Chapter 8
Quantitative Research in Research on the Education and Learning of Adults

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8.1 Introduction

This chapter starts from the observation that there is a limited presence of quantitative research published in leading adult education journals such as *Adult Education Quarterly*, *Studies in Continuing Education* and *International Journal of Lifelong Learning*. This observation was also discussed by Fejes and Nylander (2015, see also Chap. 7). As an adult education scholar mainly working with large quantitative datasets, I aim to provide more insight on what quantitative methods have to offer to the field. I will do this through a brief discussion of the role of methodologies and methods in empirical research, but also by engaging with examples of quantitative research available in the scholarly literature, including a range of existing quantitative scales, and how these can be taken forward in new research as tools to generate the construction of new knowledge. I will first explore potential reasons why the presence of quantitative research in the leading generic adult education journals is so limited.

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8.2 Hypotheses on the Limited Presence of Quantitative Research in the Adult Education Literature

A bibliometric analysis of top cited articles in the leading adult education journals by Fejes and Nylander in 2015 (see also Chap. 7) concluded that in relation to methods, *'qualitative approaches have near total dominance'*. In their analysis, they included the 57 most highly cited articles published in *Adult Education Quarterly, International Journal of Lifelong Education* and *Studies in Continuing Education*. Only 7 of these articles contained a quantitative component, either by being purely quantitative in nature, or being part of a mixed methods research design in which quantitative and qualitative methods were integrated. In discussing this observation, Fejes and Nylander (2015; see also Chap. 7) put forward some hypotheses on the underlying reasons of the underrepresentation of quantitative methods. One of their arguments is that many doctoral candidates in the field of adult education tend to come from practical backgrounds with an interest in capturing the experiences of adult learners, a topic leaning more towards the adoption of qualitative methods. While quantitative methods can also be used to capture experiences of adult learners, these are more likely to generate data on 'what' learners are experiencing instead of 'why' they are going through these experiences. This is, as will be further explored below, because quantitative research is better suited to capture static facts and figures while qualitative research goes deeper into the underlying meanings (see Robson 2011). Another argument put forward by Fejes and Nylander (2015; see also Chap. 7) relates to the skill package of doctoral supervisors, with a majority been trained in a period in which qualitative methods in education blossomed as a reaction against the strong positivistic nature of quantitative research. Not only in the scholarly literature, but also when visiting adult education conferences and events, it is clear the majority of academics in the field are engaged in research drawing on qualitative methods. An additional argument put forward by Fejes and Nylander (2015; see also Chap. 7) relates to the difficult funding climate of today. Generating research income is challenging and the cost of undertaking large scale survey research or experiments leading to high quality quantitative data is high. However, as I will be discussing below, there is a wide range of datasets available to researchers to undertake secondary data analysis and further exploitation of these datasets should be encouraged in the adult education scholarly community. Before discussing these datasets and a range of other quantitative tools available for researchers as found within studies published in the leading journals in the field, I provide a brief overview on historical discussions between the role of qualitative versus quantitative methods in social sciences research.

8.3 Research Paradigms

The term paradigm, as discussed by Thomas (2009, p.72) refers to 'the technical word used to describe the ways we think about and research the world'. While paradigms can be somewhat complex in nature, traditionally, the two leading paradigms in social sciences have been labelled as 'positivism' and 'interpretivism'. A more sophisticated classification of paradigms, as published by Denzin and Lincoln (2003) integrates a wider range of paradigms, including 'positivism and postpositivism', 'interpretivism, constructivism and hermeneutics', 'feminism', 'racialised discourses', 'critical theory and Marxist models', 'cultural studies' and 'queer theory'. While Thomas's distinction between positivism and interpretivism is thus maybe narrow in scope, the underlying idea is that paradigms tell us something about the way in which researcher tend to think about the world and how these worldviews can influence methodological choices they make in carrying out their research agendas. Starting from a positivist assumption, as explained by Thomas (2009), knowledge will be produced based on facts and figures which are value-free and objective. Methods are traditionally borrowed from exact sciences and the use of numbers and statistics is dominant. Positivism often resolves around the testing of hypotheses and therefore engages in deductive and theory-testing thinking. This way of thinking is in contrast with interpretivism, which starts from the assumption that researchers are those who actively engage in constructing and interpreting the world in which we live. The focus is therefore not on the achievement of an objective reality, but on furthering the in-depth understanding of the world. This can include work to explore new areas of research and to engage in theory building in areas which lack strong frameworks. Interpretivists therefore prefer to work with qualitative methodologies. The techniques they use are often hard to replicate and are strongly interrelated with the approaches used by the specific researcher. It is thus clear that crucial differences exist between quantitative and qualitative methods. Especially in the 1970s and 1980s, there has been a lively debate on which research methodologies to use, often referred to as the 'paradigm war' (see e.g. Gage 1989; Robson 2011). Furthermore, it is also possible to combine both quantitative and qualitative methods within mixed methods research, sometimes labelled at the 'third methodological movement (see e.g. Johnson et al. 2007; Teddlie and Tashakkori 2009) or as the 'pragmatic approach' (See Robson 2011). Nowadays, methodological textbooks formulate advise on choosing adequate methods best suited to answer the research questions being posed (Ercikan and Roth 2006; Teddlie and Tashakkori 2009). It is thus clear that traditionally, different types of research methods tend to serve different purposes but also draw on different sets of skills. For example, research interested in analytical accounts of facts and figures ask for well-developed quantitative and statistical skills. Going back to the observation made by Fejes and Nylander (2015; see also Chap. 7) that quantitative research in the leading adult education journals is underrepresented, it is also important to increase familiarity among scholars in the field what the potential of quantitative research is for our field. As such, a review of quantitative tools and datasets is being discussed below.

8.4 Review Procedure Distinguishing Between Quantitative and Qualitative Approaches

In order to be able to discuss examples of quantitative research as discussed in the leading adult education journals, I obviously had to search for them. In distinguishing articles drawing on quantitative versus qualitative methods, I focussed on the distinction made by Creswell (2003, p.17). Articles containing research based on quantitative methods therefore used 'predetermined' research instruments, mainly questionnaires, although quantitative data can also be generated through experiments. Data are then being analysed using statistical techniques. Articles drawing on qualitative research tend to start from more 'flexible' research designs, for example through working with semi-structured interview schedules. Common methods include interviews, focus groups and observations, leading to data which are being analysed based on texts from transcripts. It is of course also possible than one single article reports on both quantitative and qualitative research elements, drawing on a mixed methods research design.

The review exercise presented in this chapter is based on 1323 journal articles, all published between 2000 and 2017, in some of the leading generic adult education journals. All original papers published in *Adult Education Quarterly* (AEQ), *Studies in Continuing Education* (SCE) and *International Journal of Lifelong Education* (IJLE) in the period 2000 till 2017 – have been included in the analysis (N = 1323), including more than six million words of text. The reason for selecting these three journals was to keep the selection similar to previous research undertaken by Fejes and Nylander (2015; see also Chap. 7), as such, building further on their finding that quantitative research is underrepresented in the leading academic journals on adult and lifelong education. Furthermore, it is interesting to know that these journals are being edited from three different continents. AEQ's editorial office is located in the America, IJLE's in Europe and SCE's in Australia. The following keywords were included in the review analysis, linking back to keywords used by Creswell (2003, p.17): qualitative, quantitative, interview, focus group, participant observation, questionnaire, regression, correlation, ANOVA (Analysis of Variance) (examples of common statistical analyses) and (quasi)-experimental design, as well as 'mixed methods'.

All journal articles included in the analysis were subjected to a context and text mining analysis undertaken with the help of software packages QDA Miner and WordStat, products developed by Provalis Research. QDA Miner is able to code, analyse and manage big data – in this case all papers from the three leading journals between 2000 and 2017. Further analyses can then be undertaken in WordStat, which can explore co-occurrences between keywords. The programme is thus based on a text analysis searching for sentences that use one or more of the keywords as mentioned above. Whenever a keyword had been found, it had been essential to further explore the text in order to distinguish whether it was used in relation to the empirical methods and findings of the reported research, or whether it belonged to

another section, for example in relation to previous research discussed in the literature review without dealing with the methods in itself.

8.5 Results

8.5.1 General Patterns

This results section discusses the prevalence of quantitative research in three leading adult education journals. It starts by discussing the observation that a minority of articles included in the review (16%) mentioned the use of quantitative research approaches (see Table 8.1).

The numbers reported in this table represent the number of cases (journal articles) in which one of these words has appeared, with an additional scrutinising exercise for the keywords reflecting on specific data collection methods. It does not reflect how many times these words have been mentioned in the 1323 articles. If a keyword appeared several times in one article, it was counted as one. Although this is a keyword search only, which has its limitations, it does give an impression of common methods used. Overall, it is unsurprising that qualitative methods seem more dominant, which is in fact a confirmation of review results found by Fejes and Nylander (2015; see also Chap. 7), based on top cited papers. It is also important to underline that not all papers contain one of these keywords. For readers familiar with these journals, it is also not entirely surprising, as a range of papers have the nature of non-empirical contributions such as theoretical reviews or policy-oriented analyses.

Looking at journals articles published between 2000 and 2017, it thus remains a valid claim that quantitative research is underrepresented in adult education research. Statistical terms like regression and ANOVA do not feature commonly in papers. Experimental or quasi-experimental designs generating data for statistical analyses are nearly non-existent in the generic adult education literature. The term 'mixed methods' was also only found on a limited number of occasions, as can be seen from Table 8.1.

As an adult education scholar who mainly engages with large quantitative datasets, I want to open up a debate on the use of quantitative methods with fellow schol-

Table 8.1 Number of journal articles featuring methodological keywords

Qualitative	584	Quantitative	216
Interview	113	Questionnaire	143
Focus group	78	Regression	47
Participant observation	49	Correlation	34
Mixed methods	21	ANOVA	30
		Quasi-experimental design	3

Source: own analysis

ars. I want to do this through engaging in discussions of what types of data and quantitative tools are available for inclusion in academics' own research. In what follows, I will distinguish between two different ways of working with quantitative data. First of all, researchers can collect primary data themselves, and I will engage in a discussion on scales available to integrate in questionnaires. Secondly, I will critically discuss the potential role of secondary data analysis in adult education research, referring to some of the major datasets available for the scholarly community.

8.5.2 Primary Data in Quantitative Research

When deciding to collect your own quantitative data, it is important to understand you are likely going to work with a fixed research design. As Robson (2011) explain, research using fixed design need to have in-depth reflections on how to construct their questionnaires. Changing the research instrument once the data collection phase has started will not be possible anymore. Generally speaking, a survey methodology will be set up to undertake this type of quantitative research (Andres 2014; Bryman 2012). When designing the questionnaire, as recommended by Cohen et al. (2011), drawing on work by Sellitz et al. (1976), it is important to decide how question will be worded, and whether specific answering options will be included, for example through Likert scales, drop down lists, checklists are ratings. The way in which the questions and answers will have to be formulated will also depend on whether data will be collected through a postal, online, telephone or face-to-face survey mode (see Fink 1995). As Brinkmann and Kvale (2014) argue, clear procedures for data collection need to be put in place as surveys tend to be structured and fixed.

When designing a new survey questionnaire, one of the best starting points is too explore existing survey instruments. Where possible, it might be useful to borrow questions and scales from these existing survey questionnaire, as this is likely to increase the validity and reliability of your own research project. As mentioned above, qualitative studies tend to be harder to replicate, while existing scales can be used multiple times, e.g. in different types of contexts or with different groups of respondents.

Going back to the core aim of this chapter, it is important to provide an overview of existing survey questionnaires and quantitative scales available in the adult education literature. While it will be impossible to discuss every single questionnaire and their questions in detail within the word limits of a book chapter, it is important to increase familiarity with existing scales among the adult education readership. Despite the limited presence of quantitative research in the leading adult education journals, as discussed before, a number of standardised scales have been found. Interestingly, most of these scales collected data using Likert items (e.g. 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree) (Likert 1929). In order to present these scales in a structured way, I decided to group them into four categories based on their content, following my own interpretation of the papers: (1) participation scales, (2) experiences scales, (3) psychometric scales and (4) learning styles scales. The scales are being presented in Table 8.2 and discussed below using the four catego-

ries. As can be seen from the overview, most of the articles using quantitative scales were published in Adult Education Quarterly. The only category in which AEQ articles are not in the majority, concerns the group on learning style scales. Deeper investigation, for example by using content analysis, might reveal whether this is the case more general, regardless the use of specific methodologies and methods.

8.5.2.1 Participation Scales

First of all, and probably the most well-known scales in adult education research related to **participation** in adult education. The following scales were found based on the analysis in QDA Miner. Boshier (1971) developed the *'Education Participation Scale'* as a further empirical testing and validation of Houle's typology of adult learners, distinguishing between goal-oriented, activity-oriented and content-oriented learners (Houle 1961). In the past 15 years, the scale has been used to discover the motivations of African American adult learners in church-based education (Isaac et al. 2001). Boshier was also involved in a project measuring the

Table 8.2 Overview of quantitative scales as found in the leading adult education journals (N = 23 articles)

Participation scales (N = 5 articles)	Experiences scales (N = 4 articles)	Psychometric scales (N = 8 articles)	Learning style scales (N = 6 articles)
Education participation scale *Isaac* et al. (2001) *AEQ* *Boshier* et al. (2006) *AEQ* *Boeren and Holford* (2016) *AEQ*	Noel-Levitz adult student priorities survey *Giancola* et al. (2008) *AEQ*	Motivated strategy for learning questionnaire *Justice and Dornan* (2001) *AEQ*	Personal responsibility orientation to self-direction in learning scale *Stockdale and Brockett* (2011) *AEQ*
Reasons for participation scale *Mulenga and Liang* (2008) *IJLE*	Power and influence tactics scale Problem solving inventory *Hendricks* (2001) *AEQ*	Abbreviated math anxiety scale Mathematics self-efficacy scale Self-description questionnaire III-math subscale *Jameson and Fusco* (2014) *AEQ*	Oddi continuing learning inventory *Harvey* et al. (2006) *AEQ*
Adult attitudes towards adult and continuing education scale *Blunt and Yang* (2002) *AEQ*	Meanings of learning in later life *Tam* (2016) *IJLE* *Tam and Chui* (2016) *SCE*	Beck anxiety inventory *Carney-Crompton and Tan* (2002) *AEQ*	Student engagement questionnaire *Lee* (2014a, b) *IJLE*

(continued)

Table 8.2 (continued)

Participation scales (N = 5 articles)	Experiences scales (N = 4 articles)	Psychometric scales (N = 8 articles)	Learning style scales (N = 6 articles)
		Academic self-efficacy scale parental self-efficacy scale Work-family balance Scale Extended satisfaction with life scale *Van Rhijn and Lero* (2014) *IJLE*	Approaches to supervision scale Supervision practices Scale Supervision outcome Scale *Lizzio* et al. (2005) *SCE*
		General self-efficacy Scale *Bath and Smith* (2009) *SCE*	Learning to learn scale *Vainikainen* et al. (2015) *IJLE*
		Self-concept and perceived problem-solving skills scales *Porras-Hernandez and Salinas-Amescua* (2012) *AEQ*	TPD@work scale *Evers* et al. (2016) *SCE*
		Borg CR-10 scale *Piirainen and Viitanen* (2010) *IJLE*	
		Self-efficiacy scale Adult learning strategies scale Self-reported engagement scale *Rothes* et al. (2017) *AEQ*	

motivation of adult learners in Shanghai, measured through his Education Participation Scale (Boshier et al. 2006). Boeren and Holford (2016) report on research undertaken in a large scale European project that undertook a survey with adult learners which included parts of the Education Participation Scale. While Mulenga and Liang (2008) refer to Boshier's scale, they used the *'Reasons for Participation Scale'* developed by Steele (1984) to measure participation of adults studying at the Open University in Taiwan. Factors discussed were 'keeping up and fulfillment', 'intellectual stimulation', 'escape and social contact' and 'adjustment'. Another scale developed to specifically predict participation behaviour in adult education is the *'Adult Attitudes towards Adult and Continuing Education Scale'* (Blunt and Yang 2002). Their scale consists of nine items relating to three factors: 'enjoyment of learning', 'importance of adult education' and 'intrinsic value'. Drawing on attitudinal work undertaken by Fishbein and Ajzen (1975) to explain planned and intended behaviour, Blunt and Yang (2002) expand on the importance of positive attitudes towards learning in relation to adult education participation.

To conclude, five articles were found in relation to participation studies, four of them in Adult Education Quarterly and three of them using (parts of) Boshier's Education Participation Scale.

8.5.2.2 Scales Measuring Learning Experiences

A second group of scales found in the leading journals relates to the **experiences** of adult learners, mainly in relation to their participation in a specific setting. While 'experiences' are often perceived as ideally measured through qualitative research (e.g. Thomas 2009), quantitative scales equally attempt to capture feelings and experiences, although the presentation of the analysis will be more static and numerical, answering 'what' or 'how' people feel, instead of 'why' they feel a certain way. The following scales were identified.

Giancola et al. (2008) used the '*Noel-Levitz Adult Student Priorities Survey'* which consists of a scale with 50 items, divided into eight subscales on 'academic advising', 'academic services', 'admissions and financial aid effectiveness', 'campus climate', 'instructor effectiveness', 'registration effectiveness', 'safety and security' and 'service excellence' in order to study the differences between priorities of adult versus first generation students. Experiences in relation to program planning in adult education, from the perspectives of both students and staff members were measured through the *'Power and Influence Tactics Scale'* (POINTS) and the *'Problem Solving Inventory'* in the work of Hendricks (2001). The authors argue for a further testing of the POINTS instrument in order to enhance the reliability of the scale and to test the construct of power and influence in a wider range of settings with diverse samples. To date, no other research using POINTS has been published in one of the three leading adult education journals. Another type of research that investigates experiences of learners drawing on quantitative scales has been undertaken by Tam (Tam 2016 and Tam and Chui 2016). In her research, 6-point Likert items are used in relation to the *meaning of learning in later life*, but also the barriers to learning experienced by older adults.

In total, four articles were found to focus on learning experiences, a theme often perceived as leaning itself towards the use of qualitative methods. Two out of four articles where work by Tam.

8.5.2.3 Psychometric Scales

Scales are often used in psychological – **psychometric** – research and it is thus not surprising to see that, based on the analysis, a group of measurement instruments relate to concepts like anxiety and self-efficacy and these type of scales can be identified as a third type. The *'Motivated Strategy for Learning Questionnaire'* was used by Justice and Dornan (2001) to explore metacognitive differences between traditional and non-traditional students and focuses on factors like test anxiety, self-efficacy and self-regulation. Anxiety in relation to mathematics courses was assessed

by Jameson and Fusco (2014) using items from the *'Abbreviated Math Anxiety Scale'* as well as the *'Mathematics Self-Efficacy Scale'* and the *'Self-Description Questionnaire III-Math Subscale'*. Anxiety has also been a central feature of the work conducted by Carney-Crompton and Tan (2002). Their work investigated the academic performance and psychosocial functioning of female non-traditional students in Canada. They used the *'Beck Anxiety Inventory'* which consists of 21 anxiety items and which has, according to previous research, a strong internal consistency. Self-efficacy has also been the main variable in research conducted by Van Rhijn and Lero (2014) with Canadian student parents. They used the *'Academic Self-Efficacy Scale'* as well as the *'Parental Self-Efficacy Scale'*. Also the *'Work-Family Balance Scale'* was included in their measures. The project revealed that parent students' self-efficacy matches their satisfaction in relation to being a student and a family member, with satisfaction measured through use of the *'Extended Satisfaction with Life Scale'*. Apart from the academic and parental scales, there is also a *'General Self-Efficacy Scale'* which had been used by Bath and Smith (2009) to analyse propensities of lifelong learners. The theme of self-efficacy returns in the paper by Rothes et al. (2017), who delve deeper into the motivation of adult learners based on the *Self-Efficacy Scale*, the *Adult Learning Strategies Scale* and the *Self-Reported Engagement Scale*. In understanding the non-participation of adults, Porras-Hernandez and Salinas-Amescua (2012) worked with the *'Self-Concept and Perceived Problem-Solving Skills Scales'* and found that non-participation of poorly educated women cannot solely explained by their dispositional characteristics. A scale that is different from the previous ones but which probably best fits in the category on psychometrics is the *'Borg CR-10 scale'* used by Piirainen and Viitanen (2010) in a project on community development based on individual expertise.

With eight articles, this category on psychometric scales is the largest group. This is not entirely surprising as quantitative research using scales is not uncommen in psychological research.

8.5.2.4 Scales Measuring Learning Styles

A fourth group of scales as found in the leading journals relates to **learning styles**, some of them specifically focussing on self-directed learning. The following scales were found. Stockdale and Brockett (2011) reviewed the literature on self-directed learning and developed a new *'Personal Responsibility Orientation to Self-Direction in Learning Scale'* (PRO-SDLS), providing the scholarly community with an improved measurement instrument replacing the *'Self-Directed Learning Readiness Scale'* (Guglielmino 1977). Another instrument to study self-directed learning, the *'Oddi Continuing Learning Inventory'* (OCLI) was used by Harvey et al. (2006), proposing a four factor structure based on 'learning with others', 'learner motivation/self-efficacy/autonomy', 'ability to be self-regulating' and 'reading avidity'. The development and learning of students has also been studied using a modified version of the *'Student Engagement Questionnaire'* by Lee (2014a, b) which consists of a range of items related to 'critical thinking', 'self-managed learning' 'adaptability', 'problem-solving', 'communication skills', 'interpersonal skills and

group work', 'computer literacy', 'active learning', 'teaching for understanding', 'feedback to assist learning', 'assessment', 'teacher-student relationship' and 'student-student relationship'. Within the specific context of supervision for practising psychologists, Lizzio et al. (2005) constructed the *'Approaches to Supervision Scale'* to analyse supervisees perceptions of teaching and management approaches used during the supervisory process, one in relation to themselves and one in relation to the approaches used by their supervisor. These scales were conducted together with a *'Supervision Practices Scale'* and a *'Supervision Outcome Scale'* to measure the use of supervision techniques and the effectiveness of supervision. Vainikainen et al. (2015) report on the *Learning To Learn (TLT) Scale*, an instrument they have used with a longitudinal follow-up study with more than 600 pupils in Finland and which they correlated with scores on complex problem solving. The *TPD@Work Scale* developed by Evers et al. (2016) concentrates on the further learning of teachers after graduation and contains dimensions on experimenting, reflecting and collaborating.

To recap, six articles were found to use scales in relation to the category of learning styles. As mentioned above, only two of them were published in Adult Education Quarterly, the journal which has more articles using scales compared to Studies in Continuing Education and International Journal of Lifelong Learning.

8.5.3 Secondary Data in Quantitative Research

Researchers who want to undertake quantitative research can also choose to work with existing datasets.[1] While technically speaking, every existing dataset might be labelled as a secondary data set, researchers usually refer to major datasets collected by leading international organisations or by major research projects. Smith (2008, p.37) discussed that *'secondary data analysis remains a relatively underused methodological technique in in the social sciences'*. This might, according to Smith (2008) have to do with scholars' scepticism about the quality of secondary datasets, referring to the danger of having to deal with high levels of missing values and measurement errors, or because scholars feel these datasets are too much reducing the complexities of everyday life into a spreadsheet. However, as Smith (2008) argues, a range of datasets are available for free and can be used to analyse a range of research questions. As education policies are nowadays largely driven by benchmarks and indicators, the exploitation of datasets by scholars is being encouraged in large scale projects (Holford and Mohorcic-Spolar 2012).

Currently, one of the major datasets of interest to adult education scholars is based on data from PIAAC's (Programme for the International Assessment of Adult Skills) Survey of Adult Skills, organised by the OECD. PIAAC's interest is in read-

[1] Because of the word limit of this book chapter, it will be impossible to discuss each survey and its questionnaire in detail. However, both the OECD's PIAAC and the Eurostat website contain detailed documentation relating to their surveys and can be consulted for free.

ing, writing and problem-solving skills of adults, but the dataset includes relevant information in relation to a wider range of lifelong learning variables, including participation. The Survey of Adult Skills is in fact a follow-up study from The International Adult Literacy Survey, which was also organised by the OECD and was conducted in three waves between 1994 and 1998 (Desjardins et al. 2006, p.28). Desjardins et al. (2006, p.27) mention that IALS *'is one of the most complete of all surveys undertaken'*, while other OECD sources exist too, mentioned by Desjardins et al. (2006, p.28–29) as:

- 'the International Adult Literacy Survey (IALS)'
- 'the Adult Literacy and Lifeskills Survey (ALL)',
- 'the Thematic Review on Adult Learning (TRAL)' and
- 'the Programme for the International Assessment for Adult Competencies (PIAAC)'.

The OECD is not the only international organisation that produces relevant datasets for use by adult education scholars. Surveys organised at the level of the European Commission include:

- 'the European Labour Force Survey (LFS)',
- 'the Adult Education Survey (AES)',
- 'the Continuing Vocational Training Survey (CVTS)',
- 'the European Survey on Working Conditions (ESWC)' and
- 'the Eurobarometer on lifelong learning'.

Going back to the data mining exercise, results indicate that *International Journal of Lifelong Education* had nine hits for the key term 'IALS', but has in fact only one research article that draws on data from the Survey in an aggregated form (Bathmaker 2007). *Studies in Continuing Education* has four hits for IALS, but none of the papers can be classified as an example of secondary data analysis using data from IALS. The term has thus been used within another section such as within the literature review. *Adult Education Quarterly* only shows two hits for IALS, none of them analysing data from IALS. The paper from Rubenson and Desjardins (2009) exploring the Bounded Agency Model refers to IALS but draws on data from the Eurobarometer 2003. Searching for the full key term 'International Adult Literacy Survey' instead of the acronym IALS does not increase the number of papers that can be classified as secondary data analysis papers.

The specific adult education dataset provided by the European Commission is based on the Eurostat Adult Education Survey (AES). *Adult Education Quarterly* features a paper from Boyadjieva and Ilieva-Trichkova (2017), exploring adult education participation. In *Studies in Continuing Education*, I found one paper (Boeren 2011) drawing on the Adult Education Survey. In *International Journal of Lifelong Education*, I found two papers that draw on aggregated data from AES. One by Broek and Hake (2012) in relation to adults' participation in higher education and one by Roosmaa and Saar (2012) on non-formal education in the old EU member states. In recent years, papers using PIAAC data have started to appear. Lavrijsen and Nicaise (2017) published about systematic obstacles to lifelong learning in

Studies in Continuing Education, and Krupar et al. (2017) drew on PIAAC data for their study on nonformal education, immigration and skills, published in *Adult Education Quarterly*.

The limited availability of research drawing on secondary data analyses in our field might indicate the limited interest or lack of skills in working with these data sources.

8.6 Limitations, Discussion and Conclusions

Research in the social sciences can be carried out using a range of methods and methodologies, as discussed earlier in this chapter. This might enhance the quality of knowledge discovery in the area, for example through combining methods or through exploring similar topics through different methodological angles (Robson 2011). A starting point of this chapter was the observation made by Fejes and Nylander (2015; see also Chap. 7) that quantitative research is underrepresented in the leading generic academic adult education journals. This finding has also been confirmed in this chapter based on my own data mining exercise.

In undertaking these types of reviews, it is important to remain critical and discuss its limitations. For example, the review only included three generic adult education journals: Adult Education Quarterly, Studies in Continuing Education and International Journal of Lifelong Education. Although they are the leading journals in the field, more specialist journals in the wider field of adult education, for example on workplace learning, were not taken into account. Much of the research undertaken by policy-oriented organisations, like the OECD and the European Commission contain lots of quantitative data and results (e.g. based on PIAAC data) are generally present within their own or commissioned research reports. However, these types of research results do usually not end up in the generic adult education journals. It would thus be interesting to undertake a similar review exercise, but with another range of journals, e.g. those that deal specifically with workplace learning and Vocational Education and Training. At this moment, it is unclear whether it would generate similar findings. This might be the case, or not, which might indicate that quantitative research tends to be published in more subfield specific journals.

A recent article in Adult Education Quarterly by Daley et al. (2018) discussed the situation of the lack of quantitative research in adult education and made the argument that the pendulum has swung too far to the side of qualitative studies. Their article, written as an AEQ Forum Discussion Paper as a reflection on an earlier version of this chapter published in AEQ (see Boeren 2016), calls for more debate on the need for a methodologically more diverse research field. They also highlight the strengths of quantitative research as it contains *'measurements that can be reliably duplicated by researchers using similar tools, methods and criteria'* (p.160). While in the past, the pendulum seem to have swung toward to quantitative side of the methodological spectrum, it is now clearly positioned at the qualitative side. I agree

with Daley et al. (2018) that it might be more healthy for the adult education research community to bring the pendulum back towards the middle, in which there is a balance between the use of quantitative and qualitative methods, or both. As seen from the review exercise, quantitative scales exist to measure concepts like learner experiences and learning styles, and do also have the potential to give a voice to the learners themselves, as often centralised in qualitative research. These areas of interest can thus be studies using both quantitative and qualitative approaches, and in accordance with Daley et al. (2018) it would be good to go back to a field where choices for research methods flow from research questions instead of the other way round. Including more quantitative studies would make it possible to include larger samples and to validate each others' work. It is clear from bibliographic work that quantitative studies do tend to cite each other more, and to offer more follow-up work, building on previous findings (Fejes and Nylander 2015; see also Chap. 7). Both in Daley et al.'s and my own contribution, these suggestions are not being made to undermine qualitative research in the field of education, but as a way to call for a wider debate on the methodological imbalance we are currently seeing.

One of the aims of research, on top of the general knowledge generation, can also be to influence debates in policy and practice., It is in fact interesting that – and contradictory at the same time – so few scholars in the field engage with the large scale datasets being available to them. Big data, benchmarks and indicators and measurable goals are part of the core jargon used by the leading international organisations like the European Commission and the OECD. McFarland et al. (2016) called the increased focus on big data *'a watershed moment for the social sciences'* (p.12). The sharp expansion of big data discourses also comes with the need for researchers to use different types of analytical techniques. Examples include machine learning and other forms of Artificial Intelligence. Are researchers feeling uncomfortable in working with big data because of the strong neo-liberal and capitalist focus of current policies? And do policy-makers then not believe in the power of qualitative studies, which are often smaller in scale, to provide an evidence-base for policy changes? Whether adult education scholars like big data or not, it is a clear reality these days that 'numbers' do no not exclusively belong to the field of mathematics, but have gained significant power in influencing the work of administrations and governments (Desrosières 1998). As a research community, we need to be careful that we do not loose oversight of the newest developments in social sciences research and that we remain able to participate in interdisciplinary research projects in which these big data techniques are being used. A specific example of a project in the field of adult education in which Artificial Intelligence is being used in the Horizon 2020 project ENLIVEN: Encouraging Lifelong Learning for an Inclusive & Vibrant Europe.[2] In the call for proposals, the European Commission explicitly asked consortia to develop an Intelligent Decision Support System, underpinned by Artificial Intelligence, designed to help policy makers reach more effective and efficient policy decisions to help younger vulnerable adults to return to education or employment. While more details on this project can be

[2] See http://www.h2020enliven.org

found at the website in footnote, the realisation of this tool is worked out as an interdisciplinary approach between a team of computer scientists and social scientists. Unsurprisingly, this work has a strong quantitative nature.

As highlighted before by Fejes and Nylander (2015; see also Chap. 7) the strong focus on qualitative methods in the field means that not many new doctoral students undertake quantitative studies as most of their supervisors will be specialised in the use of qualitative methods. More skills training and specific methodological resources on how to deal with quantitative research in adult education might be needed. As suggested by Daley et al. (2018), not only in relation to postgraduate education, but also through running workshops on quantitative data methods during conferences and workshops organised by the learners societies in the field, or to pointing scholars out to existing training initiative.[3]

Last but not least, as discussed above, sound research designs tend to flow from the specific research questions we want to answer. In my view, there is no doubt that the adult education field has still important knowledge gaps to fill which would profit from the use of quantitative methods.

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[3] For example the Essex Summer School in Social Science Data Analysis (see http://www.essex.ac.uk/summerschool/)

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