A within-person theoretical perspective in sales research: outlining recommendations for adoption and consideration of boundary conditions

Abstract

In the sales literature it is standard practice for researchers to collect cross-sectional data from multiple salespeople, and to compare those salespeople on the data obtained. This between-person approach is suitable for research aiming to draw conclusions between salespeople. However, many salesperson processes are dynamic and vary within salespeople over time, requiring datasets with repeated-measures. This article highlights the need to adopt a within-person theoretical perspective in sales research. Critically, the article shows how our present understanding of boundary conditions may change depending on whether a between-person or within-person level of analysis is adopted. Using examples from the sales literature, we show how the practical implications from between-persons research designs do not necessarily generalize to the within-person level. Further, we explain the methodological and analytical considerations that researchers must account for when undertaking within-person research. Furthermore, the article provides decision criteria that help to identify when within-person analysis should be conducted, outlining analysis tools that are capable of correctly estimating within-person effects without bias. Examples of how within-person research can enhance theory within future sales research, and how within-person research may influence management implications are also discussed. Finally, potentially remedies to within-person research barriers are given.

Keywords: within-person, level of analysis, intra-individual, disaggregation, longitudinal, repeated-measures.

Introduction

Generating a better understanding of the world in which we live is a fundamental objective of all research, whether the aim is to create new theory, or to generate a better understanding of an already existing theory. Busse, Kach, and Wagner (2017) explain that theory in its most general sense pertains to answering the *what*, *how* and *why* questions, whereas the boundary conditions to a theory explain the *where*, *when*, and *for whom* questions. Developments in research methods allow us to continually test new theories, as well as the boundary conditions of existing theories. One such development is longitudinal modeling, which allows researchers the opportunity to explore how things change over time (Curran and Bauer 2011).

On this front, Bolander, Dugan, and Jones (2017) advocate the need for increased consideration of longitudinal designs in general in salesforce research. One key advantage of longitudinal research Bolander, Dugan, and Jones (2017) touch on is the ability to conduct a within-person analysis, providing that repeated-measures data is available. However, it is important to distinguish between longitudinal research in general, and the special case of repeated-measures data. An example of a longitudinal data set without repeated-measures is seen in Guidice and Mero's (2012) study which measures variables at three separate time points, yet the authors do not measure any variable more than once. Not all longitudinal research incorporates repeated-measures data, but all data sets with repeated-measures are by definition longitudinal. Repeated-measures data is the only type of data which allows the researcher to study within-person effects, which itself is the only way it is possible to study intra-individual changes in key concepts of interest. Change itself may be uni- or multivariate. Univariate change refers to change in only one variable, typically the dependent variable. An example of a study focused on univariate change is that of Ahearne, Lam, Mathieu, and Bolander (2010) in which the authors examine changes in sales performance. Multivariate change refers to change in more than one variable (MacCallum, Kim, Malarkey, Kiecolt-

Glaser, 1997). An example of this is Viswanathan, Li, John, and Narasimhan (2018)'s analysis of how changing a salesperson's incentive structure influences intra-individual effort allocation and sales performance.

A close reading of a large number of existing sales research studies shows that many of them are concerned with testing hypotheses that implicitly describe within-person processes, and that others fail to distinguish between-person from within-person processes. For example, consider an archetypal hypothesis such as 'salesperson adaptiveness increases sales performance' (e.g., Singh and Das 2013). This hypothesis could be describing one of at least two different expectations of what we might observe in the real world. In a between-person sense, the researcher might be intending to imply that 'relative to salespeople who display low adaptiveness, salespeople displaying higher adaptiveness exhibit higher sales performance'. Alternatively, in a within-person sense, the hypothesis can be seen to be saying that 'as an individual increases their adaptiveness, their performance increases'. In the worst case, the researcher specifying the hypothesis may not give any thought as to which of the two they are interested in. However, these two versions of the hypothesis are not interchangeable. They may both be true, one may be true, or neither. Without repeated-measures of adaptiveness and performance over time for individual salespeople, it is impossible to test anything more than the between-person hypothesis.

Beyond this, the implications of each hypothesis for sales management practice are not necessarily interchangeable. If the between-person hypothesis is correct, such that compared to salespeople displaying low adaptiveness, salespeople displaying higher adaptiveness exhibit higher sales performance, an implication might be "employ people who display more adaptiveness". However, it is *not* necessarily the case that one can also suggest that managers should "train employees to display more adaptiveness" (see Molenaar 2004). Why? It is possible that a salesperson who increases their adaptiveness may not experience an increase

in their sales performance, but experience a decrease in their sales performance instead. Specifically, it may be that in order for a salesperson to increase their adaptiveness, they must exert additional effort or expend additional resources on adaptation activity, diverting effort and resources away from selling; if so, at some point, the performance benefits gained from an individual increasing their adaptiveness may be outweighed by the performance losses accrued from reduced selling activity. Only a within-person study can tell the researcher what happens when salespeople's adaptiveness levels increase.

Furthermore, many processes of interest to sales researchers and practitioners are dynamic, meaning they evolve over time (Little 2013). One cannot make assumptions of the influence of individual changes based simply on comparing individual salespeople against each other. Unfortunately, however, researchers continue to make within-person assumptions about the implications of their research findings, despite conducting between-person analyses. Krishnan, Netemeyer, and Boles (2002) for example, draw the implication that a self-efficacy enhancing training program should increase a firm's long-term profitability. However, their research compares the self-efficacy of different salespeople, at no point examining whether individual changes in self-efficacy influence profitability. Since within-person relationships are often not consistent with their between-person counterparts (Molenaar 2004), the between-person design of the study can only support the implication that hiring employees who are higher in self-efficacy results in higher firm profitability. We see here clearly how within-person research helps illuminate boundary conditions, in that boundaries may not be consistent across contexts (Busse, Kach, and Wagner 2017).

The present paper aims to outline the key importance of understanding within-person theoretical models, and, correspondingly, of incorporating within-person data collection and analytic designs. We thus address how taking account of within-person effects should serve to help explicate a number of key boundary conditions in existing sales research (e.g., Busse,

Kach, and Wagner 2017). In doing so, we advance also the research agenda of Bolander, Dugan, and Jones (2017), who advocate the use of latent growth modeling in longitudinal sales research. Our contribution to this stream of work is to, (1) explicitly focus on within-person theory and repeated-measures empirical research, providing methodological and analytical considerations specific to conducting within-person analysis, and (2) identify analysis frameworks that are specific to dealing with different within-person research questions. Therefore, the current research is designed to help researchers more fully realize their theoretical goals and avoid confusion between general longitudinal and specifically repeated-measures designs.

For ease of exposition, we frame our work along the lines of a typical empirical paper in sales management. That is, we outline the state of within-person research in extant sales literature and discuss the importance of understanding within-person concepts when theorizing. We follow this with an outline of the key methodological and analytic considerations of importance when conducting within-person research. Succeeding this, we show how a lack of consideration of within-person concepts can lead to serious problems in drawing useful implications from sales management work. As a common thread, and to show the importance of understanding within-person research, we use the example of literature that examines salesperson self-efficacy. Our aim is to provide guidance to sales research on how to adequately conduct within-person research, and thus discover and test new and important boundary conditions to sales force theory. To this end, while our primary focus is on understanding the implications of a within-person approach to theory, we also provide a decision tool which explains the different forms of within-person analysis researchers can undertake, alongside providing specific analysis techniques that can be used to conduct each type of analysis. Finally, within-person research barriers are discussed, with potential remedies given.

Within-person research within sales literature

It is likely that in a substantial majority of selling and sales management theory there is a need for clarity as to whether the theory relates to the within-person level, the between-person level, or both. In each situation it is vital that researchers clarify which level they are dealing with, since it should influence both their research design, and the implications they draw from their work. As an illustration, we look at all the quantitative sales articles published in the *Journal of Personal Selling & Sales Management, Journal of Marketing, Journal of Marketing Research, Journal of Business Ethics, and Journal of the Academy of Marketing Science* over the last 10 years. The data set comprises 235 articles, of which only 73 articles explicitly discuss whether their research is conducted at a within- or between-person level (or both). A close analysis of these 73 articles identifies that the level of analysis is only discussed when studies use experimental or longitudinal research designs, or utilize multilevel analyses.

Furthermore, of the 235 articles in the data set, 37 use a longitudinal research design, where both between- and within-person levels of analysis can be addressed, while the remaining 198 studies utilize cross-sectional data, and consequently are unable to examine within-person change, limiting the studies to only a between-person level of analysis. Despite this latter fact, 28 of the 198 cross-sectional articles discuss hypotheses that can be considered consistent in some way with within-person logic. We do not wish to highlight individual papers here. However, typical examples of the inconsistencies include: hypotheses which suggest change in one variable may influence change in another (ambiguous as to whether the change is within or between people), hypotheses which argue that increasing levels of variable *x* leads to some performance outcome (implies a within person change), and a number of studies that actually use theory consistent with within-person logic to justify their hypotheses, but use a between-person design to test the latter. These results demonstrate that (a) sales research

articles often are not explicit in considering within-person or between-person levels of analysis[1], and that (b) research can be ambiguous or vague in terms of the level of analysis chosen.

Theorizing at the within-person level

To illustrate the importance of clearly delineating between within- and between- person levels when theorizing, we now employ the concept of *self-efficacy*. Self-efficacy is defined as a person's belief in their capabilities to successfully complete a task (Gupta, Ganster, and Kepes 2013), and is widely considered an important variable in sales performance models (Fournier et al. 2010). Over 30 articles in the sales domain examine self-efficacy's relationship with various aspects of salesperson performance, finding unanimously that salespeople with higher self-efficacy perform better than those lower in self-efficacy. The latter finding is not unique to the sales literature: across a wide range of contexts, self-efficacy levels are often found to be positively related to higher performance outcomes (Stajkovic and Luthans 1998), and as a result, it is generally accepted among those in the sales research field that higher self-efficacy in salespeople is desirable (e.g., Gupta, Ganster, and Kepes 2013; Krishnan, Netemeyer, and Boles 2002). However, research in the sales domain does not explore the correlates of self-efficacy with repeated-measures data, so ruling out the possibility of drawing within-person conclusions.

Building on the seminal work of Vancouver, Thompson, and Williams (2001), research in fields outside the sales domain indicates that a number of significant boundary conditions to the self-efficacy/performance relationship may be evident when a within-person level of

[1] Note: Within- and between-person levels of analysis are not the same as those discussed in Johnson, Friend, and Horn (2014). In their article, a 'within' analysis refers to relationships within organizations, and not within-individuals over time.

analysis is adopted. Indeed, at the within-person level, the relationship between self-efficacy and performance is decidedly equivocal. Some studies find a positive effect of intra-individual increases in self-efficacy on individual performance (e.g., Seo and Ilies 2009; Gilson, Chow, and Feltz 2012), some find a negative effect (e.g., Vancouver and Kendall 2006; Yeo and Neal 2006), and yet others find a null effect (e.g., Richard, Diefendorff, and Martin 2006; Beattie et al. 2011). As such, we might infer that there are at least some potential moderating factors acting at the within-person level, and thus in respect of a relationship that is seemingly well-established in sales research based on research conducted at the between-person level, new potential boundary conditions must be considered. For example, both Schmidt and DeShon (2010), and Beattie et al. (2016) find that performance feedback ambiguity moderates the within-person relationship between self-efficacy and task performance, such that under high ambiguity conditions, within-person self-efficacy increases are negatively related to within-person task performance, whereas in low ambiguity conditions within-person self-efficacy increases within-person task performance. Conversely, in contrast to the *within*-person case, the *between*-person self-efficacy/performance relationship is positive under both ambiguity conditions (Schmidt and DeShon 2010). Another moderator - task complexity - also appears to highlight the potential for self-efficacy to have different performance relationships across levels of analysis. Beattie, Fakehy, and Woodman (2014) find that under low task complexity conditions, at the within-person level there is no evidence to support a relationship between within-person self-efficacy change and performance change; however, in a meta-analysis of the *between*-person self-efficacy/performance relationship (Stajkovic and Luthans 1998), self-efficacy demonstrates a positive relationship with performance.

Finally, when considering mediation as another boundary condition to the self-efficacy/performance relationship, effort allocation is shown to be the primary mechanism by

which self-efficacy influences performance (Bandura 1997). As such, it is theorized that those high in self-efficacy will exert more effort than others; this, in turn, leads to greater performance. In between-person analyses, results provide consistent empirical support for these latter relationships (e.g., Stajkovic and Luthans 1998). However, research examining within-person changes suggests that in cases where individuals *already have* high self-efficacy, increasing their self-efficacy further can be detrimental to performance; that is, a positive within-person change may actually *reduce* a person's effort, resulting in lower performance (Beck and Schmidt 2012).

It is clear, then, that considering the within-person level of analysis can highlight potential boundary conditions in previously well-established theories. Indeed, psychologists argue that the within-person level is the fundamental unit of importance within psychological research (McArdle and Nessleroade 2014; Hoffman 2015). This is due to the fact that processes in the real world are, almost by definition, rarely static (Curran and Bauer 2011). Indeed, a considerable portion of applied psychology deals with analyzing variance within individuals, for example how a variable and its relationships evolve over time. This is in contrast to the state of current research in sales, where the majority of studies *compare* individuals (*inter*-individual differences), rather than look at the process *within* individuals. Moreover, looking only at between-person variance is a danger to the conceptual integrity of research (Voelkle et al. 2014). This is not to say that between-person research is itself a pointless endeavor; in fact, quite the opposite. Understanding what makes people different and why they are different represents an important contribution to research. In reality, however, a combination of between-person and within-person processes characterizes the real world; thus, understanding *between-person differences in within-person change* constitutes valuable knowledge to researchers (Beck and Schmidt 2012).

Interestingly, within-person research is gaining traction outside of the sales literature (e.g., Curran et al. 2014; Voelkle et al. 2014; Cowan and Taylor 2015). Outcomes, predictors, and boundary conditions may all differ at the within-person level from what is accepted at the between-person level (Hulin, Henry, and Noon 1990). Although many important sales variables evolve over time, to the best of our knowledge, only 23 articles in extant sales research examine within-person relationships, covering 13 research areas, as we outline in Table 1. This state of play provides significant opportunity for sales researchers to extend theory, since without within-person consideration, theories and tests provide only a static understanding of dynamic processes. In many current literatures, researchers can only speculate as to the intra-individual implications of their findings. One reason for the lack of within-person analysis might be the perceived challenges of collecting and analyzing repeated-measures data at multiple time periods. As such, we provide below an introduction to the key issues and techniques concerning within-person research, and where necessary, provide additional references for further reading. This is complemented by the identification of potential barriers, with potential solutions discussed.

INSERT TABLE 1 HERE

Despite the tendency for sales research to utilize cross-sectional designs, and so limit the potential implications of findings to between-person conclusions, it is rarely the case that a theory of human behavior can be understood exclusively by between-persons research (Molenaar, 2004). Employing the research themes that Schrock, Zhao, Hughes, and Richards' (2016) bibliometric analysis outlines, Table 2 provides examples of how current theory can evolve further by undertaking within-person analysis. Clearly, there is some confusion concerning levels of analysis within sales literature, and therefore within-person theory and its understanding requires further attention in this domain.

INSERT TABLE 2 HERE

Collecting and analyzing data at the within-person level

Longitudinal and within-person research are not the same thing; longitudinal research simply pertains to any study conducted over time, whereas within-person analysis refers specifically to the level of analysis at which the research is conducted, and requires a repeated-measures design (Hoffman and Stawski 2009).

INSERT FIGURE 1 HERE

Figure 1 shows the variance components for any person-specific variable. Here it can be seen that there is a 'between-person' variance component that corresponds to differences between individuals on the variable in question, a 'within-person' variance component that corresponds to changes within an individual over time on the variable in question, and a 'between-person differences in within-person change' variance component which corresponds to differences between people in the extent to which they change over time on the variable in question. As such, the variance of any variable collected in a repeated-measures design can be decomposed into a 'within' and a 'between' component (Hoffman and Stawski 2009), and measuring the within-person variance component is not possible without repeated-measures.

Cross-sectional research designs can only analyze between-person variance components. Longitudinal designs, on the other hand, can be structured to examine between-person variance, within-person variance, or both, providing that one has repeated-measures of the variable. Relating this back to theoretical concerns, within-person research infers changes at

the intra-individual level over time, whereas between-person research examines differences at the inter-individual level, either longitudinally or at a snapshot in time (Hoffman and Stawski, 2009). Different types of data are required for different levels of analysis. Purely within-person research requires time series data, which involves multiple measurements of (at least) one individual over time. However, to examine between-person differences in within-person changes, longitudinal panel data is required, where time-series data is available for multiple individuals. Of course, purely between-person research simply requires a cross-sectional dataset of multiple individuals at one time point. To aid readers in clearly delineating between the different levels of analysis, Table 3 provides comparisons of research hypotheses specified at different levels of analysis across a range of topics, alongside the type of data required to answer the different research hypotheses.

INSERT TABLE 3 HERE

Transferring these theoretical ideas to empirical concepts requires an understanding of the notion of variance. In short, and as seen in Figure 1, many variables of interest to sales scholars, such as resilience (Pangallo et al. 2015), can vary either within an entity over time, between different entities, or both. Self-efficacy, for example, can change over time within a person, and so the self-efficacy of each salesperson in a sample of salespeople may, in part, differ from other sample members at any given point in time, perhaps in response to feedback. Some variables, on the other hand, may be stable over time within individuals (perhaps conceptualized as stable traits), and thus will only demonstrate variance across individuals; neuroticism might be an example of this kind of variable (Rees, Breen, Cusack, and Hegney 2015).

The analysis of ‘within-person’ variance components has the aim of generating understanding about the stability or change *within* an entity over time, whereas analyzing the ‘between-

person' variance component is focused instead on building knowledge of differences *between* two or more individuals (Stewart and Nandkeolyar 2006). The typical unit of analysis for within-person research is individuals, yet researchers can apply the same concept to a team or an organization. However, in so doing, the researcher may miss valuable knowledge about individual processes within that specific team or organization, and thus the researcher's rationale for their choice must be justified[2].

To summarize the arguments to date, Table 3, in conjunction with the further reading articles given throughout, should help sales researchers gain a greater understanding of within-person theory; this is simply the first step in designing a strong within-person study. Below, we unpack the other key considerations of importance.

Methodological considerations

Types of change

Complicating the concept of change, Minbashian and Luppino (2014) outline two forms of change, namely short-term variability (also called fluctuation) and long-term change. Short-term fluctuations are typically tested hourly or daily, where levels of a variable fluctuate around a typical level. By contrast, long-term change can be tested over months or years, and typically implies a change in the base level over that time period. Of course, this is not to say that variables can demonstrate only one form of change; for instance, long-term change may occur with volatile, fast and dramatic ups and downs, or can occur in a slow and steady fashion (Minbashian and Luppino 2014). Take, for example, a salesperson's performance. Over a short period of time, such as a few months, a salesperson naturally experiences peaks and troughs in performance (fluctuations) around their base level, the latter of which is set

[2] Importantly, within-person research must not to be confused with research examining differences both within and between *companies* (e.g., Briggs, Jaramillo, and Weeks 2012), which is multilevel cross-sectional research, not dealing with intra-individual changes.

roughly by their ability. However, over a longer time period, a salesperson may attain new skills, and enhance their network, and as a result, their base level may increase. Furthermore, longer-term change in some variables (e.g., sales ability) may stabilize and plateau after a period of time following initial recruitment and training (Miraglia, Alessandri and Borgogni 2015). Thus, a salesperson's performance might show an initial pattern of fluctuating but rapid growth, followed by a slowing of growth, until ultimately, the salesperson's performance maintains a relatively stable level over time with only small fluctuations around this level (Thoresen et al. 2004).

Measurement Considerations

Within the context of the theory being considered, the researcher must determine how a variable is expected to change, specifically how often, and the number of times, a variable is to be measured. For some theories, variables measured at closer intervals will demonstrate stronger within-person relationships than variables measured at wide intervals: for example, salespeople's current performance may demonstrate a strong relationship with their previous month's self-efficacy change, but may not show any relationship with a self-efficacy change occurring 12 months previously. Other theories may demonstrate delayed within-person effects which take years to uncover, thus requiring longer intervals between measurements (Little, 2013). It is also worth bearing in mind that measurements can be taken at unequally spaced intervals, since there is no necessary requirement for equally spaced measurements (McArdle 2009).

As for the number of times one should take a measurement, repeated-measures at three different time points is technically enough to establish a linear trend, whereas four and five measurement occasions allow the researcher to test for quadratic and cubic trends, respectively (McArdle and Nessleroade 2014). Of course, these latter suggestions are the

minimum requirements, and more measurement occasions generally allow greater power to detect different relational forms (McArdle 2009). However, the demands of the repeated-measures design (e.g., on respondents) must be taken into account here. It is a general rule, certainly when collecting primary data - as is often necessary in sales contexts - that when a large number of measurement periods is required, data becomes much harder to collect.

Sample size and power

Although within-person data may be challenging to collect, it is imperative that the researcher understands sample size requirements: a large enough sample is needed to ensure that model testing has a reasonable chance of detecting the relationships of interest if they really exist. For multilevel models, power for the within-person level (level 1) is influenced by total sample size, while power for the between-persons level (level 2) can be enhanced by increasing the number of individuals[3] (Hoffman 1997). Furthermore, the effect size of the relationship of interest (Hertzog, Lindenberger Ghisletta and von Oertzen 2006) can influence the required sample size required for a given power, and one way to test a model's power is to conduct Monte Carlo simulations (Muthen and Muthen 2002). However, detailed discussion of these more technical concepts is well beyond our present scope, and further discussion on sample size and power can be found in Lu et al. (2013) and Guo, Logan, Glueck and Muller (2013), among others.

Analytical considerations

The methodological considerations we present above are critical elements in the design of a robust empirical study. Without a strong design, no amount of analytic sophistication can save a study. That said, of course, it is vital that researchers hoping to add within-person

[3] This is analagous to the 'groups' discussed in cross-sectional multilevel modeling literature.

research to their capabilities also understand a number of key analytical considerations. Indeed, while there is certainly a lack of longitudinal research in general within the sales field (Bolander, Dugan, and Jones 2017), simply calling for increased consideration of longitudinal research may not solve the paucity of within-person research. As we demonstrate above, some longitudinal designs do not produce data suitable for within-person analysis (Curran et al. 2014). Further, on analyzing the data, researchers may aggregate longitudinal data into a single score (e.g., Li, Sun, & Cheng 2017), completely eradicating the opportunity to examine within-person change, or between-person differences in within-person change. Within-person analysis can only be conducted when a longitudinal repeated-measures research design is used, where data on a specific variable is collected on *at least three* time points, so as not to confuse change with measurement error (Little 2013).

Additionally, although time is an inherent factor in within-person analysis, it may not be the causal mechanism behind the effects of change, and thus does not have to be explicitly modeled in within-person research, and used only to structure the data (e.g., as in Beck and Schmidt 2012). For example, in clinical psychology, theories predict that the magnitudes of relationships will change over time (Curran et al. 2014), whereas with other theories (e.g., self-efficacy theory), time itself is not expected to play a prominent role. Thus, for clinical psychologists, time is often a causal mechanism (or a proxy for some other unobservable mechanism), while for many other studies, it is not. This following section discusses different analytical considerations concerning within-person research.

Establishing within-person variance in a variable

Within-person studies can contain both within-person hypotheses and between-person hypotheses; for example, salesperson performance may vary both within- and between-salespeople. Obtaining the intra-class correlation (ICC) of any variable identifies the amount

of variance which is between-person, as opposed to within-person for that variable (Little, Schnabel, and Baumert 2000), and is calculated by dividing the between-person variance by the total variance (between-person + within-person variance). The total variation in a construct will always add up to 1, so if .52 (52%) of the variation is between-person, then .48 (48%) of the variation must be within-person. The ICC will determine whether a within-person analysis is worthwhile. There are no hard-and-fast rules as to how much within-person variance necessitates a within-person analysis. However, if there is very little within-person variation, for example 1%, then the researcher requires a very good justification for concluding that within-person analysis is worthwhile. If an ICC is above 10%, then a multilevel model must be specified in order to account for dependency in the data (Grimm, Ram and Estabrook 2017). Once the within-person variance is obtained, the research must then make sure their data conforms to certain expectations so that adequate estimates can be obtained.

Data assumptions

There are additional considerations that researchers must deliberate on when undertaking within-person research. For example, by nature, the assumption of independence of measurements is violated in within-person research (Twisk, 2013). Specifically, because the repeated-measures come from the same individuals, there is an inherent element of dependence which must be taken into account when modeling within-person changes; this can be addressed by utilizing a multilevel analysis[4] (Little, Schnabel, and Baumert 2000). Further potential remedies for the lack of independence of measurement issue include utilizing random effects within multilevel models (Hoffman and Stawski 2009), or by allowing the residuals of the repeated-measures to correlate when utilizing structural equation

[4] In a multilevel analysis, individual change (intra-individual) becomes level 1 and individual differences (inter-individual), level 2.

models (see Newsom [2015] for further discussion). Furthermore, the residuals of the repeated-measures are generally assumed to be normally distributed in many longitudinal data analyses (Hoffman 2015). However, there are techniques that can model non-normally distributed dependent variables, for example generalized estimation equations (Certo, Withers and Semadeni 2017), or generalized linear modeling (Smithson and Merkle, 2014). [For a further discussion on normality of data assumptions see Hoffman (2015).]

Homogeneity of variance and sphericity are also assumptions that may be violated by repeated-measures data (e.g., as in Dustin and Belasen 2013). Homogeneity of variance posits that each group (or individual in the case of within-person research) demonstrates equal variances, whereas sphericity discusses the assumption that differences between all combinations of related groups are equal (Vasey and Thayer 1987). Using Pillai's trace multivariate test and undertaking Greenhouse–Geisser corrections is one potential remedy to account for these violations (Dustin and Belasen 2013).

Finally, specific to measuring latent variables over time, it is essential that the researcher is measuring the same latent construct at each time point (Jak and Jorgensen 2017). If this is not the case, then any within-person change may be down to measurement error rather than actual changes in the relationship. There are four forms of measurement invariance, with each form stronger than the last; these are factorial, weak, strong, and strict (Widaman, Ferrer and Conger 2010). Factorial invariance refers to the pattern of zero and non-zero loadings, and the same item structure on each latent variable remaining identical across measurement occasions. Weak invariance additionally constrains the factorial loadings, whilst strong and strict invariance add equal intercept and variance constraints, respectively. This longitudinal invariance procedure appears analogous to that of Steenkamp and Baumgartner (1998) cross-cultural invariance. Constraints can also be added to the errors; however, some authors argue this is too strict an assumption (Little, 2013). Partial invariance can also be obtained, where

some constructs demonstrate invariance whereas others do not, but in this case, researchers must be cautious drawing conclusions from observed relationships (Little, 2013). Measurement invariance can be tested by using likelihood-ratio tests, where the stronger form of invariance is nested within the weaker form of invariance (Hoffman, 2015). [For a further discussion see Widaman, Ferrer and Conger (2010).] Alongside understanding the quality of the data, the researcher must also make sure that they have adequate within-person estimates, as discussed below.

Disaggregation

When analyzing within-person variances, the researcher is required to separate the within- and between-person components of the variance of the relevant variables; this is termed disaggregation (Curran and Bauer 2011). If disaggregation is not conducted, the researcher can obtain biased estimates, since between-person variance can confound the within-person variance (Voelkle et al. 2014). Using simulated data, Sliwinski, Hoffman, and Hofer (2010) demonstrate that failure to separate between-person variance from within-person variance leads to uninterpretable implications regarding within-person change. Ultimately, biased estimates can result in the relationships within a model being misrepresented.

Not every analysis tool used in longitudinal modeling will appropriately disaggregate between-person variance from within-person variance. This includes a number of very common methods for longitudinal analysis, such as the cross-lagged panel model and the standard latent growth model (Hamaker, Kuiper and Grasman 2015; Curran et al. 2014), which examine only between-person differences when evaluating stability and change over time. However, growth models with structured residuals[5] (see Curran et al. 2014) adequately

[5] In this analytic model the residuals become the isolated within-person estimates, successfully achieving disaggregation.

separate the variances, and thus when conducting any within-person analysis generate accurate estimations.

One solution to the within- and between-person variance aggregation issue is person mean centering (PMC), sometimes called group-mean centering[6] in the multilevel literature (Curran and Bauer 2011). PMC simply means obtaining the average of scores on a variable for each individual separately (the sum of each score divided by the number of scores), and each individual's PMC score functions as their between-person estimate (Enders and Tofighi 2007). This procedure should only be undertaken on the independent variable side of the model, and not on the dependent variable. To obtain the within-person estimate, each person's PMC score is subtracted from their own score at each time point (e.g., Time1 score – PMC, time 2 score – PMC, and so on). Every individual will have a different PMC score for each variable, and the within-person estimates are specific to each individual. For an example of how to gain within-person estimates using Mplus, see Curran et al. (2014). However, this type of disaggregation can be undertaken using all common software packages used for longitudinal multilevel modeling or longitudinal structural equation modeling.

Other informative sources discussing the separation of effects include Curran and Bauer (2011) and Hoffman and Stawski (2009). Disaggregation is an issue which many researchers may be unaware of (Curran and Bauer 2011) and is a very important consideration when undertaking within-person analysis in order to ensure that estimates obtained by the chosen analysis technique correctly represent what the researchers are making inferences about.

Available analysis frameworks

While in-depth guidelines as to the analysis techniques best-suited to different within-person objectives are outside the scope of the present paper, Figure 2 provides a simple decision tool

[6] Variables can also be grand-mean centered; however, this form of centering does not correctly disaggregate within- and between- variance (Curran and Bauer 2011).

which researchers can use to help determine appropriate analysis methods to examine different types of theoretical change. The paper now provides a brief walk-through of the simplest version of each analytical tool and discusses how they can be extended. In addition, Figure 2 outlines current research utilizing the techniques discussed, and provides example studies utilizing these techniques[7].

INSERT FIGURE 2 HERE

At the first level of Figure 2, there is the issue of whether the analysis of a variable over time is appropriate. If variables and/or relationships do not change over time, there is no need to undertake within-person research, and simple cross-sectional studies examining between-person differences will suffice. In all other cases, however, where changes in variables and/or relationships are expected over time, then within-person analysis must be conducted, and one must then use theory to predict whether between-person differences in within-person change are expected; the answer will often be 'yes'. The hypotheses the researcher is testing will decide whether a univariate or multivariate framework is required; if a hypothesis discusses change in only one variable, then a univariate model should be utilized, whereas a multivariate model should be used if change is being assessed in multiple variables.

For simply analyzing within-person univariate change, the change score model is useful; here, only one variable is measured repeatedly, obtaining difference scores. This model can be further extended to examine analyze bivariate change, labelled a dual-change score model (Kievit et al. 2018). The random-intercept cross-lagged panel model is another technique used to analyze multivariate change, and is a variation of the cross-lagged panel model that

[7] Interested readers should see McArdle (2009), Hamaker, Kuiper and Grasman (2015), Curran et al. (2014), and Tate (2004), for further reading material on the change score model, random-intercept cross-lagged panel model, latent growth model with structured residuals, and slopes-as-outcomes models, respectively.

separates within-person variance from between-person variance, since a standard cross-lagged panel model only analyzes between-person differences (Hamaker, Kuiper and Grasman 2015).

As Bolander, Dugan and Jones (2017) discuss, latent growth modeling can also be used to model change within variables. However, similar to the cross-lagged panel model, a standard latent growth model only tests between-person differences over time, which does not allow for the disaggregation of within-person variance from between-person variance, and therefore results in conflated estimates. Disaggregation requires a latent growth model with structured residuals (Curran et al. 2014), which includes time-specific residuals within the model to separate the variances; these residuals represent the within-person estimates. As with the change score model, the latent growth model can be extended to analyze multivariate change. Change score models, cross-lagged panel models, and latent growth models can all be extended to examine between-person differences in within-person change.

The slopes-as-outcomes model is the final tool discussed; the slopes-as-outcomes model is part of the longitudinal multilevel modeling framework and is useful for comparing multivariate change over time with multiple groups. Here the slopes represent within-person change, and may be fixed or random (Curran, Obeidat and Losardo 2010). Fixed slopes represent a situation where change over time is not expected to vary within-groups, while random slopes detail the variability around the fixed slope; a researcher may choose to only examine fixed slopes if groups are not expected to vary in their within-person change over time (Little, Schnabel and Baumert 2000).

The research question and relationships of interest between the variables will, along with data considerations, determine which analysis technique is most applicable to the research question. The authors point out that the tools displayed are merely examples and should not

be seen to be the 'only solution', nor to be unsuited to other tasks. There are many other models which can be used when hypotheses examine within-person change, for example the auto-regressive latent trajectory model with structured residuals (Mahler, Fine, Frick, Steinberg and Cauffman (2018), or latent class modeling (Lanza and Cooper 2016). However, Figure 2 should aid researchers in understanding appropriate analytical models for such within-person theories. For further information aiding researchers in choosing appropriate analysis tools, readers are referred to Bainter and Howard (2016), Usami, Hayes, and McArdle (2016), Locascio and Atri (2011), and Jung and Wickrama (2008).

Problems in drawing conclusions and managerial implications

Serious problems can emerge by drawing conclusions from research studies that fail to address within-person issues. Beyond the drawing of inappropriate theoretical conclusions, research that overlooks within-person logics and data has the potential to negatively influence management practice. These potential problems can be clearly observed in much sales research, and to illustrate the point, we continue to use the self-efficacy literature as illustration.

Studies of self-efficacy in the psychology literature identify potential boundary conditions where enhancing self-efficacy may be detrimental to performance (e.g., Beck and Schmidt 2012). Yet, current sales research in self-efficacy suggests that increasing self-efficacy is inherently associated with performance increases (e.g., Carter et al. 2016; Mulki, Lassk, and Jaramillo 2008). However, in sales research, these within-person conclusions are invariably drawn from between-person research designs. Furthermore, these conclusions are used to drive managerial implications which focus on enhancing individual salespeople's self-efficacy. At no point in the sales literature does there appear to be acknowledgement or consideration of the fact that, in some situations, enhancing self-efficacy may negatively

shape performance; yet these latter logics are demonstrated in the within-person self-efficacy literatures in other research domains (e.g., Vancouver and Kendall 2006; Beattie et al. 2011).

Furthermore, important boundary conditions may not be consistent across levels. Consequently, within-person research in sales can help us more clearly understand the boundary conditions of prior research in sales. For example, when considering the specific case of self-efficacy in the sales literature, the implications drawn from current sales-based self-efficacy research studies (i.e., increase self-efficacy because it can improve sales performance) may only be appropriate in some situations (e.g., for individuals who are initially low in self-efficacy), but not in others (e.g., for individuals who already have high within-person self-efficacy levels, believing themselves to be undertaking an easy task). If researchers commit to undertaking within-person research in sales, it is likely that a significant amount of existing sales knowledge will need to be adapted to include the relevant boundary conditions; as a result, assumptions held by many sales scholars and practitioners, and practical recommendations emerging from current implications, may need to be rethought.

It is uncertain exactly how many important sales-relevant processes will demonstrate contrasting findings at the different levels of analysis, and until within-person research begins to be undertaken, many of the current understandings of sales-relevant issues may actually be incorrect, such that interventions that managers believe can enhance sales outcomes (e.g., providing more feedback to enhance intra-individual self-efficacy and so drive performance), may demonstrate a different relationship from that expected at the within-person level. Furthermore, within-person research may identify variables that are hard to elevate within individual salespeople (e.g., mental resilience), and so sales managers may come to prefer alternative strategies to build and shape the sales teams on those variables (e.g., selecting individuals with high levels on those variables when recruiting, rather than attempting to

increase those variables after salespeople are hired). These are merely two examples how within-person research could potentially change how managers undertake their managerial duties.

Addressing data collection barriers in within-person research

Collecting repeated-measures data from multiple individuals at multiple time-points is a unique challenge to within-person research. It may be difficult for researchers to entice sales personnel to provide data after the first occasion. Attrition is almost a natural feature of a repeated-measures design; individuals may not complete follow-up requests for further data due to reasons such as lack of time, lack of motivation, turnover, amongst other things.

However, there are numerous ways to reduce this threat. Researchers can use archival data to obtain proxies for certain behavioral measures. Examples include utilizing number of sales calls as a proxy for effort (cf Ahearne et al. 2010) or using existing customer satisfaction scores an organization collects as a proxy for customer-related performance, since this data may already exist within the organization. Indeed, objective sales data from company records may be available to many sales researchers (Bolander, Dugan, and Jones, 2017), and this data can provide a ready-made platform for within-person research. Furthermore, in a bid to reduce attrition, researchers can offer incentives to motivate continued participation within studies, while enlisting a superior's support (e.g., CEO) can also aid in obtaining continued participation.

Other important considerations include the ability of modern data analysis techniques to handle unbalanced data (e.g., Hierarchical linear modelling), whether that be in respect of varying time intervals between measurements, or varying number of measurements obtained for different individuals. Interestingly, methods also exist to allow the analysis of unbalanced

data[8] (i.e. some individuals may not provide data at each time point, for example provide data at times 1 and 3, but not time 2 and 4). Additionally, it is important to reiterate that only those variables that are assumed to change within the duration of the study are required to be measured on more than one occasion. This may mean researchers could undertake much of the data collection on the first data collection instance, subsequently reducing the demands on participants in future waves.

Lastly, experimental research designs can be an efficient method to collect within-person data. Researchers are able design experiments examining changes over either one, or numerous visits, to a laboratory, resulting in reduced demands on both the participants and the researcher.

Conclusion

Boundary conditions are essential to understanding theory, especially for complex processes which unfold over time (Hoffman and Stawski 2009). However, very few studies in the sales domain appear to develop theory while taking into account within- and between-person levels in their conceptualizations. We suggest that the sales discipline will advance significantly if it begins to take account of these issues in developing theory; for example, by understanding how relationships change in response to critical events (Morgeson and Hoffman 1999) or uncovering how within-person processes evolve (e.g., Ahearne et al. 2010), researchers may identify processes that contradict findings that emerge from between-person dynamics. Equally, sales researchers must think very carefully about the theoretical and managerial implications that they draw from between-person research. In the current study we use self-efficacy as an example theory to demonstrate the need for within-person sales research, but it

[8] How to treat missing data is beyond the scope of this paper

is relatively easy to see how other well-established areas of salesforce study would benefit from consideration of within-person issues.

Where theory suggests that variables may demonstrate intra-individual change, sales researchers must begin to conduct within-person analyses. Within-person changes can identify important boundary conditions to theory that cannot be found by conducting cross-sectional research (Molenaar 2004). However, simply conducting longitudinal research by itself does not mean that within-person analyses can take place; for this, repeated-measures of variables over time are required. Within-person analysis is almost untouched within sales research, and considering the sales world is constantly evolving, research must begin to reflect this. However, it is not expected that every variable that sales researchers examine requires within-person analysis, only those that are likely to demonstrate change within the individual. Moreover, when sales researchers undertake within-person research, in order to correctly obtain estimations of the within-person parameters, they must ensure that between-person and within-person variances are adequately disaggregated (Curran et al. 2014). For this, techniques such as the random intercept cross-lagged panel model and latent growth models with structured residuals would be appropriate. It is clear then, that differences between individuals, and changes within an individual, provide different knowledge. Consequently, conducting analysis at the within-person level is an important future research agenda which authors must begin to investigate. To deliver some indicative ideas about when taking account of within-person theories could help illuminate and test new boundary conditions within sales research, and for readers interested in further discussions on within-person analysis, Table 2 identifies some potential extensions to theory. Table 2 does not provide an exhaustive list; however, the list exemplifies the notion that future research can extend theory when considering many important sales processes, something sales researchers must begin to discover.

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Comment [DC1]: They have put this as Michael, as part of Q3, this is in text and here so is correct

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Figure 1. An overview of the variance components within any person-specific variable measured over time

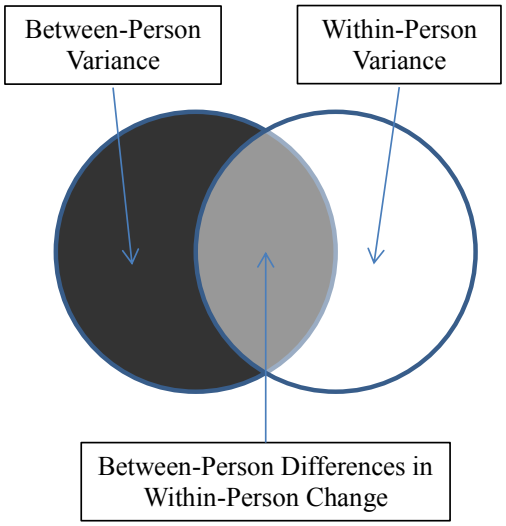

Figure 2. Analysis decision tree

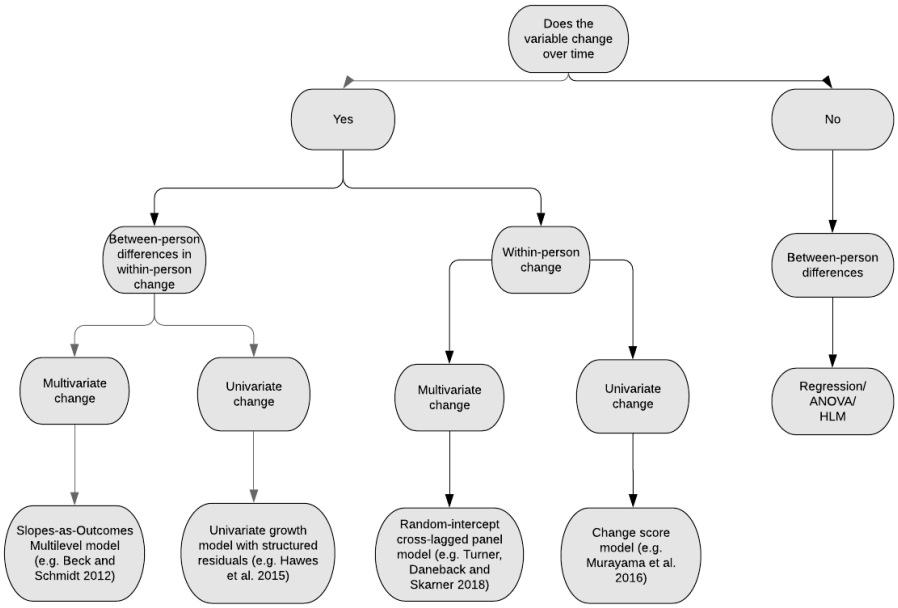

Table 1. An overview of existing within-person sales literature

Research Topic	**Studies Examining Research Topic**
Consumer trust in salesperson and purchase intention	Bateman and Valentine (2015)
Customer listening	Koehl, Poujol, and Tanner Jr (2016)
Cumulative sales failure	Boichuk et al. (2014) Bolander, Zahn, Loe, and Clark (2017)
Effort allocation	Chung and Narayandas (2017) Lim and Chen (2014) Viswanathan, Li, John, and Narasimhan (2018)
New product performance	Fu, Bolander, and Jones (2009)
Organizational identification	Bommaraju, Ahearne, Hall, Tirunillai, and Lam (2018)
Retailer returns	Beitelspacher, Baker, Rapp, and Grewal (2018)
Salesperson capability	Feng and Fay (2016)
Supervisory control and learning	Katsikeas, Auh, Spyropoulou, and Menguc (2018)
Salesperson effectiveness	Singh, Marinova, Singh, and Evans (2018)
Salesperson Ethics	Fischbach (2015) Rousselet, Brial, Cadario, and Béji-Bécheur (2018)
Salesperson future value	Kumar, Sunder and Leone (2014)
Salesperson performance	Ahearne, Lam, Mathieu, and Bolander (2010) Atefi, Ahearne, Maxham, Donavan, and Carlson (2018) Bommaraju and Hohenberg (2018) Dustin and Belasen (2013) Jaramillo and Grisaffe (2009) Kishore, Rao, Narasimhan, and John (2013). Panagopoulos, Rapp, and Ogilvie (2017) Patil, and Syam (2018) Shi, Sridhar, Grewal, and Lilien (2017)

Table 2. Examples outlining how within-person theory can further existing sales research

Research Theme	**Example Within-Person Theory Development**
Leadership	Does empowering salespeople enhance their adaptability?
Relationship Marketing	Does industry moderate the relationship between increases in a firm's investment to relationship maintenance and customer satisfaction?
Salesperson Decision-making	Do unethical selling behaviors increase as salespeople begin to fall behind on sales targets?
Salesperson Motivation	What is the impact on well-being of increases in a salesperson's effort?
Salesperson Performance	How do unplanned critical events influence a salesperson's performance trajectory?
Salesperson Role Stress	Does consistent exposure to adversity decrease a salesperson's resilience?
Salesperson Technology	When will increasing salesperson technology use lead to increases in salesperson performance?
Sales Force Control Systems	How does becoming more behavior control-orientated influence intra-individual sales performance?

Table 3. Comparison of research hypotheses at different levels of analysis, and type of data required.

Example Hypothesis	**Between-person**	**Within-person**	**Between-person differences in within-person change**
Example hypothesis 1:	Learning orientation will be positively related to performance	Within-person performance will change over time	Learning orientation will influence within-person performance changes, such that salespeople with higher learning orientation will experience more positive changes in within-person performance
Example hypothesis 2:	Role ambiguity will be negatively related to job satisfaction	Intra-individual increases in role ambiguity will decrease intra-individual job satisfaction	The effect of role ambiguity intra-individual change on intra-individual job satisfaction will be moderated by industry
Example hypothesis 3:	Self-efficacy will be correlated with effort	Within-person self-efficacy will enhance within-person effort	Between-person self-efficacy will moderate the within-person self-efficacy/effort relationship, in that within-person self-efficacy will be positively related to effort for salespeople with low between-person self-efficacy, and negatively related for salespeople with high between-person self-efficacy
Minimum standard of data required	Cross-sectional panel data	Time series data	Longitudinal panel data