the motivation to match these standards with behavior. In physical activity research, the schema measure developed by Kendzierski (1988), asks how self-descriptive physical activity-related aspects are to the respondent, while the most common identity measure, developed by Anderson and Cychosz (1994) asks participants to consider the magnitude of whether physical activity is self-descriptive of oneself and the perceived views of others. This highlights the potential social activation component of identity in comparison to schema within its measurement. Still, Markus and Wurf (1987) suggest that the schema and identity concepts are completely convergent constructs and one can, and is likely to, draw upon information from others during schema development. In the physical activity domain, this convergence between schema and identity has had support with correlations between the two descriptive concepts of $r = .78-.89$, even when uncorrected for measurement error (Berry, Strachan, & Verkooijen, 2013).

The identity/schema concept has the potential to add considerable understanding and complement our more popular social cognitive/reasoned action, or stage-based models of behavior used in physical activity and health research. First, it provides a larger social, cultural, and personal context than most of our popular models of behavior change, which are often within-behavior specific (Rise, Sheeran, & Hukkelberg, 2010). The strength of a schema/identity is thought to be related to one's overall conceptions of self. Thus, for example, physical activity identity is still relative to the strength of other relevant identities in one's larger self- and social-related contexts (Strachan &

Brawley, 2008). Most of our popular theories of behavior change tend to be quite myopic and do not address the multiple goals and motivations people seek in daily life (Presseau, Tait, Johnston, Francis, & Sniehotta, 2013; Rhodes & Blanchard, 2008), suggesting that the inclusion of the identity concept could fill that void.

Second, the identity/schema concept represents a dynamic variable dependent, at least in part, on past experiences but not entirely overlapping with past behavior (Kendzierski & Morganstein, 2009). Thus, in essence, identity/schema represents a maintenance concept in behavioral continuation and not an adoption-based concept that can be targeted for intervention. The disentangling of maintenance constructs from adoption constructs is clearly important in repeated behaviors like physical activity (Nigg, Borrelli, Maddock, & Dishman, 2008; Rhodes & de Bruijn, 2013; Rothman, Baldwin, & Hertel, 2004). Similar to habit (Gardner, 2015), identities foundational basis in past behavior may make it an essential construct in understanding behavioral maintenance. Indeed, given that identity/schema is likely to have formed long after initial physical activity intentions and behavior have first occurred, its role in action control (translating intentions into behavior) may be particularly important (Rhodes & Yao, 2015).

Finally, the identity/schema concept's mechanisms for influencing behavior are proposed as context-activated and reflexive (Stets & Burke, 2000), making it a relatively unique source of behavioral motivation when compared to reasoned action or regulation tactics (e.g., plans, self-monitoring). Cognitive screening speed and activation highlighted in schema theory is quite similar to automatic motives and processing, which has been under-served in our most popular models applied to health behavior (Sheeran, Gollwitzer, & Bargh, 2013). Similarly, the motivation to reduce adverse affective motivation proposed from identity-behavior discordance has also been relatively under-served in traditional social cognitive models (Conner, McEachan, Taylor, O'Hara, & Lawton, 2015) and is conceptually different from explicit affective judgments (e.g., physical activity will be pleasant) (Rhodes, Fiala, & Conner, 2009). This may be a key source of automatic affective motivation (Williams & Evans, 2014).

Despite all of this potential for understanding a health behavior like physical activity and contributing beyond contemporary popular theories, there have been limited reviews of the literature that addresses either identity or self-schema in the physical activity domain. Two narrative overviews have defined the similarities of schema and identity for physical activity and suggested recommended courses for research and intervention (Strachan & Whaley, 2013; Whaley & Schroyer, 2010), yet there has been no systematic review or meta-analysis of the literature. Thus, the purpose of this paper was to provide a systematic review of the identity and schema concepts in the physical activity domain. We sought to provide a basic point-estimate of the relationship through meta-analysis, with follow-up moderator examination of the measures employed, study quality and various sample and method demographics that were available from the studies gathered. Next, through the use of a narrative review, we sought to follow-up with an examination of the correlates of identity/schema and group these according to constructs that have been modelled as predictors of identity/schema and constructs that have been modeled as criterion variables of identity/schema. Finally, we wished to evaluate the evidence for the proposed processes by which identity and schema may affect physical activity. It was hypothesised that identity and schema would show no difference in their relationship with behavior, based on the theory that they are generally commensurate constructs (Markus & Wurf, 1987), and that the correlation with physical activity would be in the medium to large range (Cohen, 1992). We considered the follow-up review content as exploratory to help guide and shape future research with this concept.

Method

Eligibility criteria

The review followed PRISMA guidelines to ensure that necessary components were included and reported in the review and meta-analysis (Moher, Liberati, Tetzlaff, & Altman, 2010). Aligning with

the purpose of this review, the eligibility criteria of article selection was kept broad to capture any studies that involved identity/schema with physical activity. Eligible studies included regular physical activity of moderate level intensity. If studies were more obtuse on the intensity component, then we evaluated whether they may have reached a moderate level using the compendium of physical activities (Ainsworth et al., 2011).

Exclusion criteria

Research articles were excluded if the study was in the area of sport or athlete identity as this is a specialised population. Commensurate with most public health recommendations (World Health Organization, 2012), physical activity was defined in the moderate-to-vigorous intensity for this review. As mentioned above, studies that did not meet a moderate level intensity were excluded. Studies that included the measurement of both identity/schema and behavior (physical activity or exercise) were grouped as meta-analysis articles. All other studies were retained for the narrative review.

Search strategy

Articles were searched in English peer-reviewed journals from December 2014 to June 2015 by two reviewers using Medline, PsycINFO, PubMed, Scopus, and SPORTDiscus databases. A combination of the following terms was used to search in the title, abstract, and key-terms which included: physical activity, exercise, MVPA, exercise identity, identity, schema, and self-schema.

Screening and quality assessment

The screening procedure of articles by title, abstract and full article was performed based on the eligibility criteria. The systematic screening steps are outlined in Figure 1. The Effective Public Health Practice Project Quality Assessment Tool was used for experimental studies (Armijo-Olivo, Stiles, Hagen, Biondo, & Cummings, 2012). This particular assessment tool categorises experimental studies as weak, moderate, or strong. Observational studies were evaluated by using a modified version of the Downs and Black's (1998) 22-item assessment tool (Kirk & Rhodes, 2011). A total of three items were modified from the Kirk and Rhodes (2011) tool which included: *Did the study use a validated identity/self-schema measure? Did the study use a longitudinal design and include an analysis of behavior change?* These items were scored as either 1 = yes, 0 = no, unable to determine. The final modified item was weighted at two points and asked: *Did the study use a validated physical activity measure (scored: 2 = validated objective, 1 = validated self-report, 0 = non-validated instrument)?* Studies that scored 11–14 points were categorised as high-quality studies, scores of 7–10 were considered moderate quality and scores of 0–6 were considered low quality studies.

Qualitative studies were evaluated using a modified version of Schou, Høstrup, Lyngsø, Larsen, and Poulsen (2012). The tool was scored out of 15 and studies that scored 11 or higher were considered high-quality, between 7 and 10 were considered moderate quality, and those that scored 6 or lower were considered low quality (see Appendix 1). Examples of some of the questions used to assess the studies include, 'Relationship between researcher and context/or participants has been described', and 'A logical connection between data and themes is described'. Risk of bias was assessed independently by two reviewers (NK and AQ) with no discrepancies regarding the quality classification of the studies. The quality scores for the papers can be found in Appendix 2.

Data abstraction

Items for the data abstraction included: primary author and year, geographical location, participant characteristics, length/design, physical activity/exercise measures, identity/self-schema measures,

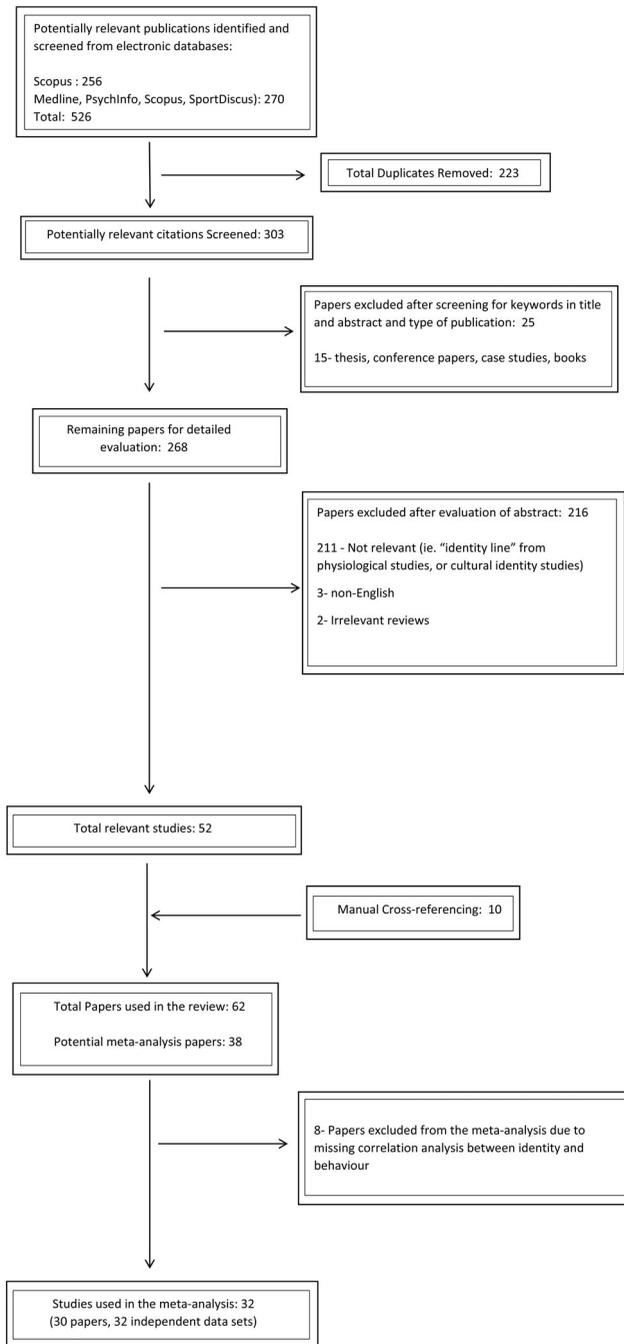


Figure 1. Review and retrieval flow chart.

effect sizes/study results and quality rating. The assessment of identity or schema construct was determined based on the definition provided in the study followed by the items used to assess the construct. Studies that used custom measures were examined on an item-basis. Any discrepancies were discussed among the authors until 100% consensus was reached.

Meta-analysis plan

The Comprehensive Meta-Analysis programme (Borenstein, Hedges, Higgins, & Rothstein, 2005) was used for meta-analysis, corrected for sampling bias. Values from both fixed and random effects models were extracted. In addition to the overall effect sizes, 95% confidence intervals were calculated. Heterogeneity among effect sizes were determined by computing a Q-statistic and I². The Q-statistic denotes whether the variance in effect sizes is no greater than by sampling error, whereas the I² indicates the amount of dispersion. For the purposes of this meta-analysis, I² values of 25 were identified as having a low dispersal, 50 as a moderate dispersal, and 75 as a high dispersal (Higgins, Thompson, Deeks, & Altman, 2003). Publication bias was assessed by including estimates of the number of missing studies, tests of funnel-plot asymmetry and selection function procedures (Duval & Tweedie, 2000a, 2000b; Egger, Smith, Schneider, & Minder, 1997).

In the case of considerable variance and dispersal, we planned to examine potential moderators to the sensitivity of the findings. These moderators were dependent on the characteristics of the studies retrieved but we planned to examine: measure of physical activity (PA)/exercise, type of PA/exercise measurement, schema/identity, type of schema/identity scale, quality assessment (high, medium, low), sample (undergraduate, and adults), and region (North America, Europe). If a study reported both longitudinal and cross-sectional correlations, then the longitudinal finding was used for the analyses. Studies that were at least four weeks in length were considered longitudinal. If a study used self-report and objective measure, then the results from the objective instrument was selected. The quality assessment was used to assess the potential risk of bias and methodological quality. Sample power and stability suggestions by Hempel et al. (2013) were considered when conducting the moderation analyses, and moderator sub-groupings were used if a 30:70 ratio or greater was present.

Narrative analysis plan

Following initial read-throughs of the studies, themes and sub-themes were developed in conjunction with our interest in the predictors of identity/schema, the criterion constructs/mediators of identity/schema as modeled within the papers retrieved, and the evidence for the proposed processes by which identity and schema may affect physical activity. Studies were not mutually exclusive in these groupings as a particular experiment could assess all or only one of these factors. Themes were created within these broad categories where at least three studies were required to establish a theme. This has been previously used in reviews by Kirk and Rhodes (2011), and Rhodes, Temmel, and Mark (2012). Based on Sallis, Prochaska, and Taylor's (2000) rubric for determining an association among studies, a theme was considered to have an association if greater than 59% of studies supported a relationship/finding; inconclusive if 34–59% of studies found any association/finding, and no association if less than 34% of studies showed any association. When analysing the themes, both statistical significance ($p < .05$) and a meaningful effect size (Cohen, 1992) ($d > .19$; $r > .09$) needed to be present in order to confer a positive or negative association with the criterion. Studies where effect size could not be determined were considered on significance value alone.

Results

Evidence synthesis

The search yielded 526 potential relevant papers. After 223 duplicates were removed, 303 studies were screened based on title and abstract and 25 were removed and an additional 15 were removed as there were not full text journal articles (i.e., thesis, conference paper). The next step involved detailed evaluation of 268 papers which further eliminated 216 articles based on abstract screening. The third step was conducted by performing a detailed evaluation of 52 manuscripts

that resulted in sorting the remaining papers as either potential for the meta-analysis and/or narrative review. Cross-referencing of these articles identified 10 new papers which increased the total number of papers to 62. Where discrepant, two reviewers discussed the article until 100% consensus was reached for every study. Of the 38 potential meta-analysis studies, 30 studies (32 independent data-sets due to two separate analyses completed for gender) included a correlation coefficient between identity and behavior. The full 62 papers (one paper used a duplicate data set) were used for the narrative review. [Figure 1](#) displays the detailed steps of the screening process, Supplementary Table 1 outlines the abstraction of the studies, and the complete reference list for these papers can be found in Appendix 3.

Study characteristics

[Table 1](#) summarises the overall study characteristics of the 62 papers included in this review and the 32 independent data-sets included in the meta-analysis. Overall, 21 studies met the criteria to be considered high quality (10 used in the meta-analysis), 34 (22 used in the meta-analysis) were considered of moderate quality and 7 (1 in the meta-analysis) were considered low quality. Given, the single low quality study for the meta-analysis, this was removed for examination during the moderator analyses. Of the 62 papers, 43 of these were cross-sectional and 15 considered longitudinal (>4 weeks). The geographical representation was dominated by studies from North America ($n = 38$) and Europe ($n = 21$) with a few from Australia ($n = 3$). The samples were primarily undergraduate students ($n = 34$) with the remainder comprised of adults ($n = 24$) and children or adolescents ($n = 4$).

Meta-analysis

Both fixed ($r = .40$, 95% CI .38–.41) and random ($r = .44$, 95% CI .39–.48) effects models showed a point-estimate and confidence interval between identity/schema and physical activity behavior in the high range of a medium effect size (please see [Figure 2](#) for the forest plot and Appendices 4–5 for additional information). Egger's regression (see Appendix 6) revealed that there was asymmetry in the distribution of effect size ($p < .05$). Therefore, Duval and Tweedie's trim and fill analysis was used to estimate the adjusted effect sizes. The analysis found that no studies needed to be trimmed from the left of the mean; however, it suggested trimming seven studies to the right of the mean. With the correction of adjustments to the right side of the mean, the effect size of

Table 1. Overall study characteristics.

Characteristics	Sample, $N = 62$ papers ($N = 32$ independent data-sets in the meta-analysis)
<i>Geographical location</i>	
North America	38 (19)
Europe	21 (12)
Australia	3 (1)
<i>Study design</i>	
Cross-sectional	43 (24)
Longitudinal	15 (7)
Qualitative	4
<i>Physical activity measurement</i>	
Objective	3 (4)
Self-report	58 (29)
<i>Quality rating</i>	
High	21 (10)
Moderate	34 (22)
Low	7
<i>Population</i>	
University students	34 (20)
Adults	24 (11)
Children and adolescents (18 years and younger)	4

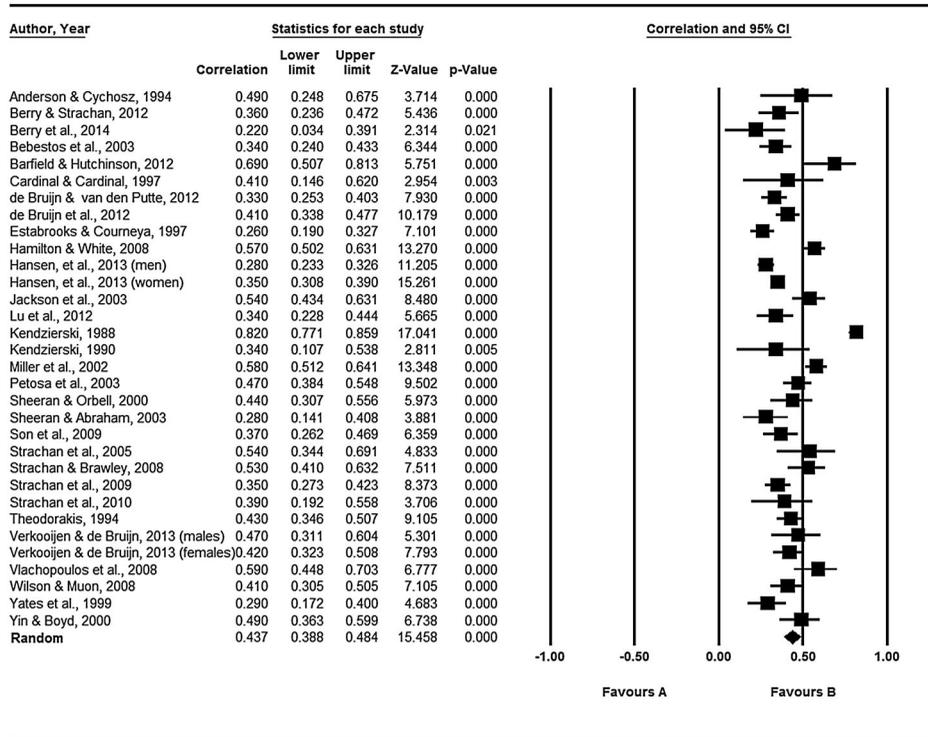


Figure 2. Forest plot of meta-analyses studies.

identity/schema and physical activity was increased slightly to $r = .48$ ($CI = .43-.53$), using random effects estimation. However, the results showed that the effect sizes in the sample were significantly heterogeneous $Q(31) = 267.67, p < .01$ and of high dispersion $I^2 = 88.42$. Thus, moderator analyses were employed to examine whether study characteristics could account for some of this dispersion. Examination of quality assessment, scale of PA/exercise, type of PA/exercise measurement, schema/identity, type of schema/identity scale, sample, and region did not show significant moderation ($p > .05$; see Table 2).

Narrative review

Identity/schema as a predictor of behavior change

Five studies employed an analysis of change in behavior from a baseline assessment and used identity to predict that change (Cardinal, 1997; Cardinal & Cardinal, 1997; Jenum, Lorentzen, & Ommundsen, 2009; Strachan, Brawley, Spink, Sweet, & Perras, 2015; Tsorbatzoudis, 2005). All five studies measured identity and not schema. These prospective assessments ranged from 14 days (Cardinal, 1997) to three years in duration with sample sizes of 23 (Cardinal, 1997) to 1766 (Jenum et al., 2009) participants. Only one study employed objective assessment of behavior (Cardinal, 1997) but three of the studies featured a behavior change intervention compared to a control group change (Cardinal, 1997; Jenum et al., 2009; Tsorbatzoudis, 2005). Overall, the results were very mixed. Cardinal (1997) showed a null trial with no changes in identity or behavior, but both Jenum et al. (2009) and Cardinal and Cardinal (1997) showed correlations between change in identity and changes in physical activity. Strachan et al. (2015) also showed that identity predicted change in physical activity over eight weeks. By contrast, Tsorbatzoudis (2005) found positive changes in physical activity from a 12 week school-based intervention but these did not link to identity, which

Table 2. Summary statistics for hypothesized moderators of identity/schema and physical activity.

Characteristics	Q_b (heterogeneity total between)	p	K	Fixed r	Effects 95% CI	Random r	Effects 95% CI	Q_w (heterogeneity total within)	p	I^2	τ^2	SE
<i>Correlation</i>			32	0.40	0.38–0.41	0.44	0.39–0.48	267.67	0.00	88.42	0.02	0.01
Identity/schema												
With behaviour												
<i>Quality</i>	2.17	0.14						261.45	0.00			
High			10	0.36	0.33–0.39	0.38	0.29–0.47	27.84	0.00	67.67	0.01	0.01
Moderate/low			22	0.41	0.39–0.43	0.46	0.40–0.52	233.62	0.00	91.01	0.03	0.02
<i>Behaviour</i>	0.06	0.81						255.48	0.00			
Exercise			21	0.43	0.40–0.45	0.43	0.37–0.49	167.02	0.00	88.03	0.03	0.01
Physical activity			11	0.37	0.35–0.39	0.45	0.36–0.52	88.46	0.00	88.70	0.02	0.01
<i>PA measures</i>	4.88	0.30						191.79	0.00			
Custom			7	0.49	0.46–0.53	0.49	0.40–0.58	125.17	0.00	95.21	0.09	0.06
GLTEQ			11	0.41	0.38–0.45	0.44	0.36–0.52	32.98	0.00	65.73	0.01	0.00
IPAQ			4	0.39	0.35–0.43	0.40	0.27–0.52	4.28	0.23	29.97	0.00	0.00
Other validated			6	0.49	0.45–0.53	0.47	0.37–0.57	14.93	0.01	66.51	0.01	0.01
Objective			4	0.32	0.29–0.35	0.33	0.20–0.45	14.43	0.01	79.21	.00	.00
<i>Identity/schema</i>	0.14	0.71						266.71	0.00			
Identity			26	0.39	0.37–0.41	0.43	0.38–0.49	122.83	0.00	78.96	0.01	0.01
Schema			6	0.41	0.37–0.46	0.46	0.34–0.56	143.88	0.00	97.11	0.13	0.09
<i>Identity scale</i>	4.87	0.30						213.43	0.00			
Anderson			12	0.45	0.41–0.48	0.47	0.39–0.55	41.31	0.00	74.37	0.02	0.01
Custom			3	0.37	0.31–0.44	0.38	0.21–0.53	1.00	0.61	0.00	0.00	0.01
Kendzierski			6	0.50	0.46–0.54	0.50	0.39–0.59	109.50	0.00	95.43	0.10	0.07
Other validated			6	0.34	0.31–0.36	0.35	0.23–0.46	50.59	0.00	90.12	0.01	0.01
Sparks and Sheppard			5	0.41	0.37–0.45	0.43	0.31–0.54	11.03	0.03	63.74	0.01	0.01
<i>Sample</i>	0.17	0.68						239.97	0.00			
Students			20	0.41	0.38–0.43	0.44	0.38–0.50	173.24	0.00	89.00	0.18	0.02
Adults			11	0.37	0.35–0.39	0.42	0.35–0.50	66.73	0.00	85.01	0.12	0.01
<i>Length</i>	0.06	0.81						264.87	0.00			
Cross sectional			25	0.39	0.37–0.41	0.43	0.38–0.49	249.63	0.00	90.39	0.03	0.01
Longitudinal			7	0.43	0.39–0.48	0.45	0.33–0.55	15.24	0.02	60.62	0.01	0.01
<i>Region</i>	2.8	0.24						229.81	0.00			
Europe			12	0.36	0.34–0.38	0.40	0.32–0.47	40.32	0.00	72.72	0.01	0.00
North America			19	0.43	0.40–0.45	0.46	0.39–0.52	189.49	0.00	90.50	0.05	0.02

Notes: GLTEQ = Godin Leisure-Time Questionnaire; IPAQ = International Physical Activity Questionnaire. Not all sub analyses include $k = 32$ as some studies could not be classified.

showed no change from baseline and between groups. Thus, the results on whether identity relates to changes in physical activity are mixed at present and only a handful of studies with considerable design heterogeneity are present to evaluate this research question.

Predictors of identity/schema

While both identity and self-schema constructs clearly highlight the importance of past behavior as an antecedent (Markus, 1977; Markus & Wurf, 1987; Stryker & Burke, 2000), it seems highly relevant to understand other potential predictors of the construct in order to explain who acquires an identity and how one may intervene to promote identity/schema formation. Interestingly, this aspect has seen limited research in the physical activity domain and only one complete model of schema formation has been tested (Kendzierski & Morganstein, 2009). Still, 15 studies were retrieved that modelled various predictor constructs with identity/schema as the dependent variable (de Bruijn, Verkooijen, de Vries, & van den Putte, 2012; Hardcastle & Taylor, 2005; Kendzierski, 1988; Kendzierski, Furr, & Schiavoni, 1998; Kendzierski & Morganstein, 2009; Rossing & Jones, 2015; Springer, Lamborn, & Pollard, 2013; Strachan, Brawley, Woodgate, & Tse, 2005; Strachan, Fortier, Perras, & Lugg, 2013; Verkooijen & DeBruijn, 2013; Vlachopoulos, Kaperoni, & Moustaka, 2011; Whaley & Ebbeck, 2002; Wininger, 2007; Wright, MacDonald, & Groom, 2003; Yin & Boyd, 2000, see Table 3). Of these studies, all were cross-sectional with the exceptions of de Bruijn et al. (2012) and Hardcastle and Taylor (2005), which featured a two-week and 10 week prospective designs, respectively. Thus, the current research is limited in its assessment of identity formation over time. Furthermore, five of the studies represent undergraduate student samples (de Bruijn et al., 2012; Kendzierski, 1988; Verkooijen & DeBruijn, 2013; Wininger, 2007; Yin & Boyd, 2000) and six of the studies included exclusive athlete or exerciser samples (Kendzierski et al., 1998; Kendzierski & Morganstein, 2009; Springer et al., 2013; Strachan et al., 2005; Strachan et al., 2013; Whaley & Ebbeck, 2002) while sample sizes ranged from six (Rossing & Jones, 2015) to 733 participants (Vlachopoulos et al., 2011). Though the heterogeneity in these studies was large, there were eight themes of correlates that were conceptually similar across the studies.

Kendzierski & Morganstein's (2009) model of self-definition highlights the importance of *commitment* (i.e., importance of the behavior to oneself) and *perceived ability* (i.e., perceived capability/skill to perform the behavior) to schema formation. Five studies examined commitment as a predictor of identity (Hardcastle & Taylor, 2005; Rossing & Jones, 2015) or schema (Kendzierski, 1988; Kendzierski et al., 1998; Kendzierski & Morganstein, 2009). Seven studies have examined perceived ability, conceived here as parallel with Bandura's (1977) original conception of self-efficacy and Ajzen's (1991) conception of perceived behavioral control, as a predictor of identity (de Bruijn et al., 2012; Hardcastle & Taylor, 2005; Strachan et al., 2005; Vlachopoulos et al., 2011) or schema (Kendzierski et al., 1998; Kendzierski & Morganstein, 2009; Yin & Boyd, 2000). All studies showed support for the commitment-identity/schema relationship. These included either medium-sized correlations with commitment (Kendzierski, 1988; Kendzierski & Morganstein, 2009) or related variables such as high priority (Hardcastle & Taylor, 2005; Kendzierski et al., 1998; Rossing & Jones, 2015) and the effort spent on the physical activity behavior (Kendzierski et al., 1998). In terms of perceived ability, six (Hardcastle & Taylor, 2005; Kendzierski et al., 1998; Kendzierski & Morganstein, 2009; Strachan et al., 2005; Vlachopoulos et al., 2011; Yin & Boyd, 2000) of seven studies supported an association with identity/schema. The only study (Kendzierski & Morganstein, 2009) to examine both of these concepts in the same regression model, also showed independent support for both as predictors of identity, yet commitment was a considerably larger (standardised coefficient = .67 to .84) correlate than perceived ability (standardized coefficient = .11 to .20). The results are still limited, but there is supportive evidence at present that commitment and perceived ability may be key correlates of identity/schema.

Affective judgments about physical activity is an umbrella term used to describe expectations of enjoyment, affective attitude, and intrinsic regulation (Rhodes et al., 2009). Six studies examined affective judgments as predictors of identity (de Bruijn et al., 2012; Strachan et al., 2013; Vlachopoulos

Table 3. Summary of the narrative review findings of identity/schema.

	Number of studies	Association
<i>Modeled predictor construct</i>		
Commitment	Schema = 3 study Identity = 2 studies	+
Perceived ability	Schema = 3 study Identity = 4 studies	+
Affective judgements	Schema = 2 studies Identity = 4 studies	+
Perceived benefits	Schema/identity = 1 study Identity = 3 studies	?
Identified/integrated regulation	Schema = 0 studies Identity = 3 studies	+
Introjected regulation	Schema = 1 studies Identity = 3 studies	?
Extrinsic regulation	Schema = 0 studies Identity = 3 studies	0
Social activation	Schema/identity = 1 study Schema = 1 studies Identity = 6 studies	+
<i>Modeled outcome construct</i>		
Intention	Identity/schema = 1 study Schema = 2 studies Identity = 10 studies	+
Self-regulatory efficacy	Schema = 0 studies Identity = 4 studies	+
Self-regulation strategies	Schema = 0 studies Identity = 3 studies	+
Exercise dependence	Schema = 0 studies Identity = 3 studies	?
<i>Processes of identity/schema on behaviour</i>		
Intention × identity/schema	Schema = 4 studies Identity = 2 studies	+
Heightened negative affect after hypothetical behavioural lapse	Schema = 0 studies Identity = 3 studies	+
Lowered positive affect after hypothetical behavioural lapse	Schema = 0 studies Identity = 3 studies	+
Faster response time when encountering stimuli related to the schema/identity	Schema = 2 studies Identity = 1 study	+
Schema/identity effect on causal attributions	Schema = 2 studies Identity = 1 studies	0

Notes: + = positive association (>59% of studies), - = negative association (>59% of studies), ? = indeterminate (34–59% of studies showing an association) and 0 = no association (<34% of studies showing any association). NA = not applicable.

et al., 2011; Wininger, 2007) or schema (Kendzierski et al., 1998; Kendzierski & Morganstein, 2009). All studies found a significant positive relationship in the medium to large effect size range. It should be noted that the only study to examine a model of identity/schema with proposed causal depth (Kendzierski & Morganstein, 2009) showed that affective judgments on identity may be mediated via commitment (through want). Nevertheless, the contemporary literature supports a base relationship between affective judgments and identity/schema.

Four studies were available to examine whether perception of the *benefits* of physical activity predicted identity/schema. These were largely evaluated via qualitative means (Rossing & Jones, 2015; Springer et al., 2013; Whaley & Ebbeck, 2002), although one study employed instrumental attitude from the theory of planned behavior and identity (de Bruijn et al., 2012). Overall, the qualitative studies were all supportive of the benefits of physical activity emerging as central themes during identity development, such as social and health advantages from regular physical activity, but this

was not replicated in the single quantitative study. The analysis is limited, however, as no studies have examined benefits in the form of outcome expectations (see Bandura, 1998).

Three studies evaluated whether autonomous motivation in the form of *identified/integrated regulation* in self-determination theory predicted identity (Strachan et al., 2013; Vlachopoulos et al., 2011; Wininger, 2007). All three studies supported this relationship, supporting a link between self-determined motives and identity. By contrast, no relationship was found between *extrinsic regulation* and identity with the three studies that applied this concept (Strachan et al., 2013; Vlachopoulos et al., 2011; Wininger, 2007). Vlachopoulos et al. (2011) and Strachan et al. (2013), however, found small positive correlations between *introjected regulation* (i.e., guilt-based motivation) while two other studies found no evidence for a relationship (Kendzierski et al., 1998; Wininger, 2007). The small number of studies supports a null relationship between extrinsic motives and identity, but mixed results for whether introjected regulation is a correlate.

Finally, eight studies were present to appraise *social activation variables* and physical activity identity (de Bruijn et al., 2012; Hardcastle & Taylor, 2005; Rossing & Jones, 2015; Verkooijen & DeBruijn, 2013; Vlachopoulos et al., 2011; Whaley & Ebbeck, 2002; Wright et al., 2003) or schema (Kendzierski et al., 1998). Four qualitative studies (Hardcastle & Taylor, 2005; Rossing & Jones, 2015; Whaley & Ebbeck, 2002; Wright et al., 2003) all highlighted themes of social comparison and activation when expressing identity/schema. That is, identity is formed partially from a comparison to others and feelings of belonging. A quantitative analysis of social comparison as a correlate of identity/schema was also supported in the studies by Kendzierski et al. (1998) and Verkooijen and DeBruijn (2013). Interestingly, this correlation did not extend to subjective norm as measured in the theory of planned behavior (de Bruijn et al., 2012) but it was similar to relatedness from self-determination theory (Hardcastle & Taylor, 2005; Vlachopoulos et al., 2011). Overall, the results support social activation variables such as social comparison, acknowledgement and relatedness with physical activity identity.

Outcome correlates of identity/schema

Theoretical models are strengthened by their causal depth, where mediators between two constructs aid in the interpretation of how one variable may affect another (Baranowski, Anderson, & Carmack, 1998). The contemporary literature on the proposed outcome correlates of identity/schema lacks formal tests of mediation with subsequent physical activity (with the exceptions of Banting, Dimmock, & Lay, 2009; Strachan et al., 2015), yet 22 studies were available to appraise the relationship of identity/schema as an independent variable when predicting another construct (Banting et al., 2009; Bebetos, Papaioannou, & Theodorakis, 2003; Bélanger-Gravel & Godin, 2010; Berry et al., 2013; Carraro & Gaudreau, 2010; Hamilton & White, 2008; Jackson, Smith, & Conner, 2003; Karr et al., 2013; Lantz, Rhea, & Mesnier, 2004; Lorentzen, Ommundsen, & Holme, 2007; Lu et al., 2012; Murray, McKenzie, Newman, & Brown, 2012; Ries, Hein, Pihu, & Armenta, 2012; Sheeran & Orbell, 2000; Son, Mowen, & Kerstetter, 2011; Strachan & Brawley, 2008; Strachan, Brawley, Spink, & Glazebrook, 2010; Strachan, Brawley, Spink et al., 2015; Strachan, Brawley, Woodgate et al., 2005; Strachan et al., 2013; Theodorakis, 1994; Yun & Silk, 2011). Studies ranged from 67 (Strachan et al., 2005) to 2421 (Karr et al., 2013) participants and only three studies reported on a prospective design lasting beyond two weeks (Lorentzen et al., 2007; Ries et al., 2012; Theodorakis, 1994).

Four main themes emerged from this literature. First, 13 of the 22 studies focused on schema (Banting et al., 2009; Berry et al., 2013; Sheeran & Orbell, 2000) or identity (Bebetos et al., 2003; Bélanger-Gravel & Godin, 2010; Berry et al., 2013; Hamilton & White, 2008; Jackson et al., 2003; Lorentzen et al., 2007; Ries et al., 2012; Strachan & Brawley, 2008; Strachan et al., 2010; Theodorakis, 1994; Yun & Silk, 2011) as a predictor of intention to engage in physical activity. All of these studies found identity/schema to predict intention, with most effect sizes in the medium to large range. Further, six (Bebetos et al., 2003; Bélanger-Gravel & Godin, 2010; Hamilton & White, 2008; Jackson et al., 2003; Ries et al., 2012; Sheeran & Orbell, 2000) of seven tests showed that identity/schema had an independent

association with intention (beta = .18 to .51) after controlling for the constructs of the theory of planned behavior and Lorentzen et al. (2007) and Strachan et al. (2010) showed a similar effect when controlling for constructs in social cognitive theory. Yun and Silk (2011) also found that the relationship between intention and identity was independent of several forms of injunctive and descriptive norms. Overall, the results support a reliable correlation between intention and identity, and indicate that much of this relationship may be independent of social cognitive factors such as attitudes, perceptions of control/self-efficacy, and social factors.

Three studies examined identity as a predictor of self-regulatory efficacy (i.e., confidence to regulate goal choices and goal persistence) (Strachan & Brawley, 2008; Strachan et al., 2010, 2015), while one study examined identity as a predictor of a related construct of scheduling efficacy (i.e., capability to schedule a behavior). All four studies supported a positive association. The highest quality study featured an eight week prospective design and showed evidence that self-regulatory efficacy could fully mediate the effect between identity and change in physical activity (Strachan et al., 2015). Overall, the results support the potential effect of identity on self-regulatory self-efficacy.

Three studies were also present to evaluate whether identity could predict the use of physical activity self-regulation strategies, such as the planning and monitoring of behavior (Carraro & Gaudreau, 2010; Strachan & Brawley, 2008; Strachan et al., 2013). There was evidence in two (Carraro & Gaudreau, 2010; Strachan et al., 2013) of these studies that identity could positively predict the number and use of these self-regulatory strategies. While more studies are still warranted to examine self-regulation and identity, the current results support the premise that identity may affect strategy use to perform regular physical activity.

Finally, four studies were also present to examine the potential maladaptive consequences of identity with its proposed impact on exercise dependence-related features (Karr et al., 2013; Lantz et al., 2004; Lu et al., 2012; Murray et al., 2012). Three of the four studies found some support for a relationship between identity and features of exercise dependence (Karr et al., 2013; Lantz et al., 2004; Lu et al., 2012). Interestingly, these three studies were delimited to regular exercisers, where Murray et al. (2012) had some variability in exercise status among participants which could account for the discrepant finding. Two of the studies found a gender-based effect, with stronger associations among females. Karr et al. (2013) showed a three-way interaction of exercise identity, gender, and internalisation of the athletic-ideal body that predicted obligatory exercise in a sample of runners. The results suggest that women who report high identification with exercise and high value on having an athletic physique may be vulnerable to obligatory exercise. The effect size, however, was potentially trivial ($\eta^2 = .004$), and statistically significant via a very large sample size. Lantz et al. (2004) showed that among ultra-endurance athletes, females with high identity were more likely to report training through pain and injury than those with lower identities and their male counter-parts. Overall, the results on identity and its proposed impact on exercise dependence-related features are inconclusive with a small number of studies. More research is needed before rendering any conclusions.

Moderating processes of identity/schema and behavior

Identities have been described as a dynamic, self-regulating control system (Burke, 2006), and one of its key features may be its role in action control (translating intentions into behavior) (Rhodes & Yao, 2015) or the binding of other processes to behavior. An appraisal of interactions between identity/schema and other processes on physical activity was available among seven studies (Banting et al., 2009; de Bruijn & Van den Putte, 2012; de Bruijn et al., 2012; Estabrooks & Courneya, 1997; Sheeran & Abraham, 2003; Sheeran & Orbell, 2000; Verkooijen & DeBruijn, 2013). Sample sizes ranged from 98 (Banting et al., 2009) to 685 (Estabrooks & Courneya, 1997) participants, and only one study employed a longitudinal design extending beyond two weeks or an objective measure of behavior (Estabrooks & Courneya, 1997). All studies also featured college samples with the exception of Banting et al. (2009). Six of these studies included analyses of whether identity (de Bruijn & Van

den Putte, 2012; de Bruijn et al., 2012) or schema (Banting et al., 2009; Estabrooks & Courneya, 1997; Sheeran & Abraham, 2003; Sheeran & Orbell, 2000) moderated intention–behavior relations and five (de Bruijn & Van den Putte, 2012; de Bruijn et al., 2012; Estabrooks & Courneya, 1997; Sheeran & Abraham, 2003; Sheeran & Orbell, 2000) of these showed support for this moderating effect. All results were in the direction of higher identities/schemas showing a larger intention–behavior relationship than people reporting lower identities/schemas. It is noteworthy that the only study to not show this moderating effect also had the smallest sample size (Banting et al., 2009), and effects were in the small-medium range ($\beta = .09$ to $.35$) suggesting power limitations may have been present. Overall, the evidence suggests that identity is a reliable moderator of the intention–behavior relationship, though extension of this finding with longer prospective designs and into populations other than college students is warranted.

Processes by which identity/schema affects behavior

Identity and schema constructs have specific proposed theoretical mechanisms for how they influence behavior. Identity theory, for example, suggests that miss-matches between behavior and one's identity provide negative affect and dissonance that serve to motivate identity consistent behavioral actions (Stets & Burke, 2000). No studies have been conducted in the physical activity domain that directly manipulate these factors and examine behavior. Three studies by Strachan and colleagues (Strachan & Brawley, 2008; Strachan, Brawley, Spink, & Jung, 2009; Strachan, Flora, Brawley, & Spink, 2011); however, have used hypothetical vignettes or other means to examine the relationship between identity and affect. These studies employed cross-sectional designs and two of the three involved college samples (Strachan et al., 2009, 2011). Specifically, Strachan and Brawley (2008) used a vignette to suggest people imagine they are too busy to exercise and showed that those with high identity had higher negative affect and lower positive affect than those who reported lower exercise identities. Strachan et al. (2009) followed-up on this study by showing that perceived consistency with one's identity standard predicted low negative affect and, to a lesser degree, positive affect, particularly for those who report high identities. Finally, Strachan et al. (2011) examined affective reactions to identity-inconsistent behavior among participants with stronger and weaker exercise identities by reading hypothetical vignettes about challenges to getting exercise done where they were either situational or personally controllable. Those with high identity displayed higher negative affect than those with low identity in the large effect size range and small effects for low positive affect. Thus, if one had a high identity, not exercising created negative affect regardless if the reasons were personal or situational. Overall, field test examinations of the self-regulating effect of identity on behavior via affect are still needed, but there is reliable evidence that this effect can be obtained with hypothetical vignettes.

In schema theory, a developed schema is considered more efficient at processing self-related information and thus producing a faster response time when encountering stimuli and behavior related to the schema (Markus, 1977). Further, schema theory proposes that behavior can be initiated through the efficient screening of relevant information. Three studies have examined these proposed mechanisms with either identity (Berry & Strachan, 2012) or schema measures (Banting et al., 2009; Kendzierski, 1990). Two of these studies (Berry & Strachan, 2012; Kendzierski, 1990) featured undergraduate samples and all used cross-sectional designs or short follow-ups. All studies tested whether those with high schema/identity process relevant information faster. Kendzierski (1990), examining the speed and accuracy of whether 64 words described participants, found response latency was mixed but generally in the hypothesized direction when compared to schema, yet those with high exercise schema described themselves more with exercise-related words. Similarly, Banting et al. (2009) and Berry and Strachan (2012) showed that schema/identity as measured via response to variations of independent association tasks correlated with explicit measures of the construct. The association, however, was small in size ($r = .15$ to $.22$). Banting et al. also (2009) examined whether this processing speed of self-descriptive association related to physical activity and showed a small-

sized correlation. Overall, this small number of studies support an association between schema/identity and the processing speed of relevant information, although the effect appears small. The results are too limited to conclude whether this effect translates into the activation of behavior at present.

Three studies also investigated whether identity (Strachan et al., 2011) or schema (Kendzierski & Sheffield, 2000; Kendzierski, Sheffield, & Morganstein, 2002) affects the causal attributions (Weiner, 1985) in the form of stability, locus of causality, and controllability during lapses in physical activity behavior. All studies featured undergraduate students and cross-sectional designs. While Kendzierski and Sheffield (2000) sampled participants who had specifically engaged in recent relapse, the other two studies employed a hypothetical vignette approach to understanding potential feelings under relapse (Kendzierski et al., 2002; Strachan et al., 2011). Overall, these studies found no indication that identity interacted with attributions of causality and controllability and relapse, but both studies by Kendzierski and colleagues (Kendzierski & Sheffield, 2000; Kendzierski et al., 2002) showed that those with a high schema attributed more unstable reasons to lapse than others, despite no difference in the actual reasons for the relapse (Kendzierski et al., 2002). Overall, the results suggest that identity/schema may not affect causality and controllability attributions about relapse, but those high in identity believe their reasons for lapse are more transient than others, despite an absence of evidence for this attribution.

Discussion

The purpose of this paper was to provide a systematic review of the identity and schema concepts in the physical activity domain. Our review identified 60 papers with 62 independent data-sets, spanning from 1988 to 2015. Overall this literature is blemished by mostly modest to low quality studies (69% of studies) with a large number of cross-sectional designs, college student samples, and self-reported physical activity outcomes. Thus, all findings at this stage need to be interpreted with appropriate caution until more experimental research has been conducted. Nevertheless, the results of our review, complementary with other commentaries (Strachan & Whaley, 2013; Whaley & Schroyer, 2010), show very promising effects and several interesting findings congruent with our hypotheses and the theory behind the identity (Burke, 2006; Stryker & Burke, 2000) and schema (Markus, 1977; Markus & Wurf, 1987) concept.

First, we sought to provide a basic point-estimate of the relationship through meta-analysis, with follow-up moderator examination of study characteristics. It was hypothesized that identity and schema would show no difference in their relationship with behavior, based on the theory that they are generally commensurate constructs (Markus & Wurf, 1987), and that the correlation with physical activity would be in the medium to large range (Cohen, 1992). Both of these hypotheses were supported. Identity/schema had an $r = .44$ with behavior, which places the relationship as one of the largest known correlates of physical activity behavior commensurate with intention (Bauman et al., 2012; McEachan, Conner, Taylor, & Lawton, 2011). Furthermore, the finding was robust and invariant to the measures employed (including schema or identity assessments), study quality and various sample and method demographics. This suggests that measurement and operationalisation of the construct as an identity or schema is relatively negligible and the findings have relatively robust generalizability.

Our narrative review of the identity/schema literature followed this quantitative synthesis. An examination of whether change in physical activity could be predicted by identity showed mixed results and was marred by a limited sample of only four studies. Future research would benefit from longer time lags in longitudinal designs and an examination of the acquisition or maintenance of physical activity across time with identity as a time-varying covariate.

By contrast, 15 studies were available that modeled identity/schema as a dependent variable. It is noteworthy to point out that all of this research is correlational at present, yet the findings are potentially important because although the identity/schema construct clearly highlights past behavior as

an antecedent (Markus, 1977; Markus & Wurf, 1987; Stryker & Burke, 2000), it yields little information on how one may intervene to promote identity formation. This literature is fragmented at present with no unifying theory of identity acquisition. Indeed, identity and schema theory are clearly stated in terms of their regulating mechanisms upon behavior (Markus, 1977; Markus & Wurf, 1987; Stryker & Burke, 2000) but more obtuse on what actually causes an identity (i.e., beyond behavior). Perhaps because of this gap in the research literature, most of the studies in physical activity have relied on mere correlate-level analyses. Commitment, ability/self-efficacy, positive affective judgments, identified/integrated regulation, and social-comparison factors were all consistent correlates of identity while more controlled types of motives (pressure, guilt, obligation) were not reliably linked. The only multivariate model employed to understand these correlates tested Kendzierski and Morganstein's (2009) self-definition model and found that the critical correlates for identity formation may be the level of commitment to physical activity and to a lesser extent one's appraisal of skill and ability to perform.

Certainly, more replication of this model and the application of other models where identity is featured such as variants of social identity theory (Hogg & Abrams, 1988; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) and, group cohesion principles (Carron & Spink, 1993) modified to individuals, physical self-perception theories (Fox, 2000), prime theory (West, 2009), volitional behavior theory (Bagozzi, 1992), or multi-process action control (Rhodes & Yao, 2015) would be useful. With the possible exception of social comparison, most of the current correlates literature has applied constructs from established social cognitive and/or motivation theories so it provides little in the way of unique detail on what actually forms an identity beyond what instills physical activity motivation (e.g., affective judgments, perceived benefits, ability/self-efficacy). We speculate that investment in materials and symbolism relating to physical activity as well as repeated sacrifice of choosing physical activity over other possible behaviors (Carron & Spink, 1993) may help form identities. Furthermore, it seems an acceptance, affirmation, and alignment of physical activity with other personal values may be critical to identity formation (Ryan, Williams, Patrick, & Deci, 2009). Future research will benefit greatly by employing experimental designs in order to examine identity formation through the manipulation of specific variables.

Our examination of identity/schema when modeled as a predictor of other constructs also proved interesting. Four studies explored the potential darker side of identity and its role in determining maladaptive exercise dependence symptoms. The research literature is mixed with small or null effects and no experimental or longitudinal studies. Exercise dependence has a relatively low population prevalence (Hausenblas & Symons Downs, 2002) compared to the number of people reporting an exercise identity/schema (Kendzierski, 1988; Strachan & Brawley, 2008), so it is likely that extreme identity formation that translates into exercise dependence is relatively rare.

The 13 studies that examined a relationship between identity/schema as a predictor of intention, however, all showed a reliable link. Furthermore, these studies showed that an identity-intention relationship holds even when controlling for social cognitive constructs, commensurate with a prior meta-analysis of identity and the theory of planned behavior (Rise et al., 2010). This supports theorising that identity may link to motivation via broader social, cultural and personal contexts than the constructs measured in popular models of behavior change (Jackson et al., 2003). The actual directionality of intention and identity needs future research, however. Our contemporary analyses have merely added identity to social cognitive regression models in cross-sectional designs as an 'additional' predictor of intention and this approach has been criticised for limiting the dynamic understanding of motivation development (Sniehotta et al., 2014). Indeed, given that identity/schema is likely to have formed long after initial physical activity intentions and behavior have first occurred, it may be a consequence of motivation-behavior relations and more important in regulating action control than forming intentions (Rhodes & Yao, 2015). This was supported in the review with clear evidence that identity/schema moderated intention-behavior relations. Furthermore, there was consistent evidence that identity was predictive of both the use of self-regulatory strategies (e.g., plans) and self-regulatory efficacy. The results suggest that identity/schema may be tied to the

capacity and use of volitional strategies for physical activity, which are among the strongest proximal agents of behavior change (Carraro & Gaudreau, 2013; Conn et al., 2011; Hagger & Luszczynska, 2014; Rhodes & Pfaeffli, 2010). Future research into the longitudinal and dynamic relationship between intention, self-regulation, identity/schema, and behavior is warranted.

Our review also examined the state of evidence on how identity/schema is proposed to affect behavior. Identities are thought to serve as personal standards of behavior and motivate behavioral action via negative affect (discomfort) when situations activate a discrepancy between these personal standards and behavior (Stryker & Burke, 2000). Current research shows strong support for this theorizing via hypothetical manipulations and correlational research with no major differences in the attributions of causality or controllability in performing physical activity. Future research now needs to involve actual field tests of identity and behavior concordance vs. discordance. Still, contemporary results support how identity may serve as a reflexive self-regulating system in behavioral maintenance and this process is distinct from reasoned action approaches (Head & Noar, 2014) and affective judgments about physical activity behavior (Rhodes et al., 2009). It appears that one reason for this system may be based on biased attributions that barriers are less stable, and thus can be overcome (Kendzierski & Sheffield, 2000; Kendzierski et al., 2002). Another factor may be due to faster signal detection of environmental cues to act. A developed schema (or identity) is also considered more efficient at processing self-related information (Markus, 1977). This has been supported in the available research using variants of independent association tasks and response time, although the effect size is small. More evidence that physical activity behavior and motivation can be initiated through this efficient screening of relevant information is now needed.

Interestingly, the identity and schema conceptualizations did not show functional differences in terms of their relationship with behavior or their correlates and processes within the narrative review. This is highly supportive of the conception that the two constructs are commensurate (Markus & Wurf, 1987), and it is recommended that both these literatures be merged with future research. Overall, the results support continued theoretical and applied research on identity/schema with more robust designs, objective physical activity assessment, and broader population samples. Future research may also benefit from the understanding of sedentary behavior identities/schemas and how these interact with physical activity. There is a reliable negative correlation between sedentary pursuits and physical activity (Mansoubi, Pearson, Biddle, & Clemes, 2014; Rhodes et al., 2012) and the potential cross-behavioral implications for physical activity is interesting. How identity related to sedentary activities may thwart physical activity motivation and behavior has seen no research activity at present so this may be an interesting avenue for research exploration.

This literature review is limited by the search terms and search engines employed as well as it only included studies in English. Furthermore, the review is limited to published work which has strengths in the base level of quality that accompanies the peer-review process and the reliability of search access on the topic, yet limits because of the potential positivity bias/aversion to null that results from the peer-review system (Ferguson & Heene, 2012).

In summary, our review was the first to assess schema and identity research within the physical activity domain and appraise its relationship with behavior via meta-analysis. Further narrative analyses included an assessment of the evidence for its correlates, as well as its proposed mechanisms on physical activity. Current research is of modest to low quality due to a large number of cross-sectional designs, employing self-reported behavior and college samples. The results, however, are promising enough to warrant future research with stronger designs. The construct has a medium-sized correlation with physical activity and this is independent of whether it is conceived as schema or identity, or the methods employed. Besides past behavior, identity/schema may be linked to commitment to physical activity and ability, as well as positive affective judgments, identified/integrated regulation and social activation and comparison. It has reliable evidence as a moderator of the intention-behavior relationship and as predictor of intention, self-regulation strategies and regulatory self-efficacy.

There is also good evidence to support that identity/schema is associated with increases in the speed of processing of relevant information and creates negative affect under hypothetical identity–behavior discrepant situations.

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