Understanding why apprentices consider dropping out: longitudinal prediction of apprentices' workplace interest and anxiety

Tim E. Powers[1]* and Helen M. G. Watt[2]

*Correspondence:
tim.powers@monash.edu
[1] Faculty of Education,
Monash University, Clayton
campus, 19 Ancora Imparo
Way, Melbourne, VIC 3800,
Australia
Full list of author information
is available at the end of the
article

Abstract

Although apprenticeships ease the school-to-work transition for youth, many apprentices seriously consider dropping out. While associated with noncompletions, dropout considerations are important to study in their own right, because they reflect a negative quality of apprenticeship experience and can impact apprentices' quality of learning and engagement. Few studies have addressed apprentices' dropout considerations using comprehensive theoretical frameworks. To address this gap, this study examined how apprentices' interest and anxiety growth trajectories predicted dropout considerations and associated with perceived resources and demands, grounded in expectancy-value theory (EVT) and the job demands-resources (JD-R) model. Australian apprentices ($N = 2387$) were surveyed at 6-month intervals utilising an accelerated longitudinal design, on their workplace interest and anxiety, job-related resources (role model, timing of choice, employer teaching, expertise, job security, and training wages) and demands (lack of information, career indecision, and excessive work). Latent growth models (LGM) within a structural equation modelling framework showed apprentices began with high interest which declined over time, and low anxiety which increased in the latter half of their first year until the end of their second year. Apprentices' dropout considerations were predicted by initial interest and anxiety levels (at the beginning of their apprenticeship), and by interest losses during their apprenticeship (but, not by increases in anxiety). Almost half the variance in interest and anxiety trajectories was explained by apprentices' perceived resources and demands: resources had a greater effect on promoting interest than reducing anxiety, whereas demands were more important in exacerbating anxiety.

Keywords: Apprenticeships, Interest, Anxiety, Expectancy-value theory, Job demands-resources model

Introduction

Trade apprenticeships that combine work and study are widely praised as a means of easing the school-to-work transition (OECD 2009) and reducing youth unemployment (OECD 2017). Initial workplace experiences can take on heightened importance in *post school* apprenticeship systems where unemployment in the first year beyond high school

has been linked to increased likelihood of future unemployment (Lamb and McKenzie 2001).

Approximately one-third of current apprentices consider dropping out of their apprenticeship, in studies from Australia (Gow et al. 2008; Powers 2015) and Germany (Seidel 2019). Dropout considerations are strong predictors of actual student dropout (e.g., Bean and Metzner 1985; Sandler 2000), and the strongest predictor of employee turnover (see meta-analyses by Allen et al. 2010; Bauer et al. 2007; Griffeth et al. 2000). Even for apprentices who remain in their apprenticeship, dropout considerations can undermine work satisfaction and commitment (Allen et al. 2010), engagement (Halbesleben and Wheeler 2008), future performance (Bakker and Costa 2014), and associate with stress at work (Allen et al. 2010). Dropout considerations are worth examining in their own right because they reflect a negative quality of apprenticeship experience (Eicher et al. 2014) which may accumulate over time (Hobfoll 2012).

This raises important questions about what motivates individuals to consider leaving an apprenticeship. Despite research into a multitude of personal demographics, socialisers, and structural components associated with apprenticeship entry and attrition (Bednarz 2014), many acknowledge that a "league table" of background and external factors has not led to results which are generalisable (Harris et al. 2001; Virtanen et al. 2014). Employers, trade teachers and apprentices widely believe individual motivation is a central factor in enhancing retention (Harris and Simons 2005), but motivation is often ill-defined, assuming lay definitions (Kanfer et al. 2017). Drawing on expectancy-value theory (EVT; Eccles-Parsons et al. 1983) this study examined apprentices' underlying psychological motivational values as the main drivers of dropout considerations. In turn, contextual influences on apprentices' values were examined by locating recurrent themes in the apprenticeship retention literature within the job demands-resources model (JD-R; Demerouti et al. 2001) to explain differences between and within apprentices over time.

Australian apprenticeships

The Australian apprenticeship system is based on the *dual system* involving on- and off-the-job training at the tertiary-level which incorporates a national curriculum and a training contract registered with the State or Territory Training Authority. Despite a highly regulated trade school environment, there is little regulation on the nature of employers who may take on an apprentice (Smith and Kemmis 2013). This is particularly concerning, given apprentices spend 80% of their time on-the-job, and employment-related reasons are the most commonly cited amongst the 44–46% trade apprentices who do not complete their training (Bednarz 2014; NCVER 2020). Countries with similarly unregulated on-the-job oversight, also highlight employment-related reasons for apprenticeship dropouts (e.g., New Zealand and UK; Alkema et al. 2016; Berglund and Loeb 2013).

Workplace motivation

In a broad sense, motivational psychologists try to understand what drives people to action, and why they think and do what they do (Wigfield et al. 2015). Expectancy-value theory (EVT; Eccles-Parsons et al. 1983) is one of the major frameworks for achievement

motivation. According to EVT, occupational and educational choices are directly influenced by subjective valuation of a task in terms of interest, usefulness, importance, and different kinds of costs (e.g., emotional cost; akin to anxiety). In a recent cross-sectional study of these four values ($N=2069$), workplace *interest* and *anxiety* were found to be the main drivers of dropout considerations for trade apprentices, above and beyond usefulness and importance values (Powers 2020). Altogether, if apprentices are losing interest, develop heightened anxiety, and seriously considering dropping out, this would constitute an undesirable quality of apprenticeship experience even if those apprentices do not drop out of their training. For this reason, we were interested to understand how apprentices' interest and anxiety developed through their training and why apprentices differed in their interest and anxiety trajectories.

Evolving interest

Interest has a long history in the literature on occupational choice (Holland 1997; Lent et al. 1994) and employment outcomes (Nye et al. 2017). Large-scale Australian studies have revealed students take up vocational pathways (Gore et al. 2017) and trade apprenticeships in particular (NCVER 2019) due to an abiding interest in the type of work performed in those occupations. How vocational and educational interests develop over time for young adults has revealed mixed trends. A recent meta-analysis of longitudinal data from 49 primary studies in the United States and Canada (Hoff et al. 2018) revealed vocational interests increased during high school and remained constant during tertiary study. Other studies revealed decreases in academic interest during high school (see meta-analysis by Scherrer and Preckel 2019) including school-based apprenticeships (Swiss apprentices; Gurtner et al. 2012) and tertiary study (Jones et al. 2010). Consequently, this study sought a better understanding of how apprentices' interest evolves through the apprenticeship.

Anxiety

While EVT has demonstrated anxiety is important to choice, far less empirical work has been conducted on such negative 'cost' factors (Wigfield et al. 2009). Costs, such as anxiety, are conceptualised in terms of the negative aspects of engaging in a task and have been found to negatively predict tertiary studies and career intentions (Battle and Wigfield 2003). Research into apprenticeship attrition signals similar results. Higher levels of actual dropout were associated with apprentices feeling their employer abused, harassed, exploited, or treated them unfairly (Harris and Simons 2005; NCVER 2019). How apprentices' anxiety unfolds over time is less well understood. It has been argued that some subject-related anxieties are more sensitive to specific instructional environments (Eccles and Midgley 1989). This may inform findings from a UK longitudinal study ($N=11,801$) where high school students experienced higher levels of anxiety when progressing to university, as compared to no change in anxiety for students who entered apprenticeships (Symonds et al. 2016). How anxiety evolves and is influenced *during* post-school apprenticeships has yet to be examined.

Apprentices' perceived resources and demands

The job demands-resources model (JD-R; Demerouti et al. 2001) proposes a framework that links job resources to motivation (e.g., interest) and job demands to strain (e.g., anxiety). Although cross-paths from resources to anxiety, and demands to interest are not outlined by the model, some studies have found such relationships (Schaufeli and Bakker 2004). Consequently, their potential existence was also explored in the present study. Job-related resources and demands refer to physical, psychological, social, and organisational aspects of the work environment which have been associated with turnover considerations (Schaufeli and Bakker 2004; Skaalvik and Skaalvik 2018) and turnover behaviour (de Lange et al. 2008). In this study, we drew on the themes from apprenticeship literature to explore influential resources and demands which are experienced both *prior* and *during* an apprenticeship.

An informed choice

Those contemplating an apprenticeship seek role clarity (Allen et al. 2010) as they struggle with their level of career choice uncertainty (Ellis et al. 2015; Saks and Gruman 2018). Inadequate information on apprenticeships (Misko et al. 2007; Snell and Hart 2008) may reflect misinformation (Eccles 2005), or difficulty in finding relevant information (Powers 2015) which may lead to career indecision. An Australian study involving 1016 plumbing apprentices revealed those who were initially indecisive about their occupational choice were 37% more likely to consider dropping out (Powers 2015).

Pre-entry engagement with tradespeople is an important source of information for Australian trade apprentices (NCVER 2019). Pre-apprenticeship training is valued as an important introduction to the trade and has been related to higher completion rates in construction trade apprenticeships which are the focus of the present study, although not universally well across all other trades (Karmel and Oliver 2011). Notably, plumbing apprentices who had been encouraged to take up the trade by plumbers were 66% less likely to consider dropping out (Powers 2015). While this may suggest that prior information concerning the occupation is important, others advise information about the apprentices' employers are more critical for retention (Stalder and Schmid 2016).

On-the-job learning resources and demands

On-the-job training provision is often viewed as a key resource and the employer's most important obligation (Smith et al. 2011). Yet, many apprentices cite difficult working conditions and poor on-the-job training as key reasons for their planned (Seidel 2019) and actual dropout (NCVER 2019; Snell and Hart 2008). Alternatively, job security has been associated with apprenticeship commitment (Harris and Simons 2005), although this relationship was found to be tenuous when controlling for career choice anxiety and interest (Powers 2015). Low training wages are commonly cited as a key reason for apprentice dropouts (Dickie et al. 2011), although this features more strongly in qualitative research. Amount of payment, in and of itself, has been a poor predictor of employee turnover decisions (Allen et al. 2010) prompting different conceptualisations of training wages (e.g., compared to alternative jobs; Karmel and Mlotkowski 2011). For instance, apprentices who anticipate a larger pay increase upon completion are less likely to drop out (Karmel and Mlotkowski 2010). Another conceptualisation which is adopted in the

present study is whether apprentices regard training wages as a fair trade for learning on-the-job, which has been identified within qualitative studies (Snell and Hart 2008).

The current study

The present longitudinal study investigated differences in growth of work-related interest and anxiety for 2387 Australian trade apprentices spanning the first 2½ years of their apprenticeship, utilising six timepoints of data from the FLARe Project (Factors Lifting Apprenticeship Retention expectations). A theoretically integrative approach was employed, anchored in expectancy-value theory (EVT; Eccles-Parsons et al. 1983) for the psychological process, and the job demands-resources model (JD-R; Demerouti et al. 2001) to examine influential factors from apprenticeship research literature. Latent growth modelling (LGM) assessed latent growth trajectories and initial levels of interest and anxiety, and tested the influence of demands and resources on between- and within-apprentice differences (Preacher et al. 2008). Specifically, there were three examined questions:

(1) How do apprentices' interest and anxiety develop through the apprenticeship? Considering the lack of clear direction in the literature on how apprentices' interest and anxiety develop over the apprenticeship, there was no preconceived hypothesis on growth.

(2) Is dropout consideration predicted by apprentices' levels of interest and anxiety at the beginning of their training, and their rate of change during their first 2½ years?

The hypothesis was that higher initial interest and lower interest losses would negatively predict dropout considerations. On the other hand, higher initial anxiety and growth in anxiety were expected to positively predict dropout considerations.

(3) How are interest and anxiety trajectories explained by job-related resources and demands?

Regarding contextual influences on these motivational processes, the hypothesis for the third research question was that job-related resources would positively predict interest trajectories, whereas job-related demands would positively predict anxiety trajectories in line with the JD-R model (Bakker and Demerouti 2017). The potential for direct effects of resources on anxiety and demands on interest was also explored given that some studies have identified such cross-paths (Schaufeli and Bakker 2004).

Apprentices may differ because they *enter* their apprenticeships with varying levels of resources (experience with a role model, timing of choice) or demands (lack of information and career indecision). Apprentices' experiences may also vary *over time during* their apprenticeship, due to job-related resources (active teaching by employer, job security, fair training wages, occupational expertise) and demands (excessive work).

Method

Participants

The present longitudinal study included 2387 apprentices from four trades—carpentry, bricklaying, plumbing and electrical—involving 30 of the 54 public Australian VET providers, with representation from all states and the capital territory. The apprentices were surveyed on four measurement occasions (M1–M4) approximately six months apart, beginning in early 2015. Using an accelerated longitudinal design, apprentices were

Table 1 Cohort sample size, measurement timepoints and missingness

	Beginning	1st year		2nd year		3rd year
	T1[a]	T2	T3	T4	T5	T6
Cohort 1 (*n* = 548)	M1	M2	M3	M4		
Cohort 2 (*n* = 646)		M1	M2	M3	M4	
Cohort 3 (*n* = 731)			M1	M2	M3	M4
Cohort 4 (*n* = 462)				M1	M2	M3
Responses	493	771	1212	1225	956	576
Unplanned missing	55	423	713	1162	883	617
Unplanned missing (%)	10%	35%	37%	49%	48%	52%
Planned missing	1839	1193	462	0	548	1194

[a] Apprentices' initial attendance at trade school (less than 1 month)

in four cohorts based on their apprenticeship progress at M1: just beginning (Cohort 1), first year semester 1 (Cohort 2), first year semester 2 (Cohort 3), and second year semester 1 (Cohort 4). Table 1 presents sample size for each cohort along with planned and unplanned missingness. Planned missing was due to the cohort-sequential design, whereby apprentices at different stages of their training were each surveyed across four measurement occasions (M1–M4) within two years, to collectively span six timepoints (T1–T6) from the beginning to the third year of their apprenticeship. Planned missing data are controlled by the investigator and can be regarded as missing completely at random (MCAR) rather than introducing potential bias to the results. This contrasts with unplanned missing data which refers to surveys that we aimed to collect but were unsuccessful in obtaining participants' responses.

The mean age of apprentices starting their apprenticeship was 20.4 years (*SD* = 5.2) and 22.9 (*SD* = 5.2) in their fifth semester. Participants were predominantly male (99.1%). Almost a quarter (23.5%) entered their apprenticeship with no higher than grade 10 education; 18.7% had attained grade 11, while the remainder (57.8%) had attained grade 12 (the final year of secondary schooling in Australia) or higher (e.g., post-secondary degree) before entering their apprenticeship.

Measures
Paper surveys were completed by apprentices at trade schools, to assess their workplace interest, anxiety, and perceived resources and demands, every six months. At the initial measurement (M1), apprentices reported additional background variables and pre-entry resources and demands relating to their career preparation (see Additional File 1: Appendix A for complete list of items). Questions were assessed on a 7-point Likert-type scale (*1—Not at all*, to *7—Extremely*) except for background variables and timing of choice, which were categorical.

Motivational values
Interest was measured by 3 items (Watt and Richardson 2006) adapted to trade apprentices, e.g., "My current job experience is something I like." The internal reliability (Cronbach α) ranged from 0.87 to 0.91 across the 6 timepoints. *Anxiety* was assessed with 3 items (Gaspard et al. 2015) adapted to gauge apprentices' perception of their workplace

experience as worrisome or annoying, e.g., "My current job experience is something I'd rather not do, because it only worries me" (α range: 0.89–0.90).

Background variables

Prior education was reported by apprentices from one of 7 levels which measured their highest prior level of education attained: less than grade 10, grade 10, grade 11, grade 12, certificate (post-secondary), diploma (post-secondary), or university degree. *Socioeconomic status* (SES) was operationalised as the mean of two items: (a) the highest parent education level, and (b) highest parent occupational status score (i.e., AUSEI06 score, McMillan et al. 2009) derived from parents' occupations as reported by apprentices. Parents' education level used the same 7 levels as for apprentices, and AUSEI06 which assigns occupations a score ranging from 0 to 100, was rescaled from 1 to 7 for equal weighting.

Pre-entry resources and demands

The following pre-entry factors were asked about at the first measurement occasion, as potential predictors of between-apprentice variance in interest and anxiety trajectories.

Lack of information was measured by 3 items tapping apprentices' pre-entry perception of their need for career information related to the trade, e.g., "I wish I had more information on where a career in this trade might take me in the future" (α = 0.86). Items were purpose-developed for the FLARe Project based on prior findings that career information associates with intentions to persist in apprenticeships (Powers 2015).

Experience with *role models* measured apprentices' prior-to-entry experience with individuals currently working in the occupation. Two items (Watt and Richardson 2007) were adapted to apprenticeships, e.g., "Before entering my apprenticeship, I've experienced good role-models in the trade." A third new item was added to reflect individuals who actively communicated with tradespeople. This item was, "Before entering my apprenticeship, I talked with people in the trade" (α = 0.68).

Timing of choice was a single item gauging how long individuals had contemplated their apprenticeship before entering. The question (adapted from Watt and Richardson 2007), "When did you decide that you wanted to go into this trade?" provided 6 choices: *right before you were hired, a few weeks before, a few months before, a year, greater than 1 year but less than 5 years, 5 or more years.*

Career indecision was assessed by adapting 3 items from a generalised scale on personal indecisiveness (Gati et al. 1996) to the domain of apprenticeships. An example item is, "I could have used some support or confirmation that this apprenticeship was a good choice for me." The reliability was lower (α = 0.56) than in Gati and colleagues' study (α = 0.69).

Workplace resources and demands (time-varying predictors)

Time-varying predictors were measured at each occasion to capture apprentices' experiences over time, as predictors of within-apprentice variance in interest and anxiety trajectories.

Employer active training assessed apprentices' perception that their employer took an active and thoughtful role in workplace training versus a passive role. This construct was measured with 3 purpose-developed items for the FLARe project, e.g., "I can tell my boss has put careful thought into my training" (α ranged from 0.82 to 0.85), based on past findings that employers who were actively involved in teaching improved plumbing apprentices' planned persistence (Powers 2015).

Expert career included 3 items to assess apprentices' level of perceived expertise and technical knowledge required for the trade. Two were existing items (Watt and Richardson 2007), plus an additional purpose-developed item—"This trade involves highly specialised knowledge" (α ranged from 0.82 to 0.86).

Job security gauged expectations of steady work within the occupation using 3 items (from Watt and Richardson 2007) adapted to reflect the subcontracting nature of trade work. An example item is, "This trade always has lots of work available" (α ranged from 0.83 to 0.88).

Fair training wage items were developed for this study (3 items), e.g., "The apprentice wage is a reasonable trade-off to learn the trade", to assess apprentices' perception of lower apprenticeship pay as a fair exchange for workplace learning (α ranged from 0.77 to 0.82).

Excessive work demands experienced on-the-job were assessed by 3 items tapping workplace pressure and work overload (Hart et al. 2000), e.g., "There is constant pressure for workers to keep working" (α ranged from 0.69 to 0.75).

Outcome variable: dropout consideration

At each measurement occasion beyond the first completed survey (i.e., M2–M4), apprentices were asked to answer whether "I have seriously considered dropping out of my apprenticeship within the last 6 months". The response options were *Yes* or *No*. When responses were organised according to time within apprenticeship (T2–T6), dropout considerations increased monotonically by a small amount from 11 to 16%. These answers were summarised to a single dichotomous outcome variable reflecting apprentices who answered "Yes" at any occasion.

Analytic plan

All latent constructs that were assessed across timepoints were initially tested for measurement invariance (see Additional file 1: Appendix B) to ensure similar meaning over time for apprentices involved in this study. Mean composite scores were utilised for all factors to ensure the sample size was appropriate for model complexity[1] (Shi et al. 2018). In two separate models, latent growth models (LGMs) were then estimated, separately for each of interest and anxiety, testing various polynomial forms for each (linear, quadratic, cubic and piecewise linear). A third model combined the latent trajectories for both interest and anxiety in a single parallel LGM as predictors of dropout considerations. A final model examined how interest and anxiety trajectories were influenced by a range of resources and demands, including pre-entry and time-varying effects to predict

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[1] $N \geq p^2$, where p represents observed variables.

differences between and within apprentices. All analyses were undertaken using Mplus version 8.4 (Muthen and Muthen 2017).

Results

Missing data analysis

Of the 2387 apprentices involved across the four measurement occasions, almost two-thirds (63%) completed at least three of the four surveys. The response rates were M1 = 84%, M2 = 51%, M3 = 57%, and M4 = 48%. For the accelerated timepoints, the unplanned missing rate of participants ranged from 10% at T1 to 52% at T6 (see Table 1). Of those who started a survey, the average item missingness ranged from 4 to 6% across all timepoints. Mean differences were compared on interest and anxiety scores, between apprentices who completed all surveys versus those who missed any, within each of the four cohorts at each of the four measurement occasions using independent t-tests. Only the fourth cohort at the first measurement occasion showed a significant difference on anxiety, which was higher for apprentices who had missed any survey occasions ($M = 2.68$ vs. 2.14 on the 1–7 scales; $t = 2.40$, $df = 311$, $p = 0.021$). Little's MCAR test revealed the data were not missing completely at random ($\chi^2 = 187.78$, $df = 105$, $p < 0.001$). As such, two auxiliary variables were included to improve full information maximum likelihood (FIML) estimation[2]; missingness was related to career choice satisfaction (highest $r = -0.12$, $p < 0.001$ across timepoints) and occupational identity conflict (highest $r = -0.17$, $p < 0.001$).

Descriptive results

Table 2 presents Pearson correlations for interest and anxiety across the six timepoints, pre-entry predictors, and the outcome variable (dropout considerations). Due to the high number of time-varying predictors measured over 6 timepoints (5 constructs × 6 timepoints = 30 variables), Table 3 presents correlations between time-varying predictors at T4 only, with all other variables. Correlations were indicative of relatively stable relationships with the time-varying predictors. As expected, interest and anxiety were negatively correlated at all timepoints. Predictors correlated with interest, anxiety, and dropout consideration in the directions anticipated: resources correlated positively with interest, and negatively with anxiety and dropout considerations; demands were related in the opposite direction. Of note, 33% of all participants had "seriously considered dropping out" at some time during their apprenticeship.

Shape of latent growth

The optimal growth shape that characterised within-individual change over time was explored through LGM for each of interest and anxiety. An intercept model was used as the baseline of comparison representing the simplest mean structure (i.e., no slope). Subsequent models added functions of slope (e.g., linear, quadratic, cubic, linear piecewise) in order to inspect model fit. When comparing models, improved fit was indicated by a significant chi-square difference test ($\Delta\chi^2$) and changes in CFI of 0.01 or greater (Chen

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[2] Auxiliary variables are used as missing data correlates and are external to the substantive model, whose meaning and relationship to other measures are inconsequential.

Table 2 Estimated Pearson correlations and descriptive statistics for motivation variables used in LGM and pre-entry predictors

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Anxiety-T1																			
2	Anxiety-T2	0.37**																		
3	Anxiety-T3	0.32**	0.35**																	
4	Anxiety-T4	0.30**	0.33**	0.33**																
5	Anxiety-T5	0.25**	0.31**	0.30**	0.33**															
6	Anxiety-T6	0.25**	0.26**	0.30**	0.33**	0.35**														
7	Interest-T1	−0.35**	−0.19**	−0.15**	−0.15**	−0.09**	−0.10**													
8	Interest-T2	−0.19**	−0.40**	−0.18**	−0.16**	−0.14**	−0.10**	0.52**												
9	Interest-T3	−0.16**	−0.19**	−0.38**	−0.16**	−0.13**	−0.10**	0.46**	0.51**											
10	Interest-T4	−0.15**	−0.16**	−0.15**	−0.38**	−0.13**	−0.12**	0.45**	0.47**	0.48**										
11	Interest-T5	−0.10**	−0.16**	−0.14**	−0.14**	−0.33**	−0.12**	0.35**	0.44**	0.45**	0.46**									
12	Interest-T6	−0.09**	−0.10**	−0.13**	−0.13**	−0.13**	−0.14**	0.34**	0.38**	0.44**	0.47**	0.50**								
13	Prior educ.	−0.02	−0.03	−0.03	−0.03	−0.03	−0.38	−0.09**	−0.03	−0.02	−0.03	−0.01	0.02							
14	SES	−0.08	−0.05	−0.03	−0.05*	0.01	0.03	0.03	0.02	0.02	0.04	0.01	−0.01	0.22**						
15	Lack of info	0.23**	0.24**	0.20**	0.16**	0.15**	0.12**	−0.09**	−0.12**	−0.10**	−0.10**	−0.12**	−0.10*	0.02	−0.02					
16	Timing of choice	−0.11**	−0.09**	−0.09**	−0.12**	−0.10**	−0.09**	0.21**	0.21**	0.21**	0.22**	0.21**	0.21**	−0.01	0.04	−0.10**				
17	Role models	−0.18**	−0.17**	−0.16**	−0.12**	−0.15**	−0.16**	0.43**	0.42**	0.36**	0.32**	0.28**	0.28**	0.01	0.09**	−0.03	0.16**			
18	Indecision	0.32**	0.34**	0.25**	0.22**	0.15**	0.15**	−0.29**	−0.31**	−0.24**	−0.24**	−0.20**	−0.19**	0.09**	0.00	0.28**	−0.17**	−0.12**		
19	Considered dropout	0.16**	0.17**	0.16**	0.16**	0.15**	0.15**	−0.24**	−0.26**	−0.24**	−0.25**	−0.25**	−0.26**	−0.01	−0.01	0.10**	−0.14**	−0.16**	0.19**	
	Mean	2.45	2.30	2.51	2.58	2.72	2.72	5.80	5.68	5.55	5.43	5.30	5.22	3.47	4.10	3.83	3.33	4.85	2.79	0.33
	SD	1.50	1.39	1.49	1.45	1.46	1.46	1.06	1.08	1.14	1.15	1.16	1.21	1.13	1.51	1.57	1.46	1.23	1.69	0.47

FIML accommodated all available cases of mean composite constructs and observed variables

$**p < .01$, $*p < .05$

2007) for nested models. For non-nested models, such as piecewise, where growth may change at certain timepoints, reduction in AIC values were relied upon (Brown 2015).

Upon inspection of raw means, *interest* appeared relatively linear (negatively) and was supported by relative improvement to the baseline model in fit when a linear slope was added (see Table 4). The quadratic and cubic models were alsocompared but did not significantly improve fit (i.e., $p > 0.05$ and ΔCFI < 0.01), supporting a linear decline as well-suited to describe apprentices' change in interest through their apprenticeship.

The shape of anxiety was more complex. *Anxiety* appeared to decrease in the first six months and then increase until the end of second year (T5), when it plateaued. A linear growth pattern showed significant improvement over the baseline intercept model, but the addition of quadratic and cubic terms did not demonstrate improved fit (see Table 4). Given the equal raw means at T5 and T6, a piecewise model holding the growth to be zero between those time periods revealed improved AIC fit. A model with negative linear growth between T1 and T2 was attempted but did not converge. Given overlapping 95% confidence intervals for means at T1 and T2, a further adapted piecewise model specified zero growth between T1 and T2. The reduction in AIC suggested this model fitted better. The final shape of anxiety supported linear growth only between T2 and T5 (see Fig. 1), with plateau effects (i.e., zero growth) at both the beginning (between T1 and T2) and the end of apprentices' studies (between T5 and T6). That is, only one latent slope parameter was supported for anxiety, representing growth from the first (T2) to fourth semesters (T5).

Unconditional parallel process LGM

A parallel LGM of interest and anxiety as presented in Fig. 2 demonstrated good fit ($\chi^2 = 73.34$, $df = 46$, CFI = 0.98, TLI = 0.98, RMSEA = 0.02). The intercept and slope correlated negatively within each construct (see Table 5). This was due to individuals who held higher levels of interest at the beginning of their apprenticeship, tending to experience steeper declines in interest over time ($r = -0.41$); whereas individuals who initially held higher levels of anxiety showed smaller increases in anxiety between T2 and T5 ($r = -0.47$). There were also inter-construct relationships. Higher initial levels of interest were associated with lower levels of initial anxiety ($r = -0.51$). The interest and anxiety slopes were similarly related ($r = -0.54$). There was no detectable relationship between the cross-construct slope and initial level of either interest or anxiety.

The intercept and slope means for interest and anxiety were significant, as was the variance for each parameter (see Table 6), indicating that explanatory variables could be usefully added to the model.

Predicting dropout considerations

The latent trajectories for interest and anxiety were used to predict apprentices' dropout considerations. The data fitted the model well ($\chi^2 = 81.04$, $df = 54$, CFI = 0.99, TLI = 0.99, RMSEA = 0.02) and explained 23% of the variability (R^2) in dropout considerations. Each of the intercept and slope for interest significantly predicted lower dropout consideration (see Table 7). The anxiety intercept predicted higher dropout consideration, but its slope did not.

**Table 3 Estimated Pearson correlations, means, and *SD* for time-varying predictors (at T4)**

Variables	Predictors of within-apprentice variance (T4)				
	Employer training	Job security	Fair wages	Expert career	Excessive work
Anxiety—T1	− 0.12**	− 0.08**	− 0.08**	− 0.07**	0.14**
Anxiety—T2	− 0.14**	− 0.08**	− 0.09**	− 0.07**	0.17**
Anxiety—T3	− 0.15**	− 0.10**	− 0.10**	− 0.07**	0.19**
Anxiety—T4	− 0.22**	− 0.16**	− 0.09**	− 0.10**	0.30**
Anxiety—T5	− 0.14**	− 0.09**	− 0.06**	− 0.06**	0.15**
Anxiety—T6	− 0.13**	− 0.08**	− 0.06**	− 0.04*	0.14**
Interest—T1	0.23**	0.15**	0.14**	0.17**	− 0.10**
Interest—T2	0.24**	0.16**	0.14**	0.19**	− 0.11**
Interest—T3	0.28**	0.22**	0.13**	0.18**	− 0.12**
Interest—T4	0.41**	0.34**	0.15**	0.25**	− 0.14**
Interest—T5	0.25**	0.19**	0.09**	0.15**	− 0.10**
Interest—T6	0.23**	0.21**	0.10**	0.16**	− 0.08**
Prior Education	− 0.09**	− 0.09**	− 0.01	0.13**	− 0.03
SES	0.05	0.02	0.01	0.10**	− 0.11**
Lack of info	− 0.10**	− 0.02	− 0.08*	0.03	0.13**
Timing of choice	0.13**	0.02	0.05	0.05	− 0.11**
Role models	0.27**	0.18**	0.11**	0.18**	− 0.02
Career indecision	− 0.11**	− 0.10**	− 0.09**	− 0.02	0.16**
Considered dropping out	− 0.06**	− 0.04**	− 0.04**	− 0.03**	0.04**
Mean	4.73	4.90	3.59	5.23	4.26
SD	1.29	1.06	1.34	1.07	1.17

** $p < .01$, * $p < .05$

Table 4 Comparing shape of growth for interest and anxiety

LGM model tested	Δχ2					
	χ^2	*df*	*p*-value	CFI	ΔCFI	AIC
Interest						
Intercept only	188.428**	16		0.749		22,230
Linear (vs intercept)	29.092**	13	*0.000*	0.977	*0.228*	22,027
Quadratic (vs linear)	29.330**	12	0.626	0.975	0.002	22,029
Cubic (vs linear)	31.878**	11	0.248	0.970	0.007	22,035
Anxiety						
Intercept only	98.381**	16		0.784		25,011
Linear (vs intercept)	35.275**	13	*0.000*	0.942	*0.158*	24,931
Quadratic (vs linear)	37.383**	12	0.147	0.933	0.009	24,937
Cubic (vs linear)	35.520**	11	0.885	0.936	0.003	24,938
Piecewise 1 (vs linear)[a]	28.045**	13	–	0.961	–	*24,921*
Piecewise 2 (vs piecewise 1)[b]	23.618*	13	–	0.972	–	*24,915*

Both quadratic models did not converge due to negative variance on linear slope, resolved by fixing the variance to zero. Both cubic models did not converge, resolved by holding the linear and quadratic variances to zero. Italicised entries indicate improved fit

** $p < .01$, * $p < .05$

[a] Piecewise model with linear slope1 at T1–T5 and slope2 at T6 = 0

[b] Piecewise model with slope1 at T1 and T2 = 0; linear slope2 at T3–T5 and slope 3 at T6 = 0

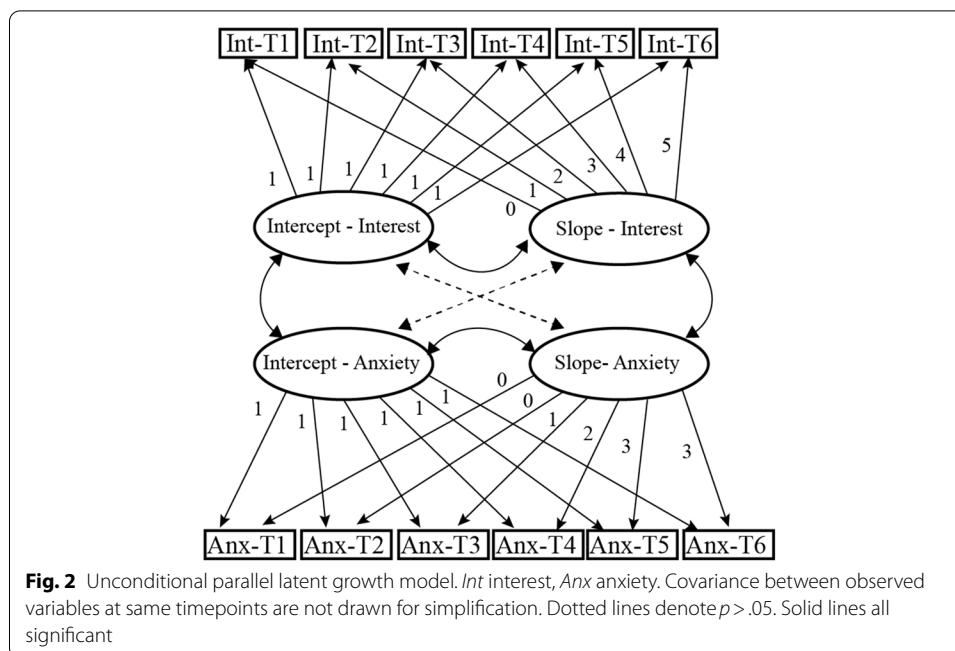**Fig. 1** Latent growth models and observed means for interest and anxiety
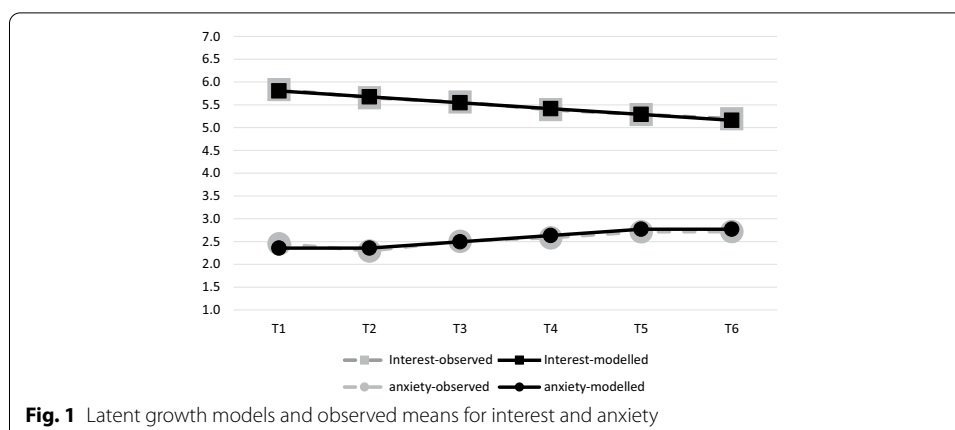
Conditional model

The single overarching conditional LGM model (Fig. 3) introduced a range of resources and demands to explain why apprentices may differ in their interest and anxiety trajectories. Pre-entry factors (prior education, SES, role models, timing of choice, lack of information, career indecision) were specified as predictors of between-apprentice variance. Time-varying factors (employer training, expert career, job security, fair training wage, excessive work) were specified as predictors of concurrent within-apprentice variance over time. The model showed good fit ($\chi^2 = 612.51$, $df = 385$, CFI $= 0.98$, TLI $= 0.95$, RMSEA $= 0.02$). All predictors were grand-mean centred, such that the results refer to mean levels for all apprentices in the sample. The regression parameters were held equal across time for each time-varying predictor, as releasing that constraint did not demonstrate significant improvement in model fit ($\Delta\chi^2 = 59.78$, $\Delta df = 50$, $p = 0.16$; ΔCFI $= 0.001$). Taken together, the time-varying and pre-entry predictors explained almost half of the variance for interest and anxiety trajectories (R^2 ranged from 43 to 48%).

Pre-entry resources and demands

The conditional model (Fig. 3) revealed pre-entry resources (role models, timing of choice) were significant positive predictors of between-apprentice variance in initial level of interest, but had no effect on interest growth (see Table 8). Role models were more important than timing of choice ($\beta = 0.26$ versus $\beta = 0.13$, respectively) in predicting initial levels of interest. Regarding job-demand characteristics, lack of information did not predict individual differences in interest trajectories. Apprentices with higher levels of career indecision predicted lower interest intercepts but less steep declines (slope).

Differences between apprentices' level of anxiety were unrelated to both examined pre-entry resources (i.e., role models and timing of choice). For demands, lack of information ($\beta = 0.14$) and career indecision ($\beta = 0.37$) were related to higher initial anxiety (i.e., intercept). Higher career indecision associated with less growth in anxiety ($\beta = -0.30$) whereas, lack of information had no impact on growth (i.e., slope).

Fig. 2 Unconditional parallel latent growth model. *Int* interest, *Anx* anxiety. Covariance between observed variables at same timepoints are not drawn for simplification. Dotted lines denote $p > .05$. Solid lines all significant

Table 5 Estimated correlations for unconditional latent growth curve model

	Interest		Anxiety	
	Intercept	Slope	Intercept	Slope[a]
Interest intercept	–			
Interest slope	− 0.41**	–		
Anxiety intercept	− 0.51**	0.17	–	
Anxiety slope [a]	0.17	− 0.54**	− 0.47**	–

[a] Slope for T2 to T5

** $p < .01$

Table 6 Parameter estimates for unconditional parallel latent growth curve model of interest and anxiety

Parameter	*M*	*SE*	Variance	*SE*
Interest intercept	5.81**	0.03	0.80**	0.09
Interest slope	− 0.13**	0.01	0.04**	0.01
Anxiety intercept	2.35**	0.04	1.09**	0.12
Anxiety slope	0.14**	0.02	0.10**	0.03

** $p < .01$

Time-varying resources and demands

The same conditional model (Fig. 3) revealed that time-varying resources and demands explained within-apprentice variance in interest and anxiety trajectories. Resources measured over time (employer active training, job security, fair training wages, expertise career) explained higher levels in interest, compared with anxiety (see Table 9). Apprentices who rated employer active teaching ($\beta = 0.24$) had the largest effect, whereas fair

Table 7 Prediction parameters of dropout considerations

Parameter	Est.[a]	SE	Std.[b]	SE
Interest intercept	− 0.20**	0.02	− 0.39**	0.05
Interest slope	− 0.71**	0.19	− 0.30**	0.08
Anxiety intercept	0.08**	0.02	0.18**	0.05
Anxiety slope	0.11	0.13	0.07	0.09

** $p < .01$

[a] Unstandardized estimates, [b] standardised estimates

Fig. 3 Conditional LGM with time-varying and time-invariant predictors. *Int* interest, *Anx* anxiety. Covariances across latent variables, and observed variables at same timepoint excluded for clarity
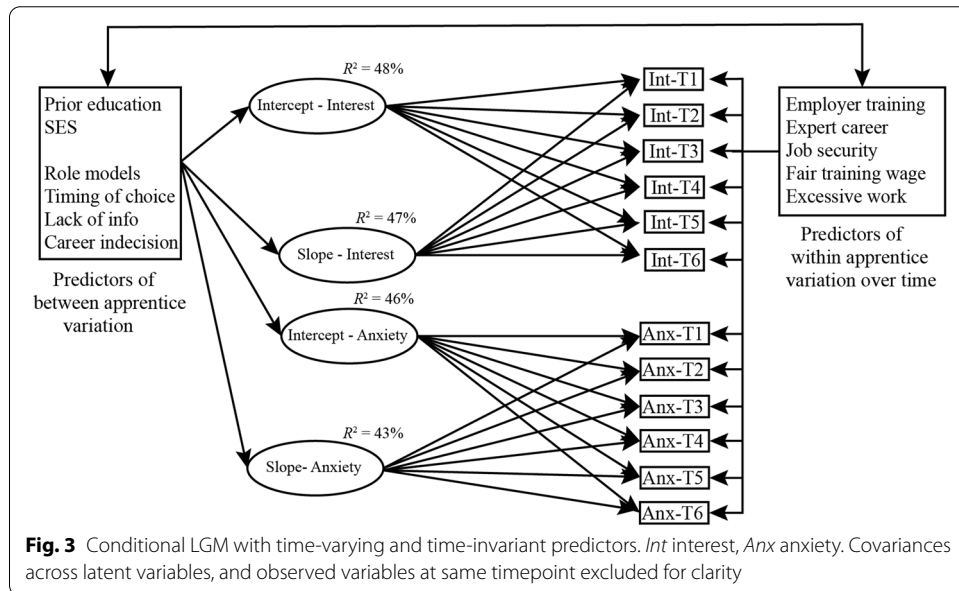
training wage (β = 0.04) had the smallest effect in explaining why apprentices experienced higher levels of interest throughout their apprenticeship. Fair training wage was not significantly related to anxiety, whereas the other three resources demonstrated small prediction effects (β ranged from − 0.06 to − 0.09). Excessive work significantly and positively predicted anxiety (β = 0.25), and negatively predicted interest (β = − 0.05).

Discussion

The present study examined the growth trajectories of apprentices' interest and anxiety during their first 2½ years, how these predicted dropout considerations, and how perceived work-related resources and demands explained differences in interest and anxiety trajectories across apprentices and over time. This study focused on dropout considerations rather than actual dropout, because even though the two have been established to be importantly linked (Allen et al. 2010), dropout considerations reflect a negative quality of apprenticeship experience and can impact apprentices' quality of learning and engagement which is undesirable. The first research question concerning motivational trajectories demonstrated that, on average, apprentices commenced with high interest that declined over time, and low anxiety which increased. Interestingly, the trajectory for anxiety showed this increase began in the latter half of apprentices' first

Table 8 Pre-entry predictors of between-apprentice variance (standardised)

Pre-entry	Interest		Anxiety	
predictors	Intercept	Slope	Intercept	Slope
Background				
Prior education	− 0.09*	0.14*	− 0.03	− 0.06
SES	0.01	− 0.04	− 0.06	0.13
Resources				
Role models	0.26**	− 0.04	− 0.04	− 0.13
Timing of choice	0.13**	0.10	− 0.03	− 0.04
Demands				
Lack of information	0.01	− 0.03	0.14**	− 0.03
Career indecision	− 0.30**	0.15*	0.37**	− 0.30**

**p < .01, *p < .05

Table 9 Time-varying predictors of within-apprentice variance (standardised)

Time-varying predictors	Interest	Anxiety
Resources		
Employer active training	0.24**	− 0.09**
Expert career	0.15**	− 0.06**
Job security	0.16**	− 0.08**
Fair training wage	0.04**	0.00
Demand		
Excessive work	− 0.05**	0.25**

**p < .01, *p < .05

year until the end of their second year. For the second research question, results supported the hypothesis that dropout considerations were predicted by lower initial levels and declines in interest. However for anxiety, higher initial levels but not growth in anxiety predicted dropout considerations. Not all apprentices reported same levels of initial interest and anxiety, nor the same growth—as hypothesised, their differentially experienced resources and demands (prior to and during their apprenticeship) predicted differences in apprentices' motivational trajectories. In answer to the third research question, resources had a greater effect on buffering interest declines than on reducing anxiety; demands were more important in elevating anxiety, suggesting a dual process that aligns to that outlined by JD-R research (Bakker and Demerouti 2017).

Evolving values during the apprenticeship

Trade apprentices' trajectories of interest and anxiety painted a picture of a positive start that deteriorated over time. It is quite likely that the transition from high-school to VET studies prompts positive initial motivations due to an increase in person-environment fit (Eccles and Midgley 1989) with regard to instruction and task structure, which have been previously associated with apprenticeship retention (Powers 2015). Starting an apprenticeship may represent a welcome reprieve from the academic focus of high school, reducing anxiety (Symonds et al. 2016), since Australian apprentices tend to have a poor self-perception of their high school academic ability (Gore et al. 2017).

Both declines in interest and growth in anxiety suggest that initial levels are tempered over time with the reality of experience, as suggested in other tertiary studies (Jones et al. 2010). The lack of growth in anxiety between starting an apprenticeship and the end of the first semester may suggest that employers view the first few months as a transitional period to acclimatise apprentices to the working environment. This aligns with findings sourced from bricklaying employers ($N = 453$) who described their biggest challenges in the first few weeks of taking on an apprentice involved keeping them "keen" and having patience to explain things (Powers 2013).

Why consider dropping out?

Initial levels of interest and anxiety for commencing apprentices were important predictors of their future dropout considerations, as were their declines in interest. Notably, the rate of change for anxiety did not significantly predict dropout considerations, when controlling for interest trajectories. Despite reported anxiety-provoking behaviours by employers and their association with attrition (Cully and Curtain 2001; Harris and Simons 2005; Snell and Hart 2008), it appears that losses in interest are the more critical motivational drivers of dropout considerations *during* the apprenticeship.

Starting with higher motivation

Prior to entry, apprentices who experienced good role models and had decided on their occupation earlier than others, started their apprenticeship with higher levels of interest. Since these resources did not significantly predict differences in the slope, this initial boost had a lasting benefit, compared to apprentices who did not experience good role models or who had decided on their occupation later.

Apprentices who were indecisive about their career choice entered with reduced interest and higher levels of anxiety. However, these detrimental effects were muted by higher growth in interest and a greater reduction in anxiety over time, when compared to apprentices who had been more decisive. Given the negative motivational impact earlier in the apprenticeship, career indecisiveness may partially explain higher levels of dropouts reported in the first year of apprenticeships (Bednarz 2014).

Information that supports new apprentices' motivation

While apprentices' attrition has been linked to various sources of information such as career advisors, training institutes, and supply companies (Powers 2015), the current study indicated which information content may be most important to explaining motivations which underpin dropout considerations. Surprisingly, a lack of information on where a career in the trade might take a person in the future did not predict trajectories of interest, net of other predictors. Notably, experience with a role model and career indecision were the most important predictors of interest at the beginning of an apprenticeship. One might assume that prior experience with a role model should be informative and diminish career indecisiveness, but these two aspects were largely unrelated. This may suggest experience with role models may inform apprentices on trade-related

work expectations (Taylor et al. 2014) but still leave them indecisive on their career choice because they had not considered alternative occupations (Eccles 2005).

Anxiety at the beginning of an apprenticeship was heightened by career indecision and, to a lesser degree, lack of information about the career path. Neither experience with a role model or extended time considering their choice reduced anxiety, suggesting a better understanding of the workplace was unrelated to anxiety. It appeared that anxiety was more affected by long-term occupational concerns – is this the right career for me and where will it take me in the future?

Motivating apprentices at the workplace

Throughout the apprenticeship, workplace resources were generally stronger predictors of interest trajectories, compared with demands. The crucial role of on-the-job training (Smith et al. 2011) was supported by the findings in this study. Apprentices who perceived their employer to be active and thoughtful in their provision of workplace training, showed greater growth in interest. Positive influences on growth in interest also included apprentices' perception of occupational expertise, and job security. Taken together, this implies a transactional relationship between apprentices and employers, where apprentices' expectations of the employer relate to their training of technical skills. This supports the proximal importance of employer training skills over social support suggested by prior research (Powers 2015). However, further longitudinal studies are needed to test this conjecture directly.

Apprentices who viewed their low training wages as a fair exchange for training had a more positive interest trajectory, which consequently predicted lower levels of dropout considerations. This contrasts with findings from prior studies where actual wages (not measured in this study) had a negative impact on dropout intentions (Allen et al. 2010), or no impact on dropout intentions (Gow et al. 2008; Powers 2015). The individual appraisal of training wages has motivational consequences. Concordant with studies that found attrition was associated with apprentices feeling exploited when the level of pay was not viewed as commensurate with the value of work (Cully and Curtain 2001; Harris and Simons 2005), this study demonstrated positive effects when training wages were framed as fair exchange for workplace training. This finding supports the commonly espoused benefits of "earning while learning" for apprentices.

Practical implications

Although the literature indicates dropouts occur early within the apprenticeship (Bednarz 2014) interestingly in this study, dropout considerations increased over time. While it is not desirable for apprentices to be feeling this way, this apparent paradox could be explained by dropout considerations being less likely to translate to actual dropout the further apprentices are through their training, likely due to the effort and level of investment they have already expended. This study sought to better understand why one-third of apprentices considered dropping out and how their motivations to do so might be explained. Here, we emphasise identified key resources and demands which are amenable to change, affording opportunities to intervene where individuals demonstrate low interest or heightened anxiety.

Those contemplating a trade apprenticeship are urged to take time to consider their choice, talk to someone working in the trade, and compare their choice with other career pathways to affirm their career decisiveness. Such active measures supported higher levels of workplace interest through the apprenticeship; noting that work-related interest has been linked to vocational aspirations (Gore et al. 2017), occupational choice (Holland 1997; Lent et al. 1994) and positive employment outcomes (Nye et al. 2017). Anxious applicants would benefit from more information on where their chosen trade career can lead in the future, as well as comparisons with other occupations, to counter their occupational indecision.

The findings provide important policy implications regarding the quality of apprentices' training experience both for workplace training and trade school. First, active and thoughtful training by the employer had the largest effect on apprentices' interest growth which, in turn, reduced dropout considerations. Given the lack of oversight on provision of workplace training in Australia (Smith and Kemmis 2013) and employers' critical role in motivating dropout considerations, we suggest that not all employers should be encouraged to train apprentices. Subsidising employers (directly or through apprentice wages) who hold a record of high apprentice dropouts or recurring apprentice dissatisfaction in relation to their quality of onsite training, appears both financially wasteful as well as unfair to apprentices placed in their charge. Employer funding may be more effective if linked to metrics on active training (e.g., employers lodging online monthly training plans, apprentices' reviewing their workplace training experience). An employer who thoughtfully plans training can motivate apprentices to remain interested in their apprenticeship and help them more successfully navigate their apprenticeship experience. Actual dropout in and of itself need not indicate inadequate employer training, since there are good reasons for apprentices to drop out, and employers who manage an appropriate exit strategy are equally valuable (Stalder and Schmid 2016). Redirecting funds into training for employers who are committed to providing quality workplace training for apprentices would be likely to have benefits for apprentices' satisfaction, commitment, and reduced stress at work (Allen et al. 2010). Given the different nature of various trades (Powers 2015), such training would be best delivered by industry groups and trade schools with knowledge of the relevant occupation-specific work context.

Second, our findings indicated that trade schools need to consider a widened scope, beyond the individual apprentice, to include employers' capacity to train onsite. Given the importance of workplace motivations in predicting apprentices' dropout considerations, it would be negligent for trade schools to ignore apprentices' workplace placements, when apprentices may be assigned to a very negative experience if hired by an employer who is poorly skilled or noncompliant in training. The policy that requires trade schools to accept an apprentice hired by any employer who provides a self-declaration of being "a fit and proper person for employing an apprentice" (see Sect. 5.5.7[2] in Education and Training Reform Act 2006, 2020) requires greater scrutiny, to ensure employers are adequately suited for onsite training. Such scrutiny may involve interviewing employers, collating prior apprentices' training satisfaction feedback, and apprentices' completion rates over time. Employers who take on their first apprentice should be offered more frequent site visits and mentoring by experienced employers who are held

in high regard for their training. The goal is to grow and maintain employers who are effective in onsite training, and exclude employers who "churn" through apprentices to take advantage of "cheap labour" (Bednarz 2014; Powers 2013).

Limitations

This study is not without limitations. On the one hand, a strength of the study is that four trade occupations were included (bricklaying, carpentry, plumbing, and electrical). On the other hand, there are noticeable differences across these four trades, such as plumbing and electrical being licensed trades that require apprentices to obtain a trade qualification before they can practice, while unlicensed trades are less competitive to enter and often attract lower wages upon completion. It was not possible to examine interactions between the tested effects and the type of trades within our study in view of the sample size. While this is a limitation, very large samples of each trade would be required in order to model these processes and examine their interactions across particular trades. Further, not all values contained in EVT were included in the models. Adding other kinds of values (i.e., utility value and other costs) or expectancies, may provide a richer understanding of apprentices' developing motivations. However, workplace interest and anxiety have demonstrated stronger associations with apprentices' intentions to leave their training, beyond other values, in other research (Powers 2020). Finally, it is acknowledged that data were self-reported which may lead to bias. Although, self-reports were used to capture individuals' subjective values and experience, employer reports would have strengthened the methodology.

Conclusion

The present study was designed to investigate how and why apprentices' motivations develop and consequences for dropout considerations. Using large-scale longitudinal Australian data and latent growth modelling, this study has demonstrated that, in line with expectancy-value theory, (EVT; Eccles-Parsons et al. 1983), workplace interest and anxiety trajectories predicted apprentices' dropout considerations. How interest and anxiety differed between and within apprentices throughout their apprenticeship was examined through the lens of the job demands-resources model (Demerouti et al. 2001). The findings supported a dual engagement-stress process where higher resources promoted initial interest and buffered against interest losses, and lower demands reduced the development of anxiety.

Even at the beginning of the apprenticeship, initial levels of interest and anxiety were important indicators of dropout considerations during the apprenticeship, suggesting early detection and warning is possible. During the apprenticeship, workplace interest decreased whereas anxiety started to increase after the first 6 months. While workplace-related reasons are those most commonly cited for not completing an apprenticeship in Australia (Bednarz 2014; Cully and Curtain 2001), this study found resources such as employer training, job security and perceptions of occupational expertise could enhance workplace interest through the apprenticeship. This suggests that much can be done to support apprentices' quality of experience, which in turn reduces dropout considerations. In comparison to other studies which found low training wages to have deleterious

effects (Cully and Curtain 2001), or no effects (Gow et al. 2008; Powers 2015), results of this study demonstrated a small positive effect when wages were perceived as a fair exchange to learn the trade.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40461-020-00106-8.

> **Additional file 1.** Appendix A includes list of measurement items. Appendix B provides measurement invariance tests on repeatedly measured factors.

Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests
The authors declare that they have no competing interests.

Author details
[1] Faculty of Education, Monash University, Clayton campus, 19 Ancora Imparo Way, Melbourne, VIC 3800, Australia.
[2] School of Education and Social Work, The University of Sydney, Sydney, NSW 2006, Australia.

References
Alkema A, McDonald H, Murray N (2016) Learning, life and work: understanding non-completion of industry qualifications. Ako Aotearoa. https://akoaotearoa.ac.nz/non-completers-industry-training. Accessed 27 Mar 2017
Allen DG, Bryant PC, Vardaman JM (2010) Retaining talent: replacing misconceptions with evidence-based strategies. Acad Manag Perspect 24(2):48–64. https://doi.org/10.5465/AMP.2010.51827775
Bakker AB, Costa PL (2014) Chronic job burnout and daily functioning: a theoretical analysis. Burnout Res 1(3):112–119. https://doi.org/10.1016/j.burn.2014.04.003
Bakker AB, Demerouti E (2017) Job demands-resources theory: taking stock and looking forward. J Occup Health Psychol 22(3):273–285. https://doi.org/10.1037/ocp0000056
Battle A, Wigfield A (2003) College women's value orientations toward family, career, and graduate school. J Vocat Behav 62(1):56–75. https://doi.org/10.1016/S0001-8791(02)00037-4
Bauer TN, Bodner T, Erdogan B, Truxillo DM, Tucker JS (2007) Newcomer adjustment during organizational socialization: a meta-analytic review of antecedents, outcomes, and methods. J Appl Psychol 92(3):707–721
Bean JP, Metzner BS (1985) A conceptual model of nontraditional undergraduate student attrition. Rev Educ Res 55(4):485–540. https://doi.org/10.3102/00346543055004485
Bednarz A (2014) Understanding the non-completion of apprentices. NCVER. http://www.ncver.edu.au/publications/2706.html. Accessed 15 Jan 2015
Berglund I, Loeb IH (2013) Renaissance or a backward step? Disparities and tensions in two new Swedish pathways in VET. Int J Train Res 11(2):135–149. https://doi.org/10.5172/ijtr.2013.11.2.135
Brown T (2015) Confirmatory factor analysis for applied research, 2nd edn. Guilford Press, New York
Chen FF (2007) Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct Equ Model Multidiscip J 14(3):464–504. https://doi.org/10.1080/10705510701301834
Cully M, Curtain R (2001) Reasons for new apprentices' non-completions. NCVER. http://hdl.voced.edu.au/10707/159578. Accessed 6 Apr 2013
de Lange AH, De Witte H, Notelaers G (2008) Should I stay or should I go? Examining longitudinal relations among job resources and work engagement for stayers versus movers. Work Stress 22(3):201–223. https://doi.org/10.1080/02678370802390132
Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB (2001) The job demands-resources model of burnout. J Appl Psychol 86(3):499–512. https://doi.org/10.1037//0021-9010.86.3.499
Dickie M, McDonald RP, Pedic F (2011) A fair deal: apprentices and their employers in NSW. NSW Board of Vocational Education and Training. http://hdl.voced.edu.au/10707/187017. Accessed 15 Apr 2013

Eccles-Parsons JS, Adler TF, Futterman R, Goff SB, Kaczala CM, Meece JL, Midgley C (1983) Expectancies, values, and academic behaviors. In: Spence JT (ed) Perspective on achievement and achievement motivation. W. H. Freeman and Company, New York, pp 75–146

Eccles JS (2005) Subjective task value and the Eccles et al. model of achievement-related choices. In: Elliot AJ, Dweck CS (eds) Handbook of competence and motivation. Guilford Press, New York, pp 105–121

Eccles JS, Midgley C (1989) Stage-environment fit: developmentally appropriate classrooms for young adolescents. In: Ames C, Ames R (eds) Research on motivation in education: goals and cognitions, vol 3. Academic Press, New York, pp 139–186

Education and Training Reform Act 2006, Authorised Version No. 082 1–777 § 5.5.7(2) (2020). https://www.legislation.vic.gov.au/in-force/acts/education-and-training-reform-act-2006/082. Accessed 10 Oct 2020

Eicher V, Staerklé C, Clémence A (2014) I want to quit education: a longitudinal study of stress and optimism as predictors of school dropout intention. J Adolesc 37(7):1021–1030. https://doi.org/10.1016/j.adolescence.2014.07.007

Ellis AM, Bauer TN, Erdogan B (2015) New-employee organizational socialization: adjusting to new roles, colleagues, and organizations. In: Grusec JE, Hastings PD (eds) Handbook of socialization: theory and research, 2nd edn. The Guilford Press, New York, pp 301–322

Gaspard H, Dicke A-L, Flunger B, Schreier B, Hafner I, Trautwein U, Nagengast B (2015) More value through greater differentiation: Gender differences in value beliefs about math. J Educ Psychol 107(3):663–677. https://doi.org/10.1037/edu0000003

Gati I, Krausz M, Osipow SH (1996) A taxonomy of difficulties in career decision making. J Couns Psychol 43(4):510–526. https://doi.org/10.1037//0022-0167.43.4.510

Gore J, Ellis H, Fray L, Smith M, Lloyd A, Berrigan C, Lyell A, Weaver N, Holmes K (2017) Choosing VET: investigating the VET aspirations of school students. NCVER, Leabrook

Gow K, Hinschen C, Anthony D, Warren C (2008) Work expectations and other factors influencing male apprentices' intentions to quit their trade. Asia Pacific J Hum Resour 46(1):99–121. https://doi.org/10.1177/1038411107086546

Griffeth RW, Hom PW, Gaertner S (2000) A meta-analysis of antecedents and correlates of employee turnover: update, moderator tests, and research implications for the next millennium. J Manag 26(3):463–488. https://doi.org/10.1016/S0149-2063(00)00043-X

Gurtner J-L, Gulfi A, Genoud P, de Rocha Trindade B, Schumacher J (2012) Learning in multiple contexts: are there intra-, cross- and transcontextual effects on the learner's motivation and help seeking? J Educ Dev 27(2):213–225. https://doi.org/10.1007/s10212-011-0083-4

Halbesleben JRB, Wheeler AR (2008) The relative roles of engagement and embeddedness in predicting job performance and intention to leave. Work Stress 22(3):242–256. https://doi.org/10.1080/02678370802383962

Harris R, Simons M (2005) Exploring the notion of retention in apprenticeship. Educ Train 47(4):350–365. https://doi.org/10.1108/00400910510601922

Harris R, Simons M, Bridge K, Bone J, Symons H, Clayton B, Pope B, Cummins G, Blom K (2001) Factors that contribute to retention and completion rates for apprentices and trainees. NCVER. http://hdl.voced.edu.au/10707/69132. Accessed 22 May 2013

Hart PM, Wearing AJ, Conn M, Carter NL, Dingle RK (2000) Development of the school organisational health questionnaire: a measure for assessing teacher morale and school organisational climate. Br J Educ Psychol 70(2):211–228. https://doi.org/10.1348/000709900158065

Hobfoll S (2012) Conservation of resources theory: its implication for stress, health, and resilience. In: Folkman S (ed) The Oxford handbook of stress, health and coping. Oxford University Press, pp 127–147. https://doi.org/10.1093/oxfordhb/9780195375343.013.0007

Hoff KA, Briley DA, Wee CJM, Rounds J (2018) Normative changes in interests from adolescence to adulthood: a meta-analysis of longitudinal studies. Psychol Bull 144(4):426–451. https://doi.org/10.1037/bul0000140

Holland JL (1997) Making vocational choices: a theory of vocational personalities and work environments (3rd ed.). Psychological assessment resources

Jones BD, Paretti MC, Hein SF, Knott TW (2010) An analysis of motivation constructs with first-year engineering students: Relationships among expectancies, values, achievement, and career plans. J Eng Educ 99(4):319–336. https://doi.org/10.1002/j.2168-9830.2010.tb01066.x

Kanfer R, Frese M, Johnson RE (2017) Motivation related to work: a century of progress. J Appl Psychol 102(3):338–355. https://doi.org/10.1037/apl0000133

Karmel T, Mlotkowski P (2010) The impact of wages on the probability of completing an apprenticeship or traineeship. NCVER. http://hdl.voced.edu.au/10707/50792

Karmel T, Mlotkowski P (2011) The impact of wages and the likelihood of employment on the probability of completing an apprenticeship or traineeship. NCVER. http://www.ncver.edu.au/publications/2364.html. Accessed 5 Oct 2020

Karmel T, Oliver D (2011) Pre-apprenticeships and their impact on apprenticeship completion and satisfaction. NCVER. http://hdl.voced.edu.au/10707/344. Accessed 5 Oct 2020

Lamb S, McKenzie PC (2001) Patterns of success and failure in the transition from school to work in Australia (LSAY research reports, Issue 8). ACER. http://research.acer.edu.au/lsay_research/67. Accessed 22 Feb 2014

Lent RW, Brown SD, Hackett G (1994) Towards a unifying social cognitive theory of career and academic interest, choice, and performance. J Voc Behav 45:79–122

McMillan J, Beavis A, Jones FL (2009) The AUSEI06: a new socioeconomic index for Australia. J Sociol 45(2):123–149. https://doi.org/10.1177/1440783309103342

Misko J, Nguyen N, Saunders J (2007) Doing an apprenticeship: what young people think. NCVER. http://hdl.voced.edu.au/10707/127039. Accessed 28 June 2015

Muthen LK, Muthen B (2017) Mplus user's guide, 8th edn. Muthen & Muthen, Los Angeles

NCVER (2019) Australian vocational education and training statistics: apprentice and trainee experience and destinations 2019. NCVER, New York

NCVER (2020) Australian vocational education and training statistics: completion and attrition rates for apprentices and trainees 2019. NCVER, New York

Nye C, Su R, Rounds J, Drasgow F (2017) Interest congruence and performance: revisiting recent meta-analytic findings. J Voc Behav 98:138–151

OECD (2009) Jobs for youth/Des emplois pour les jeunes: Australia. OECD, Paris. https://doi.org/10.1787/9789264060203

OECD (2017) Building skills for all in Australia: policy insights from the survey of adult skills studies. OECD, Paris. https://doi.org/10.1787/9789264281110-en

Powers TE (2013) Bricklaying contractors stepping up: Training bricklaying apprentices on-the-job has its challenges. Australian Brick & Blocklaying Training Foundation. http://hdl.voced.edu.au/10707/273801. Accessed 12 Dec 2013

Powers TE (2015) Predicting apprenticeship retention: not all trades are the same. In: Griffin T (Ed.) 2014 postgraduate research papers: a compendium. NCVER, pp 50–87. http://hdl.voced.edu.au/10707/364600

Powers TE (2020) Motivated apprentices: the value of workplace and trade school. J Educ Work 33(1):81–97. https://doi.org/10.1080/13639080.2020.1716309

Preacher KJ, Wichman AL, MacCallum RC, Briggs NE (2008) Latent growth curve modeling. Sage Publishing, New York

Saks AM, Gruman JA (2018) Socialization resources theory and newcomers' work engagement. Career Dev Int 23(1):12–32. https://doi.org/10.1108/CDI-12-2016-0214

Sandler M (2000) Career decision-making self-efficacy, perceived stress, and an integrated model of student persistence: a structural model of finances, attitudes, behavior, and career development. J Assoc Instit Res 41(5):537–580. https://doi.org/10.1023/A:1007032525530

Schaufeli WB, Bakker AB (2004) Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. J Organ Behav 25(3):293–315. https://doi.org/10.1002/job.248

Scherrer V, Preckel F (2019) Development of motivational variables and self-esteem during the school career: a meta-analysis of longitudinal studies. Rev Educ Res 89(2):211–258. https://doi.org/10.3102/0034654318819127

Seidel K (2019) The intention to quit apprenticeships and the role of secondary jobs. J Voc Educ Train 71(4):556–578. https://doi.org/10.1080/13636820.2019.1566269

Shi D, Lee T, Terry RA (2018) Revisiting the model size effect in structural equation modeling. Struct Equ Model Multidiscip J 25(1):21–40. https://doi.org/10.1080/10705511.2017.1369088

Skaalvik E, Skaalvik S (2018) Job demands and job resources as predictors of teacher motivation and well-being. Soc Psychol Educ Int J 21(5):1251–1275. https://doi.org/10.1007/s11218-018-9464-8

Smith E, Kemmis RB (2013) Towards a model apprenticeship framework: a comparative analysis of national apprenticeship systems. International Labour Office. http://www.ilo.org/newdelhi/whatwedo/publications/WCMS_234728/lang--en/index.htm. Accessed 5 July 2015

Smith E, Walker A, Kemmis RB (2011) Understanding the psychological contract in apprenticeships and traineeships to improve retention. NCVER. http://hdl.voced.edu.au/10707/185378

Snell D, Hart A (2008) Reasons for non-completion and dissatisfaction among apprentices and trainees: a regional case study. Int J Train Res 6(1):44–73. https://doi.org/10.5172/ijtr.6.1.44

Stalder BE, Schmid E (2016) Termination of apprenticeship contract and training success—no contradiction: paths and detours to vocational qualification. hep Verlag AG, Bern

Symonds J, Dietrich J, Chow A, Salmela-Aro K (2016) Mental health improves after transition from comprehensive school to vocational education or employment in England: a national cohort study. Dev Psychol 52(4):652–665. https://doi.org/10.1037/a0040118

Taylor A, Lehmann W, Raykov M (2014) "Should I stay or should I go?" Exploring high school apprentices' pathways. J Educ Work. https://doi.org/10.1080/13639080.2014.887199

Virtanen A, Tynjälä P, Eteläpelto A (2014) Factors promoting vocational students' learning at work: study on student experiences. J Educ Work 27(1):43–70. https://doi.org/10.1080/13639080.2012.718748

Watt HMG, Richardson PW (2006) Motivations for career choice scale. Monash University, Melbourne (**Unpublished**)

Watt HMG, Richardson PW (2007) Motivational factors influencing teaching as a career choice: Development and validation of the FIT-Choice scale. J Exp Educ 75(3):167–202. https://doi.org/10.3200/JEXE.75.3.167-202

Wigfield A, Eccles JS, Fredricks J, Simpkins S, Roeser RW, Schiefele U (2015) Development of achievement motivation and engagement. In: Lerner RM (ed) Handbook of child psychology and developmental science, vol 30. Wiley, New York, pp 1–44

Wigfield A, Tonks S, Klauda SL (2009) Expectancy-value theory. In: Wentzel KR, Wigfield A (eds) Handbook of motivation at school. Routledge, London, pp 55–75

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