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From Ordinal Representations to Representational Profiles: A Primer for Describing and Modelling Social Representations of History[1]

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Social representations theory is rich in explanatory power and broad in scope. This very complexity often leads to cases where predictions derived from the theory are difficult to operationalize and test. We argue that in many cases this is because social representations theory requires statistical models and analytic techniques that are uncommon in other social science traditions. In this chapter we outline a series of analytic methods and describe examples for their use in both improving description and testing predictions relating to social representations of history. We offer this overview as a methods primer for four complementary analytic methods for the study of social representations. These four methods are: (1) ordinal models assessing naming prevalence, (2) dimensional models assessing relational representations, (3) factorial representations focusing on unitary concepts, and the most recent addition to our toolbox: (4) representational profiles: latent class analysis allowing the assessment of representational profiles. We focus much of our primer on this method, and argue that latent class models, and factor mixture modelling in general has immense potential for the empirical assessment of social representations. This is

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because such models allow the assessment of categorical models of different types of representations, where those representations can represent different emerging factor structures derived inductively from the data. We finish by formally outlining a series of six premises for the theory and measurement of representational profiles using this novel approach. Syntax documenting a worked example of the Latent Class Model tested in one of our earlier papers using Mplus is appendicized, and additional supplementary material posted online.

According to Doise, Spini, and Clémence (1999), "SR [Social representations] can be considered as organizing principles of symbolic relationships between individuals and groups. A first assumption on which this definition is grounded is that various members of a population under study share common views about a given social issue. SR are generated in systems of communication that necessitate common frames of reference..." (p. 1). Describing social representations according to their functions and purpose rather than according to a more precise (and limiting) formal definition is characteristic of the approach taken by Serge Moscovici (1988), the founder of Social Representations Theory (SRT). Doise, Clémence, and Lorenzi-Cioldi (1993) offered a three step system for investigating social representations using multivariate statistics. This has not become standard practice. Rather, it seems to us that the majority of research in the area has been more in line with Moscovici's (1988) "[refusal] to be more specific in defining the phenomenon of social representations" (p. 213), and his expression of "opposition to a requirement that social psychologists think they can satisfy by using the right words and whose general effect is a certain sterility" (p. 213). A more inductive and descriptive approach to studying societal phenomena has resulted from this philosophy. Breakwell and Canter (1993) offered a highly varied collection of approaches ranging from qualitative to quantitative that is characteristic of the profusion of methods used to examine processes of social representation. Bauer and Gaskell (1999) subsequently remarked, "While methodological pluralism may be virtuous, when a theory apparently embraces a range of approaches from ethnography to experimentation, of data sources from pictures to attitude scales, and analytic procedures from qualitative interpretation to multi-dimensional scaling, without an explicit rationale, virtue looks more like an absence of conceptual clarity" (p.163). In light of this

pluralism, most recent advances in SRT have been more conceptual (for a summary see Wagner & Hayes, 2005) than methodological (but see Abric, 2003, for a notable exception).

Here, we outline four integrated approaches to the quantitative description and modelling of social representations. We argue that rather than being antithetical to statistical analyses and specific, operationalizable definitions, social representations are inherently complex aspects of human social life that requires a combination of advanced statistical analyses and qualitative interpretation to properly assess. Rather than being antithetical to quantitative operational models and formal definitions, we argue that formal tests of many of the predictions offered by social representations theory required advanced statistical methods that are only now finding their way into common parlance in the social sciences. Our aim in this chapter is not only to outline recent statistics methods and show how they may be used to test predictions from social representations theory, but also demonstrate how we arrived at this position. In particular, we argue that the methods and framework presented here provides an empirical way forward for operationalizing the deep structure of social representations (see Marková, 2003, and Doise et al., 1999 for different approaches to this problem). Building on this, we assert that there is now an empirical technique that is able to formally model and operationalizing the extent to which different social representations are hegemonic or widely and consensually shared across a society.

We provide case studies from our work in the study of social representations of history to show how these methods may be applied and integrated with theory. In detailing a series of methods we used to examine and reveal social representations of history, we do not imply that one mode is capable of replacing the others, but instead that each is useful for illuminating aspects of the phenomenon at different stages of theoretical development and practical use. Over the course of a decade and a half of research (a developmental process outlined using New Zealand as a case study in Liu & Sibley, 2009); we have used 4 basic modes for representing world history: 1) ordinal (naming prevalence) representations, 2) dimensional (or relational) representations, 3) factorial (unitary concept) representations, and 4) representational profiles (or latent classes/configurations). We end our chapter with a detailed overview of the use of latent class models (a form of mixture modelling) for the study of broad categorical differences in the emergent structure of social representations. We argue that this approach in particular has a lot to offer the field of social representations.

WHY SOCIAL REPRESENTATIONS OF HISTORY?

Liu and Sibley (2012) theorized that "Across cultures, and over the broad course of the evolution of human societies, a short list of the major bases of societal legitimacy might include genealogy (embodied by such representations as the divine right of kings and hereditary nobility), religion (including the authority of sacred texts as the Bible or Koran), science (with ideas about rational utility and methods for ascertaining the truth), social contracts (encompassing theoretical bases for liberal democracy and capitalism), and history. History's contributions to ordering society are not duplicated by any of these other bases of legitimacy, though they intersect with genealogy and religion, particularly where myths of origin are concerned (Malinowski, 1926). Whenever the question is asked "Why should we do this?" one answer that always has some legitimacy is "Because our forefathers did it this way." Furthermore, Liu and Hilton (2005) argued that "A group's representation of its history will condition its sense of what it was, is, can and should be, and is thus central to the construction of its identity, norms, and values." If history is considered as a narrative (Liu & László, 2007), then events and figures provide the plot and heroes and villains central to the story of groups and their social identity (Tajfel & Turner, 1979). Objectification of such a narrative would necessarily be complex, and require multiple perspectives and forms.

In this chapter, we narrow our focus to historical figures in order to illustrate the methodological principles we have encountered in illuminating representations in this area. Historical figures symbolize and embody national (Schwartz, 1997), civilizational, and perhaps global (Hanke et al., 2012) political cultures. Great figures come to embody cultural values. It is possible to talk about "Jeffersonian democracy", "The Elizabethian Age", or "Confucian philosophy". It is meaningful to refer to Christian, Confucian, Buddhist, or Mohammedian civilizations because over the course of history these men have come to symbolize values and philosophies for living. They become historical prototypes that can be used for self-categorization (Turner, Hogg, Oakes, Reicher & Wetherell, 1987). Together with historical events, which provide narrative templates (Wertsch, 2002) or historical trajectories (László, 2008; this volume) that carry lessons and justify action (Reicher & Hopkins, 2000; Liu & Hilton, 2005), figures are central to a narrative form of political psychology (Liu & László, 2007) as objectified symbols

(Moscovici, 1988). In The Pipers Son, Kutter and Moore (1945) quip that, "People don't make history… Peoples do that. Not the individual." Social representations of history can be considered as narratives, with events signalling a plot unfolding over time, characters symbolizing group values in action, and themes recurring that enable group agendas for the future.

1. Ordinal Representations: Naming Prevalence in Context

Inherent difficulties in characterizing culture (Hall, 1997) and communicating knowledge about culture and society have led influential figures as Josselson (2007) to claim that "practice of narrative research, rooted in postmodernism, is always interpretive, at every stage" (p. 7); "From a hermeneutic standpoint, narrative psychology aims to understand human experience as a form of text construction, relying on the assumption that humans create their lives through an autobiographical process akin to producing a story" (p. 8). "As scholars, we now have to ask ourselves—are we working together to put together a joint multilayered jigsaw puzzle, each on contributing a piece—or are we instead creating a long gallery of finely wrought miniatures…A gallery is nice, but I am interested in assembling a puzzle. And I have been occupied with the question of how to advance to the level of theory without reifying or losing the richness of the narrative data base?"

These are precisely the kinds of questions Moscovici (1961) wrestled with from the very beginnings of SRT, albeit from a broader epistemological base that does not privilege the lifeworld but juxtaposes it in interaction with scientific micro-worlds (Hwang, 2006). Steeped in American empiricism, we began from a methodology of naïve positivism (Hwang, 2005) and lucked into a method that was sufficiently structured but still open enough to interpretation to create some sturdy empirical foundations. Everything began with a method of open-ended nominations asking participants for answers to two questions: 1) What are the most important events in [world/national] history, and 2) Which figures have had the most impact on [world/national] history, good or bad?[2] Most answers were simple and discrete one or two word answers, and easy to code into categories that we (Liu, 1999; Liu et al., 1999) tallied and

[2] This was in the context of extensive surveys with many other qualitative and quantitative measures; for additional analysis of some of these items, see Cabecinhas et al., 2012, and Liu et al., 1999.

presented in tables listing the 10 most frequently nominated events and figures for a given sample. This technique is useful in any domain where key representational features are discrete.

The advantage of such an approach is that it can be published relatively easily in psychology journals (see for example Liu et al., 1999, 2005, 2009 and many others), can be administered to participants not familiar with the conventions of psychological research (Cabecinhas, Liu, Licata, Klein, Mendes & Feijó, 2012), but still requires substantial interpretation (see Table 1). Table 1 has never been published in the particular form represented here; the 6 samples shown were drawn from a larger sample of representations from 12 societies published in Liu et al. (2009). The key features of this ordinal representation are 1) it establishes nominal prevalence: the names of important historical figures are prominent, because the extent of people nominating them is displayed both numerically (in terms of percentages) and ordinally (e.g., Hitler is clearly the most prominent person in Table 1, appearing at the top of 4 lists and in the first or second position in all 6 lists). 2) It is contextual: the names of the figures nominated by different societies are in close visual proximity with one another, inviting comparison and interpretation. In the overall representation provided here, culture or society is made prominent and within culture sample characteristics like age or ethnicity are not. But this is a choice rather than a given feature: participant ethnicity is prominent in Liu et al. (2009) and gender/age is prominent in Table 7 of Liu et al. (2005). How we have placed the data from different countries is meaningful: for both this publication and the original 2009 paper, China and India (the world's two most populous states) are prominent at the top of the table; for this paper, we also selected 4 other states also among the largest or most historically influential among the societies surveyed, and eschewed the smaller societies within our sample of nations. In the original manuscript, all 12 societies could be seen on a single page, whereas the typesetters in the *Journal of Cross Cultural Psychology* displayed them in groups of 4 on 3 consecutive pages, rendering meaning-making for the reader more difficult. We reduced this sample of representations to 6 in the hopes that they can be displayed on a single page here (see Table 1).

Table 1. An Ordinal Representation of the Most Important Figures in World History (extracted from Liu et al., 2009).

Rank	China (N=115)	Pct	Eval	India (N=100)	Pct	Eval
1	Mao	64%	4.7	Gandhi	75%	4.9
2	Hitler	58%	3.0	Hitler	61%	3.6
3	Einstein	42%	5.5	Osama bin Laden	25%	5.6
4	Marx	40%	4.7	Mother Teresa	22%	5.8
5	Deng Xiaoping	36%	5.6	Bhagat Singh	19%	6.2
6	Napoleon	28%	4.6	Shivaji Bhonsle	18%	5.8
7	Zhou Enlai	21%	5.8	Einstein	16%	5.8
8	Newton	16%	4.9	Subhas C. Bose	11%	6.8
9	Sun Yatsen	10%	5.3	Lincoln	16%	5.6
10	Confucius	10%	5.0	George Bush Jr	11%	2.0

Rank	Russia (N=60)	Pct		Indonesia (N=104)	Pct	Eval
1	Hitler	57%	2.0	Hitler	58%	2.7
2	Stalin	56%	3.6	George Bush Jr	30%	1.9
3	Lenin	55%	3.9	Sukarno	30%	4.8
4	Napoleon	52%	3.4	Mohammed	28%	6.6
5	Vladimir Putin	35%	6.0	Einstein	23%	5.4
6	Peter the Great	33%	6.0	Mother Teresa	20%	6.0
7	Gorbachev	20%	3.3	Gandhi	18%	5.8
8	Boris Yeltsin	13%	3.3	Princess Diana	16%	6.0
9	Mikhail Kutuzov	13%	6.0	Thomas Edison	14%	6.2
10	Czar Ivan IV	13%	4.5	Marx	12%	3.7

Rank	Spain (N=142)	Pct	Eval	Brazil (N=367)	Pct	
1	Hitler	64%	1.0	Hitler	43%	2.0
2	Francisco Franco	44%	1.0	George Bush Jr	35%	1.5
3	Gandhi	31%	6.5	Osama bin Laden	23%	1.5
4	George Bush Jr	30%	1.0	Lula da Silva	22%	4.5
5	Mother Teresa	25%	6.0	Gandhi	16%	6.5
6	Columbus	15%	4.5	Freud	14%	6.5
7	Che Guevara	12%	6.0	Saddam Hussein	14%	1.6
8	Martin Luther	12%	6.0	Ayrton Senna	13%	6.5
9	Einstein	11%	6.0	Che Guevara	13%	6.0
10	Pope John Paul II	11%	4.8	Mother Teresa	11%	6.8

These choices facilitate and/or inhibit various interpretive moves. For example, we might have chosen to present 6 Western societies together to highlight features of Western social representations of history (this would have made Western ethnocentrism in nominations more

prominent). We might have chosen to present the more recent established states like the Ukraine and East Timor (this would have made national ethnocentrism more prominent). The 6 societies represented here highlight the variability in figures nominated across cultures, making the extraction of meaning besides the overall prominence of Hitler and other political/war leaders difficult. These choices might inhibit objectification of the data because they obstruct simple pattern detection and meaning making for the "amateur scientist" (Moscovici & Hewstone, 1983). The recency of the nominations is not obvious in the representations displayed (whereas highlighting the dates when the individuals were influential would have made the recency bias in SRs of history obvious).

This, of course, purposefully highlights the importance of the claims made in this section's opening paragraph, and supports the use of ordinal representations as a tool for cumulative narrative inquiry. The particular technique of cut and paste described here is only possible after the accumulation of representational data from multiple sources, and can always be revisited by adding samples (including using within-nation demographics such as age or gender to undermine or delimit previous conclusions) and juxtaposing other representations[3] to give new interpretive insight. We see these as a useful tool for producing order in a domain with considerable irregularity and variability in manner does not stifle hermeneutical advances (c.f. McKinlay, Potter & Wetherell, 1993). Tables such as these were often presented in the same article with tables of the most frequently nominated events.

For national studies of SRs of history (SRH), a narrative was inferred from interpretation of the pattern made by the according to plot elements (events) and character elements (figures) from which a story of the nation could be constructed (e.g., Huang, Liu & Chang, 2004). In New Zealand, SRHs have been used to provide the empirical base for generating a national psychology for managing group and intergroup differences using methods ranging from discourse analysis (Sibley & Liu, 2004) to factor analysis (Sibley, Hoverd & Liu, 2011), structural equation modelling (Sibley, Liu, Duckitt, & Khan, 2008), implicit associations tests (Sibley & Liu, 2009), and latent class analysis (Sibley & Liu, 2012; see Liu & Sibley, 2009 for a summary). Thus,

[3] Martin Bauer (personal communication) suggests that ordinal representations of historical eras could usefully complement data on figures and events. However eras are much less discrete variables than persons and events, and might require different treatment (see Bauer & Gaskell, 1999 for example).

ordinal representations can be used not only in hermeneutical inquiry, but as a launching pad for empirical science as well.

Because of the complexity of the data, it is harder to make narrative inferences (or provide a narrative template, see Wertsch, 2002) in a temporal, storied form in large cross-cultural studies integrating SRHs from multiple societies. Liu et al. (2009) concluded from studies of 24 societies that representations of world history were "a story about politics and war", centered around the event of World War II and the individual Hitler, focused on the near past (including everything associated with colonization and decolonization) that resulted in Eurocentrism tempered by nationalism". They were unable to specify the temporal structure of the plot or detail interactions between the figures within such a story: the inferential leaps required for such a construction fly too high over the data to provide much clarity, and need to be complemented by other, probably more qualitative methods.

2. Dimensional Representations: Relationships Between Items

As Liu, Paez, Techio, Slawuta, Zlobina & Cabecinhas (2010) argued: "there is a place for the micro-analysis of discursive features of culture, there is a place for research on societal forces in cultural transmission, and these are predominantly located in anthropology and sociology respectively. Our work is firmly grounded within the practices of cross-cultural psychology, and while we welcome cross-fertilization from related disciplines, we are content that this area of endeavour is indispensable to global research on culture." (p. 456). While SRT is known for its methodological pluralism and spans these disciplinary divides, our work has thus far been primarily informed by cross-cultural psychology's theoretical concern with the extent to which psychological phenomenon are found to be culture-specific versus universal (Berry, Poortinga & Pandey, 1997). Drawing from accumulated ordinal representations, we developed the World History Survey by selecting events and people nominated in the top ten of 2 or more of 24 societies, augmenting this with theoretical choices of additional items to make a list of 40 events and 40 figures. This has been administered to university students in 30-40 societies (Liu et al., 2012; Hanke et al., 2012), with each event and figure being rated for both importance and valence.

One statistical analysis technique useful to determine the extent of universality between samples is Multi-Dimensional Scaling (MDS) with procrustean rotations (Welkenhuysen-Gybels & van de Vijver, 2001; Commandeur, 1991). MDS has also been used by SR researchers (see Purkhardt & Stockdale, 1993) for different reasons: it allows one to see relationships between variables, with distance between items in a spatial representation also indicative of psychological distance between them (see also Doise et al., 1993[4]). Liu et al. (2012) and Hanke et al. (2012) employed MDS with proximity transformations (PROXSCAL) of the valence of historical events or figures z-transformed into Euclidean distances for each country in their sample separately. Generalized procrustes analysis (GPA; Commandeur, 1991) was used to simultaneously compare country-level configurations with one another and an overall configuration. It is possible to interpret the results of these analyses as providing clues as to underlying themata (Marková, 2003); they definitely attempt to find the organizing principles or deep structure of the representational field (Doise et al., 1999).

We found a poor fit in the underlying dimensions of meaning for the items across the various societies, accounting for only 55% (events) and 62% (figures) of the squared distances for a 2 dimensional solution. In other words, we were unable to find universal dimensions of meaning in the evaluation of historical events or figures across cultures. Subsequently, country-level hierarchical cluster analysis using Ward's method was employed to combine data sets from different countries into coherent groupings where the MDS captures more of the underlying variance in squared distances between items and produces more interpretable dimensions of meaning. For historical figures (shown in Figures 1 and 2, adapted from Hanke et al., 2012) this effort was only partially successful.

[4] Doise et al. also note that correspondence analysis using nominal or categorical data is more typical in SRT research, but such data cannot be used to test questions of universality the way interval scales can.

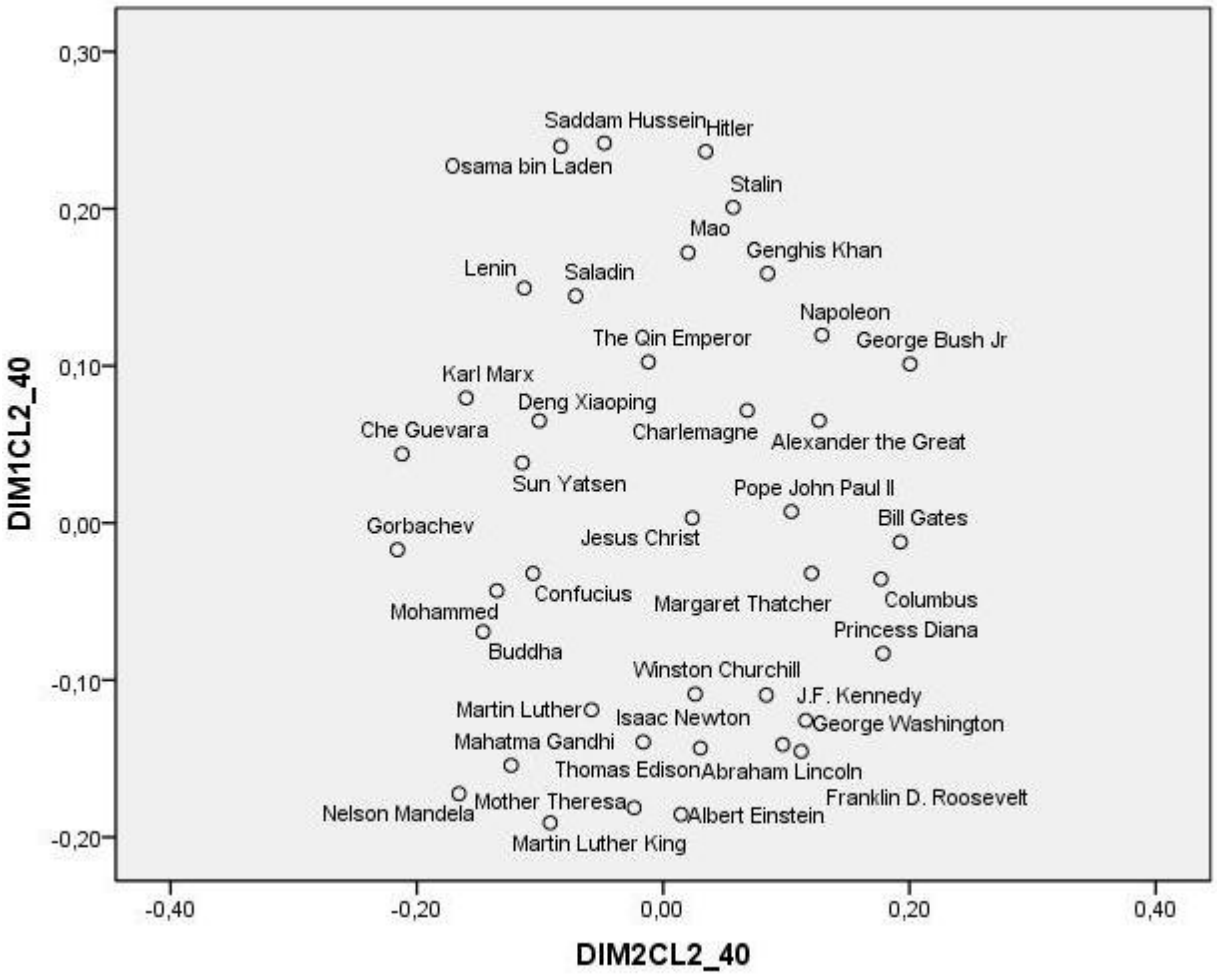

Figure 1. A Dimensional (or Relational) Representation of Important Figures in World History according to Evaluative Ratings by Western Nations.

For the aggregated data of 14 mainly Western countries, there were two clear dimensions of interpretable meaning: the vertical axis of Figure 1 depicts bad figures at the top, and good ones at the bottom. The horizontal axis shows Western dominance on the right versus resistance to Western hegemony on the left. The good/bad themata (Marková, 2003) is among the most basic in human society, whereas the dominance versus resistance to Western civilization is central to history in the wake of the industrial revolution. Spatial distances between the historical figures are revealing: Mohammed, Confucius, and Buddha are close together, in the area of the representation associated with positivity and resistance to Western hegemony, whereas Jesus Christ is a little distance away from these other great founding figures, almost directly in the

center, closer to Pope John Paul II and Charlemagne on the right than to his fellow spiritual founders on the left. Also notable is the density of positive figures at the bottom associated with liberal historical progress, represented by freedom fighting American Presidents to the right, scientists in the middle, and non-White human rights activists to the left. They could be interpreted as forming a dialectic (or themata) of historical progress towards liberalism involving powerful "freedom fighters" on the right maintaining the dominance of Western civilization and its liberal ideals, and human rights activists to the left calling the dominant group to account for its failure to live up to the high-minded ideals of liberalism in practice. George Bush Jr is notable for his proximity to Napoleon, Alexander the Great, and Genghis Khan towards the top of the figure rather than with the other American Presidents at the bottom. Close by, Hitler, Saddam, and Osama form an axis of evil atop the figure, flanked by Lenin, Saladin, Stalin, Mao, and Qin Emperor. The ideology of the West is clearly on display in this representation.

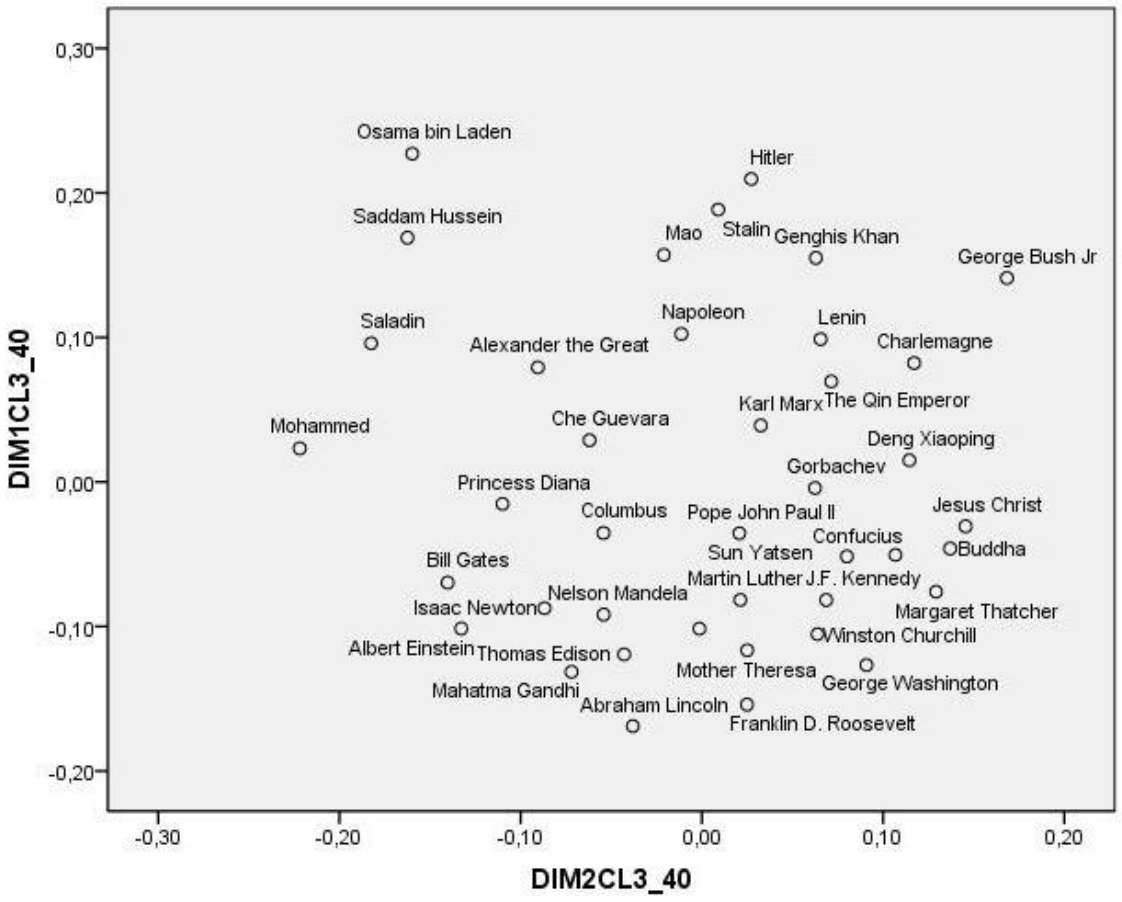

Figure 2. A Dimensional (or Relational) Representation of Important Figures in World History according to Evaluative Ratings by Muslim Nations.

Figure 2, with aggregated data from four Muslim societies (Indonesia, Pakistan, Tunisia & Malaysia), tells a different story fraught with interpretive uncertainty. An attitude of openness and humility is required, as it is extremely difficult to imply discovery of any deeper organizing principles from this representation. What is immediately obvious visually is that Mohammed stands out a distance away from every other figure, to the extreme left and vertical centre of a quadrant of the representation shared with Saladin, Saddam, and Osama, the only other Muslim figures in the World History Survey (WHS). Christ and Buddha (and to a lesser extent Confucius) are to the far right and vertical center of the figure, far from Mohammed. Hitler, Mao, Stalin, Genghis Khan, Bush Jr and their ilk are in the same place at the top and right of the figure, but quite some distance from Osama and Saddam. There is no one at the center of the figure, and in the dense lower half of the figure (as in Figure 1), the most visibly coherent cluster of historical figures might be the scientists and human rights figures to the bottom left, closer to Mohammed than to Jesus. The figure closest to Mohammed is the Islamic statesman and warrior Saladin, who expelled the Christians from Jerusalem in the Middle Ages; after him in proximity are Princess Diana and Bill Gates! What this demonstrates is the incompleteness of the figures selected by empirical means for the WHS: ordinal representations were available for only 3 Muslim societies (Indonesia, Turkey & Malaysia), and these did not produce any consensually Islamic figures (Saladin was fortunately added by the authors on theoretical grounds). Another round of research (probably qualitative) would be necessary in Islamic societies to produce a more complete dimensional representation of history for Muslims. We are currently unable to provide authoritative interpretation of the meaning of the two dimensional space shown in Figure 2. Although the vertical placement of figures is similar to Figure 1, we might hesitate to label this dimension as good-bad because Mohammed is the in middle of this axis; furthermore, the horizontal axis might be labelled as Muslim/non-Muslim, but it is difficult to explain why Bill Gates and Albert Einstein are more Muslim compatible than Margaret Thatcher or Deng Xiaoping.

3. Factorial Representations: Unitary Concepts to test Individual Differences and ascertain Group Means

Where there is reason to doubt inter-subjective interpretations of shared meanings (as is the case for the Muslim societies in the WHS), we have turned to factor analytical techniques to identify coherent groupings of items along which individuals are free to differ in their evaluations (see also Doise et al., 1993). Factorial representations allow individuals to vary in their ratings of items while presuming only that a unitary concept underlies these evaluations. Factor analysis can be used to break down an overly complex Dimensional Representation into bite-sized chunks that might serve as anchors (Moscovici, 1988) for interpetation (see Figure 3, adapted from Hanke et al., 2012). We (Liu et al., 2012; Hanke et al., 2012) typically have employed exploratory factor analysis (EFA) with a principal components analysis followed by Varimax rotation on individual-level data within societal clusters to identify structurally equivalent factors and to eliminate non-equivalent items. Factorial procrustean target rotation (using the overall sample as the norm) is used subsequently (van de Vijver & Leung, 1997) to provide fit statistics. This analysis technique was used to advantage by Liu et al. (2012) in finding 3 concepts useful in representing historical events: Historical Calamities (including both man-made and natural events), Historical Progress, and Historical Resistance to Oppression (or Human Rights). Taken together, these scales provide a factorial representation of historical events that can be used as individual difference measures, for instance to predict willingness to fight in a war (Liu et al., 2012), but they could also to used in a configuration to characterize a society or region as a representational profile (see 4 below).

Table 2. Factor structure of evaluations of 38 figures across 30 countries.

	Factors								
	1	2	3	4	5	6	7	8	9
Lincoln	**.777**	.210	.129	.102	.070	.029	.039	.016	-.089
Washington	**.748**	.097	.105	.138	.057	.123	.099	-.022	-.042
FD Roosevelt	**.719**	.145	.116	.086	.047	.109	.058	.052	-.074
JFK	**.527**	.088	.181	.069	.022	.239	.270	.090	-.026
ML King	.195	**.741**	.088	.049	.095	.064	.084	.028	-.031
Gandhi	.108	**.652**	.193	.060	.253	.002	.046	-.011	-.068
Mandela	.138	**.623**	.002	.050	.068	-.022	.140	-.066	-.007
Luther	.075	**.531**	.143	.022	.013	.276	.023	.111	.046
Newton	.094	.184	**.728**	.022	.209	.038	.067	.072	-.095
Einstein	.075	.342	**.649**	.086	.051	.014	-.077	.081	-.133
Edison	.206	.239	**.527**	.063	.094	-.024	.275	-.026	-.069
Columbus	.194	-.050	**.491**	.147	.019	.393	.082	-.022	.044
Bill Gates	.165	-.079	**.478**	.074	-.010	.267	.119	-.049	.014
Genghis Khan	-.074	.052	.011	**.633**	-.014	.062	.094	.181	.067
Charlemagne	.181	.032	.100	**.614**	.074	.104	.051	-.005	-.011
Saladin	-.040	.126	-.118	**.592**	.090	-.098	.243	.008	.033
Alexander	.259	.014	.270	**.567**	.054	.117	-.123	.047	.042
Napoleon	.095	-.066	.200	**.527**	-.080	.166	-.112	.152	.162
Qin Emperor	.126	.038	-.022	**.498**	.087	-.045	.241	.097	.053
Buddha	.078	.137	.072	.029	**.820**	.127	.097	.037	-.026
Mohammed	.029	.126	.037	.073	**.783**	.081	.052	.064	.079
Confucius	.052	.140	.207	.088	**.668**	-.018	.259	.065	-.033
John Paul 2	.137	.080	.005	.082	.158	**.712**	.005	-.030	-.044
Princess Diana	.102	.072	.147	.071	-.048	**.573**	.178	-.014	-.090
Christ	.097	.043	-.037	.033	.495	**.562**	-.090	.013	-.095
Mother Theresa	.016	.480	.111	.013	.133	**.534**	.022	.054	-.217
Thatcher	.163	.033	.278	.000	-.025	**.379**	.281	.102	.057
Sun Yatsen	.061	.109	.081	.133	.107	.078	**.654**	.059	-.053
Deng Xiaoping	.000	.072	.009	.215	.072	.055	**.610**	.193	-.092
Gorbachev	.133	.019	.066	-.003	.083	.033	**.556**	.036	.082
Churchill	.365	.146	.175	.036	.041	.173	**.424**	.010	.063
Stalin	.007	-.104	-.030	.160	-.058	.077	-.029	**.700**	.191
Lenin	.050	.037	.010	.033	.040	-.031	.211	**.687**	.106
Mao	.016	.004	-.060	.232	.045	.008	.024	**.657**	-.030
Marx	.031	.152	.266	-.043	.190	-.042	.130	**.555**	.028
Saddam Hussein	-.055	.009	-.083	.052	.036	-.056	.059	.055	**.784**
Osama bin Laden	-.110	.051	-.089	.055	-.003	-.161	.016	.038	**.772**
Adolf Hitler	-.009	-.188	.027	.150	-.034	.024	-.083	.188	**.595**

When applied to the historical figures data (see Table 2), a rather more complex[5] pattern emerged that Hanke et al. (2012) said "appear to add relatively little in terms of deeper conceptual meaning on top of what might be extracted from the individual figures". These factors were highly intuitive (e.g., American Presidents minus Bush Jr., Humanitarians (or Human Rights Activists), Scientists/Explorers/Innovators, Arch-villains, etc.) but also not particularly insightful in terms of deeper meaning. Outside of context of the factor analytic techniques used to produce them, there is no one-to-one mapping between unitary scale concepts and social representations (Gaskell, 1994). Instead, it is difficult to define how consensual they are, and indeed they are typically used as measures of individual differences in mainstream social and personality psychology. Gaskell (1994) observes that "Data reduction techniques can be blunt instruments, unable to identify subtleties in the views people hold… On many controversial issues in science, technology and the environment, people identify with both sides of the debate. This is not to say, I believe, that they feel confused or jumbled, but rather that more fundamental explanatory value systems can point them simultaneously towards adoption and resistance to economic progress" (p. 2). Therefore, we moved to a final mode of representation that uses latent class analysis to produce representational profiles that allow us to display meaningful group-based variation in subtle patterns of rating historical figures.

4. Representational Profiles: Using Latent Class Analysis (LCA) to derive Categorical Configurations of People and their Interpretation of Items

A cornerstone of social representations theory is that different communities may hold different, or contested, social representations about the same topic (Moscovici, 1988; Doise et al., 1993; Glaveanu, 2009). In terms of social representations of history, this might occur because different communities (e.g., nations) may differ in the extent to which they have different *representational profiles* of history. We use the term representational profile to refer to different combinations or patterns in the relative perceived importance or evaluation of different sets of historical events or figures (see Sibley & Liu, 2013; Hanke et al., 2012 for elaboration).

[5] As might be expected, factorial agreement was much lower in the Muslim country cluster than the other 3 clusters.

To put the idea of a representational profile in context: it might be the case that there is one hegemonic representational profile (Moscovici, 1988) governing beliefs about historical figures. This one universal profile might take the form where one set of historical figures (say for example those who promoted peace) were all universally evaluated positively, those who lost wars (or who advocated for war) were all universally seen as negative, and those who advanced science or religion were viewed as positive to neutral. A hegemonic representational profile of this type is implausible (contrast Figure 1 with Figure 2), because representations of the actions and valence of different figures in world history critically depend upon one's perspective and group position. From different perspectives the "freedom fighters" we wrote about in section 2 could be seen as rebels, or even tyrants.

It is far more likely that there are categorically different *contested representational profiles* of history, and that these different representational profiles are a core feature of what bind people together into communities of practice, as illustrated in the contrasting examples of Muslim versus Western nations in the previous section. These different representational profiles cannot be measured using the statistical analyses typical of research on social representations, like factor analysis. This is because the theory presumes that there are different categories (or communities) of people underlying ratings of different continuous ratings. Thus the common factor, or overall average masks the potentially systematic variation that social representations theory seeks to examine.

To measure representational profiles it is necessary to use mixture modelling techniques, such as Latent Class Analysis (LCA) and Factor Mixture Modelling. Methods such as Exploratory Factor Analysis (EFA), in contrast, are useful when one is interested in identifying continuous and normally distributed latent dimensions underlying responses, rather than discontinuous categories. EFA assumes *a priori*, that there is only one hegemonic profile, and then builds a model identifying the factors that best fit this single profile containing all responses. The beauty of mixture models in the analysis of social representations is that they allow one to determine the emerging group structure. That is, to determine, based purely on the data, the likely number of groups (or different profiles) hidden within the data, rather than (a) assuming there is only one profile (as in an EFA), or (b) identifying different profiles by looking at differences across *a priori* group memberships the researchers are already aware (such as demographics).

LCA can be used to explore how a set of unobserved subgroups of participants may differ reliably in their opinions or views across a range of topics. The set of unobserved subgroups then represents a categorical latent variable (that is a set of distinct categories or types of people) that are hypothesized to produce the overall pattern observed in the data (see Hagenaars & McCutcheon, 2002). LCA thus allows us to create a model categorizing people into different subtypes or categories that are theorized to underlie the overall pattern of responses. We can then use this method to determine how many different latent classes or types of people are needed to parsimoniously summarize the observed data.

LCA is thus directly suited for identifying different categories of people who have distinct *representational profiles or signatures*. That is, we can use it to identify distinct groups or types of people who may have quite a different set of beliefs or evaluations of different sets of historical events or figures in world history, some high some low, some positive, some negative, some moderate, from other distinct types of people. These different types of people may be completely missed when looking at the overall mean levels of response to a set of attitude or opinion items, because without LCA we would not have a way to reliably differentiate people in our data into different latent categories based on similarities and differences in their overall pattern of responses across a range of continuous indicators.

We advance six premises for the theory and measurement of representational profiles. We elaborate on these premises, and outline an early test of the model applied to social representations of history in the following sections. We then provide a brief conceptual overview of the statistical methods that can be used to assess representational profiles. An appendix is included at the end of the chapter showing an interested reader Mplus code and a website detailing how to do the LCA published in Sibley and Liu (2013).

Six premises for the theory and measurement of representational profiles.

1. *Social representations of history are contested*, and these contested representations form different representational profiles.
2. In terms of social representations of history, representational profiles refer to the statistically reliable differences in types or categories in the strength of evaluation of different combinations of historical events or figures. These profiles are thus categorically distinct types, not continua.

3. (a). *Contested or polemical representations of history* will have different underlying representational profiles. That is, there will be statistically reliable and identifiable differences in emerging groups of people that hold different patterns of belief about the nature of historical events and people. This should be the norm in most cases.

   (b). *Hegemonic representations of history* will have a single universal representational profile, where everybody shows a very similar pattern of belief about the nature of historical events and people. We expect this pattern to be unlikely except in more closed and authoritarian societies/eras (see Nora, 1989). It should only occur when history is not mobilized as a meaning system to create optimal distinctiveness between groups or to mobilize opposition toward other groups within the population studied.
4. Different representational profiles provide different meaning systems, and form a core feature of what binds people together into some form of community, of thought or institutionalized practices. Because representational profiles are categorically distinct from one another, the meaning systems that they provide for mobilizing public opinion will be categorically distinct, but often formed in (competitive) dialogue with one another.
5. These different representational profiles cannot be measured using the statistical analyses typical for research in social representations. This is because the theory presumes that there is a categorical profile underlying ratings of different continuous ratings (Sibley & Liu, 2013). To measure representational profiles it is necessary to use mixture modelling techniques, such as Latent Class Analysis and Factor Mixture Modelling.
6. Mixture models are the appropriate tool for identifying representational profiles because they determine the emerging group structure. That is, they determine, based purely on the data, the likely number of groups (or different profiles) hidden within the data, rather than relying on the research specifying group memberships *a priori* on the basis of measurable grouping factors of which the researchers are already aware (such as demographics). This may provide an empirical method for identifying "natural groups" (Moscovici, 1961), "affinities" (Gaskell, 1994), or what Bauer & Gaskell (1999) refer to as social segments. This removes the criticism of Potter and Litton (1985) that "the treatment of representations as co-extensive with social groups is potentially circular." (p. 81), and takes social representations theory beyond the hermeneutical circle of interpretation

favoured in qualitative research (see Wagner & Hayes, 2005) and criticized by empiricists as a "the chicken or the egg problem" (Brewer, 2001).

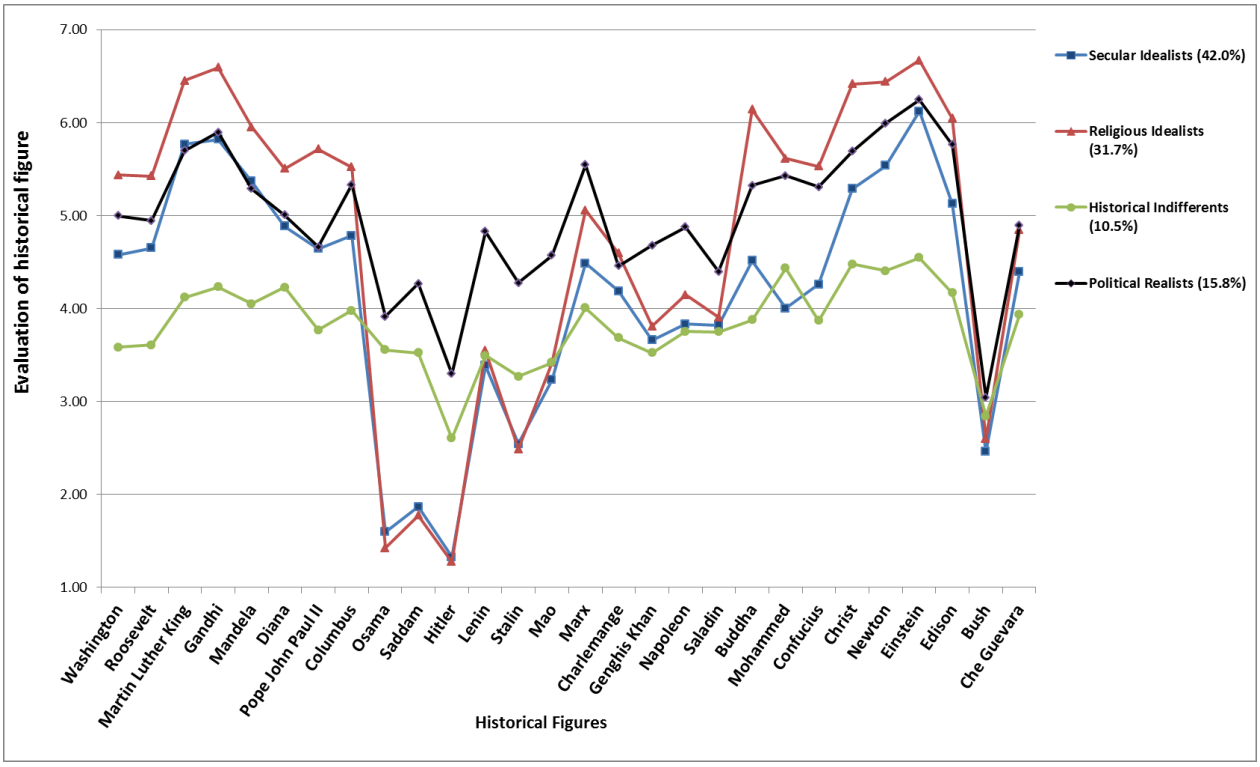

Figure 3. Estimated means for a four-profile Latent Class Analysis evaluation of historical figures (from Hanke et al., under review).

To illustrate, Hanke et al. (2012) conducted an LCA of ratings of positive versus negative evaluation of key figures in world history. They derived a stimulus set from the highest loading figures from the factorial representation described previously. From this, they identified four categorically and statistically distinct representational profiles of figures in world history. As can be seen in Figure 1, the four profiles each identified a statistically different pattern of evaluations of various historical figures. These four profiles were named as: Secular Idealists, Religious Idealists, Historical Indifferents, and Political Realists.

Hanke et al. (under review) found the two most prevalent profiles in Western cultures were Secular and Religious Idealists, who were similar in that they rated Hitler, Saddam, and Osama bin Laden very low, and scientific and democratic/human rights leaders very high. The Secular Idealists were less extreme in their ratings than Religious Idealists, and rated religious

founders other than Jesus at or just above the midpoint, but were otherwise similar in the configuration they held: 90% of Westerners fell into one of these two representational profiles. The Catholic and Orthodox Christian societies, these two profiles were also prevalent, but to the lesser extent of 75%. In Asian and Islamic societies, two other representational profiles were common: Political Realists, and Historical Indifferents. Political Realists rated dictators, generals and terrorists less negatively than the Idealists and Communist leaders like Marx and Lenin highly. But their ratings of the heroes of science and democracy were quite similar to the Idealists' profiles. People in the developing societies of Asia and the Islamic world, where survival is by no means assured (Inglehart & Baker, 2000) probably see the world as a place where a Machiavellian attitude towards power is sometimes necessary. Islamic societies had many people classified as Historical Indifferents—that is, most of their ratings (except for negative ratings of Bush and Hitler) hovered around the midpoint, possibly because few of the figures rated in the World History Survey came from the Muslim world[6]. Mapping the causes of the distribution of representational profiles in global society and tracking longitudinal changes in them is a vibrant topic for future research (Sibley & Liu, 2012). Here, the more qualitative aspects of SRT involving the institutional origins of different representational profiles may be brought into play. We suspect, for instance, that the institutions associated with nationalism and religion may play key roles in these configurational patterns, and that social context and positioning may add some situational fluidity to them as well (see Harré & Langenhove, 1998; Turner et al., 1987).

Guidelines for assessing representational profiles. We recommend a series of three steps in the development and assessment of representational profiles. These are (a) profile prediction and derivation, (b) profile validation, and (c) prevalence mapping of profile distributions.

Profile prediction and derivation. This involves the formulation of an *a priori* statement about the nature of the predicted representational profiles based on theory and previous observation. It is followed by statistical derivation of the latent classes based on the observed indicators using LCA, followed by theoretical integration of observed profiles with predicted profiles and their description until a stable theoretical solution is reached that is supported by both the theory and data.

[6] There were about 5% Historical Indifferents in Western societies, 10% in Catholic/Othodox societies, and 15% in Asian societies as well.

Profile validation. This involves testing discriminant validity of the profiles on a key set of outcomes, on which the profiles should clearly differentiate opinions or responses in one domain, but be unrelated or only trivially differentiate opinions or responses in some other domain. The reasoning for this is based on the integration of profile prediction and description (the predicted shape and number of profiles) and profile derivation (what the data supported).

Prevalence mapping of profile distribution. This involves mapping the distribution of validated profiles in different segments of the population based on key demographic features (ethnicity, immigrant status, nationality, gender, age, geographical location and socio-economic deprivation) to test specific theoretical predictions about the prevalence of the profiles in different regions of the population. This is the first step in describing how different representational profiles may provide and be used to create different systems of meaning for different groups, and in the long run may be used to see how these evolve over time and place.

CONCLUDING COMMENTS

Social representations theory is a rich and complex theory that has not garnered all the attention it deserves in mainstream social psychology. We suspect that part of the reason for this is that many of the standard statistical methods familiar to social scientists are not well suited to testing predictions from the theory. Indeed, one of the aspects of social representations theory that we find most appealing is that it affords a theoretical complexity beyond standard (linear and unitary) concepts of attitudes and social cognition. In many cases, this theoretical complexity necessitates correspondingly complex statistical models. Our purpose here was to provide an overview of four different and complementary analytical approaches to the description, measurement, modelling, and interpretation of data for social representations theory. We have framed our overview in case studies and examples of analyses from our own research on social representations of history.

The four based modes for an advanced study of social representations that we employ are: 1) ordinal (naming prevalence) representations, 2) dimensional (or relational) representations, 3) factorial (unitary concept) representations, and 4) representational profiles (or latent classes/configurations). These methods have proven invaluable for description, and hypothesis

testing for our theory of social representations of world history. We hope they may also be of utility for expanding and developing novel approaches to the study of social representations more generally, and in other domains. We are particularly excited about the application of factor mixture models and latent class models in the study of representational profiles, and hope that the six theoretical and applied premises we outline for the measurement and modelling of representational profiles using latent class analysis will help to generate renewed interest in formal hypotheses and empirical tests of social representations theory. Toward this end, we have made available online sample data sets and scripts for the latent class models in the various papers we cite as case studies in this chapter. The application of mixture models has a lot to offer the field of social representations. The strongly interpretive elements in the complex configurations of elements emerging from these sophisticated techniques (and consideration of the social forces underling them) may stimulate fruitful future dialogue in the service of advancing SRT.

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APPENDIX I

Annotated Mplus Syntax for the Latent Class Analysis reported in Sibley and Liu (2013)

```
TITLE:
    This script demonstrates how to conduct an LCA, and tests the four-class model of bicultural
    policy attitudes reported in Sibley and Liu (2013).
    This demonstration script and data is posted at: http://www.psych.auckland.ac.nz/uoa/chris-
    sibley-supplementary-files
     A full list of all Mplus scripts used in analysis of the New Zealand Attitudes and Values
    Study is also available at: http://www.psych.auckland.ac.nz/uoa/NZAVS.
DATA:
    !specifies datafile
     FILE IS Example LCA Data.txt;
VARIABLE:
    !specifies variables in datafile
    IDVARIABLE IS subnum;
    NAMES ARE
    subnum
    RESP1RT1 RESP2RT1 RESP3RT1 RESP4T1
    SYMP1RT1 SYMP2RT1 SYMP3RT1 SYMP4RT1;
    USEVARIABLE ARE
    RESP1RT1 RESP2RT1 RESP3RT1 RESP4T1
    SYMP1RT1 SYMP2RT1 SYMP3RT1 SYMP4RT1;
    !specifies number of classes
    Classes = c(4);
ANALYSIS:
    !specifies analysis type
    TYPE = Mixture;
    lrtstarts = 20 10 160 80;
MODEL:
    !specifies model parameters
    %OVERALL%
OUTPUT:
    !requests technical output comparing model fit
    Tech11 Tech14;
SAVEDATA:
    !specifies output file for latent class scores
    FILE IS LCA Data Output.txt;
    FORMAT IS free;
    SAVE = CPROB;    !saves latent class probabilities
PLOT:
    !requests a plot of the LCA, with variables in order listed
    TYPE IS plot3;
```

```
SERIES IS
ResP1rT1(1) ResP2rT1(2) ResP3rT1(3) ResP4T1(4)
SymP1rT1(5) SymP2rT1(6) SymP3rT1(7) SymP4rT1(8)
```