

DOCTOR OF PHILOSOPHY

Development of the concept of impact literacy through applying theory vs. intervention led approaches to adolescent sexual health intervention design

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Development of the concept of impact literacy through applying theory vs. intervention led approaches to adolescent sexual health intervention design

**By
Julie E. Bayley**



**The work contained within this document has been submitted by the
student in partial fulfilment of the requirement of their PhD**

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1. List of abbreviations

Term	Description
APEASE	Affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety and equality
AR	Anticipated Regret
ARMA	Association of Research Managers and Administrators
BCT	Behaviour Change Technique
BCW	Behaviour Change Wheel
BPS	British Psychological Society
CASRAI	Consortia for Advancing Standards in Research Administration Information
COM-B	Capability, Opportunity and Motivation to change Behaviour
EC ¹	Emergency Contraception
HEFCE	Higher Education Funding Council for England
IM	Intervention Mapping
KMb	Knowledge Mobilisation
MRC	Medical Research Council
NRES	National Research Ethics Service
PWM	Prototype Willingness Model
REAIM	reach, efficacy, adoption, implementation and maintenance
REF	Research Excellence Framework
STI	Sexually Transmitted Infections
TACT	Target, Action, Context and Time
TP	Teenage Pregnancy
TPB	Theory of Planned Behaviour
U16s	Under 16 year olds
WSWTTC	What Should We Tell the Children

¹ Emergency Contraception is also commonly referred to as Emergency Hormonal Contraception, and often abbreviated to EHC within pharmacy literature. However within this portfolio 'EC' is used to match the terminology used in the published outputs.

2. Abstract

Despite an overall reduction in UK teenage conception rates since the 1999 Teenage Pregnancy strategy, rates remain high and sexually transmitted infections remain a public health issue. School sex education remains a primary source of sex and relationships information for young people, but there is varied quality in provision and limited opportunity to accommodate individual differences (such as gender and age). Young people can benefit from parental support in learning about sex and relationships, but parents can feel embarrassed and underequipped to talk with their children. There is clear scope to integrate socio-cognitive theory into provision to improve education and support to ultimately improve contraception use. Approaches to intervention development can be characterised as being rooted in a singular or expanded theory ('theory led'), or focused on the problem and allowing the application of multiple theories ('intervention led').

This portfolio presents seven outputs within the theme of sex education, each offering insights into how to improve adolescent sexual health. Two articles are presented within the 'theory-led' strand. The first article (Bayley, Brown, & Wallace, 2009) explores under 16s attitudes to emergency contraception within a Theory of Planned Behaviour (Ajzen, 1991) framework. Focus groups with 13-16 year olds (n=48) suggest that practical factors and attitudes may be more significant barriers for teenagers ambivalent about pregnancy, and that confidentiality is a concern for all young people. The second article (Bayley, Baines, & Brown, 2017) integrates these findings into an extended TPB survey (n=1378) on under 16 attitudes to condoms, the contraceptive pill and emergency contraception. Findings suggest three distinct predictive models of intention (36%, 18% and 23% respectively), with attitude, gender and anticipated regret common to each. Girls appear more strongly motivated and year 10 is a crucial stage for intention. Four outputs are presented under the '*intervention-led*' strand. Output 3 (Newby, Bayley, & Wallace, 2011a) describes the process of using an Intervention Mapping (Eldredge, Markham, Kok, Ruiter, & Parcel, 2016) approach to develop a parents' sex and relationships communication programme ("What Should We Tell the Children?"). In reflection of the challenge of recruiting fathers to this programme, Output 4 (Bayley, Wallace, & Choudhry, 2009) explores how to improve fathers' engagement in parenting support. Results of focus groups, questionnaires and interviews (n=38) suggest practical difficulties, female oriented services and lack of organisational support present barriers to fathers' access. In reflection of difficulties attending a group programme and the need to improve access,

Output 5 (Bayley, Baines, & Brown, 2015) demonstrates the process of converting the group based “What Should We Tell the Children?” programme into an online Serious Game. Drawing this learning back into school based provision, Output 6 (Brown, Bayley, & Newby, 2012) applies Intervention Mapping to the development of a serious game for use in the classroom to prevent sexual coercion.

Each of these outputs highlights a range of challenges and opportunities for generating real world benefit or ‘impact’. The final output (Bayley & Phipps, 2017a) draws together this learning into a new concept of ‘impact literacy’, emphasising the need to understand the *how*, *what* and *who* of impact to drive research into practice. The learning is also synthesised into two new models of impact literate health psychology interventions, combining best practice across theory, intervention and impact models to guide subsequent development and implementation.

3. Keywords

Adolescents
Behaviour change
Contraception
Knowledge mobilisation
Knowledge transfer
Knowledge translation
Health Psychology
Interventions
Intervention Development
Intervention Mapping
Impact
Impact literacy
Impact research
Implementation research
Research impact
School
Sex education
Sexual health
Teenage pregnancy
Theory of Planned Behaviour
Under 16s

4. Summary of portfolio

Risky sexual behaviour places young people at increased risk of unplanned pregnancy, sexually transmitted infections (STIs) and short to long-term health problems (Social Exclusion Unit, 1999). However, despite an overall downturn in teenage pregnancy rates within England and Wales (Hadley, Chandra-Mouli, & Ingham, 2016; Wellings et al., 2013), rates remain high (Office for National Statistics, 2014) and present an ongoing public health challenge. First intercourse is often unprotected amongst adolescents (Wellings et al., 2001) and interventions are needed to both increase the use of primary contraception (e.g. condoms) and improve uptake of emergency contraception where needed.

School-based sex education is a primary platform for communicating sex and relationship information to young people (Tanton et al., 2015). However, brief interventions struggle to address individual influences on safe sex behaviour (Bailey et al., 2010), and knowledge-only interventions do not significantly affect intention to use contraception or actual contraceptive use (Abraham, Sheeran, Spears, & Abrams, 1992). More intensive, theory driven interventions tend to be more effective (Oringanje et al., 2009), offering much potential for improving sex education provision (Brown, 2006). With parents uniquely placed to offer bespoke advice, and with evidence showing a positive effect of parent-child dialogue on adolescent sexual behaviour (Macdowall et al., 2015; Parkes, Henderson, Wight, & Nixon, 2011), it is essential to support parents' ability to communicate. Thus, enhancing sex education with socio-cognitive theory and supporting parents to talk with their children are two key routes to address ongoing public health challenges surrounding adolescent sexual health.

Health psychology offers theory-rich interventions which target behavioural determinants to achieve health related goals. However, in practice, there is often a disconnect between rigorously developed academic interventions and sustained implementation in a real-world setting. The narrow focus of theory-led work (e.g. model building, testing and expansion) can overlook the challenges of social implementation. Conversely the user focused nature of intervention-led approaches can dilute theory and over time lose intervention fidelity. Whilst there is a growing body of knowledge on theory based behaviour change techniques (Michie, Atkins, & West, 2014; Michie et al., 2013), intervention development (Bartholomew, Parcel, Kok and Gottlieb, 2001; Bartholomew,

Parcel, Kok, & Gottlieb, 2011; Eldredge, Markham, Kok, Ruiter and Parcel, 2016) and implementation (Glanz & Bishop, 2010; Nilsen, 2015) there remains insufficient clarity on how theory vs. intervention led approaches lead to longer term impact.

This portfolio of seven outputs represents a body of work outlining the challenges of conducting theory and intervention led research in real world settings, and preserving academic rigour along the impact pathway. The first six outputs demonstrate adolescent sexual health studies illustrating original applications of theory, empirical studies with hard to reach/under-explored groups (e.g. under 16s), qualitative and quantitative research, intervention development and implementation, innovation via serious games and studies focused on improving implementation and impact. These outputs are presented under two strands to represent the contrasting approaches:

- **Strand 1: Application of theory-driven health psychology research in an adolescent sexual health context.** This strand reflects on the utility of a theory-led approach in understanding adolescent contraception intentions, and how sex education may be enhanced accordingly. Output 1 illustrates a Theory of Planned Behaviour belief elicitation study on emergency contraception, and output 2 shows a large-scale cross sectional extended TPB survey on attitudes to multiple contraceptives.
- **Strand 2: Application of intervention development frameworks and impact-focused approaches to enhance adolescent sexual health.** Strand 2 represents a more innovative, intervention-led, theory-agnostic approach and reflects on the challenges for implementing interventions in practice. Output 3 illustrates the application of Intervention Mapping to the development of a parents' communication programme, output 4 details a study to explore issues around uptake of interventions by fathers, output 5 shows the conversion of the programme into a serious game, and output 6 details the development of a serious game to prevent sexual coercion.

Implications for theory-led vs intervention-led approaches to adolescent sexual health are discussed, and considered alongside emerging evidence on impact. Drawing together the learning from the portfolio, a seventh output offers the new concept of 'impact literacy'. This outlines how a combined understanding of *how* research knowledge is mobilised, by

who and for *what* effect is vital if impact pathways are to be appropriately, realistically and meaningfully planned. , This portfolio then concludes with the development of two new models which (i) synthesise existing frameworks for theory based intervention development and impact to articulate the journey from conception to sustained effect, and (ii) a translation of this into a guiding and iterative framework for the development of impactful theory based interventions.

A note on terminology

The terms ‘user’ and ‘stakeholder’ are used throughout this portfolio and are presented as discrete but overlapping concepts. ‘Users’ refers to those who directly benefit from the research, i.e. those who are users or recipients of an intervention, and for whom the research/intervention is aimed at influencing. In this context, these may include, but are not restricted to patients, staff/practitioners, school pupils, teachers and parents. In contrast, ‘stakeholders’ is a far broader term referring to all those individuals or groups who have an interest in the research, and may positively or negatively influence the research, development or implementation process. By definition all users are stakeholders, but the latter may be less directly involved with the research/ intervention itself. Stakeholders may include, but are not restricted to users, service leads, commissioners, policy makers, special interest groups and funders.

The primary population of interest in this series of studies is under 16s. This group is variably referred to in literature and policy as adolescents, young adolescents, young people and many other terms, and the age range associated with each term varies. Thus, for clarity throughout this portfolio, the term ‘under 16s’ (abbreviated to u16s) is used to denote the focus on young people within the presented studies who are below the age of consent.

5. Introduction to the researcher and areas of research interest

Applied health psychology research

I am a researcher within the Faculty of Health and Life Sciences and a HCPC Registered Health Psychologist. A summary of outputs and grants is provided in Appendices A and B. My primary research focus has been the development and evaluation of evidence and theory-based behaviour change interventions to address adolescent sexual health, although I have conducted independent research and intervention development across a range of health psychology areas. I have obtained over £150,000 grant income as principal investigator and over £90,000 as co-PI, and disseminated widely through academic and practitioner journal outputs, conferences and online formats. I have led research teams to deliver multiple projects, mentored staff and taught under- and post-graduate healthcare students (including a range of modules for psychology students, health psychology master students, medical students, occupational therapists and midwives). Alongside ongoing academic activities such as reviewing for peer-reviewed journals, I have also been a member of the HLS Ethics committee and Coventry University Research Data Management Stakeholder group.

Impact and knowledge mobilisation

From April 2012 until August 2014 I undertook an increasingly split role between academic research and research management. Starting as the academic lead for the development of a Jisc funded impact capture system for Coventry University, I was subsequently seconded into the Vice Chancellor's Office as the university's impact officer (2014-6). During this time, I designed and delivered a programme of behaviour-change informed impact training to over 500 CU staff within CU and facilitated impact planning for funding bids. I also support and advise on impact across the sector, both nationally and internationally; as the Association for Research Managers and Administrators (ARMA) co-champion for Impact and Training and Development Committee event lead, I facilitate impact best practice through UK training events and networking, professional mentoring and directly contributing to national policy consultations (e.g. HEFCE review of impact). I also sit on the Consortia for Advancing Standards in Research Administration Information (CASRAI) Impact working group, an international information standards organisation, and am collaborating on the development of international competency standards for non-commercial knowledge brokerage. I have delivered a substantial

number of knowledge mobilisation and impact talks, including applying intervention mapping logic to impact, culture change and impact, embedding impact institutionally and knowledge mobilisation for health. In 2015 I won the inaugural Association of Research Management and Administrators (ARMA) Research Impact award and was nominated for the ARMA 'Collaboration' award in 2016 in recognition of my work to build the concept of impact literacy with Dr David Phipps (York University, Toronto).

This portfolio reflects both elements of my professional activities and showcases how the two interconnect. More specifically the portfolio represents how the experience of undertaking academic research, whilst also approaching research from an impact lens, has allowed me to understand how research is mobilised over time. By purposefully connecting both areas, it highlighted the importance of an impact literate approach to research; i.e. the need to be able to understand and critically appraise the processes and skills needed to generate demonstrable outcomes.

6. Background to research

6.1.i. Public health and academic context health and academic context

Reducing rates of adolescent conception and childbearing is a major national (National Institute for Health and Care Excellence, 2007b) and international (United Nations Secretary-General, 2010) public health priority. Unsafe sex places young people at increased risk of sexually transmitted infections (STIs) and unintended pregnancy, both of which can impact long-term health and wellbeing (Health Inequalities Unit, 2007). At the outset of this body of research, national efforts to address sexual health were harnessed within the Teenage Pregnancy Strategy (Social Exclusion Unit, 1999) which set a target to halve teenage pregnancy (TP) by 2010. To date, the UK under-18 conception rate has reduced by 55% since 1998 figures (Office for National Statistics, 2017), but 45.2% of 16-19 year old pregnancies are still unplanned (Wellings et al., 2013). STIs have continued to increase, and young people aged 16-24 years are at most risk of infection (Public Health England, 2015). The associated negative health and social implications of poor sexual health (Brown, Arden, & Hurst, 2007; Churchill, Allen, Pringle, & Hippisley-Cox, 2002; Health Inequalities Unit, 2007; Paranjothy, Broughton, Adappa, & Fone, 2009; Shaw, Lawlor, & Najman, 2006) underpin continued UK Government public health focus (Department for Children Schools and Families, 2010; Department of Health, 2013). Thus, despite an overall downturn in pregnancy rates, there is need for further efforts to address adolescent sexual health.

Adolescents' preferred contraceptives are condoms, the contraceptive pill and emergency contraception (EC; (Office for National Statistics, 2009). Unlike Long Acting Reversible Contraceptives (LARCs), these are effortful and require interaction within the sexual encounter and/or diligent daily compliance (Hancock, Lees, & Brown, 2011). However this is undermined by socio-cognitive factors such as having drunk alcohol (Kiene, Barta, Tennen, & Armeli, 2009), difficulties carrying or asking a partner to use condoms (Hillier, Harrison, & Warr, 1998), and broader social norms such as cultural acceptance of teenage pregnancy (Arai, 2007). Psychological factors such as adolescent egocentrism (Muuss, 1982), unrealistic optimism (Weinstein, 1982), inadequate risk appraisal (Newby, Wallace, & French, 2011), self-efficacy (Sheeran & Taylor, 1999) and ambivalence about pregnancy (Bayley, Brown, et al., 2009) along with broader concepts of self-esteem and aspirations (Newby, Sewell, Bayley, & Brady, 2011) also negatively affect young people's engagement in safe sex.

School based sex education remains the primary source of sexual health information for many young people (Tanton et al., 2015). Evidence suggests a positive relationship between school sex education and delay of sexual debut, likelihood of protected sex and – for females – lower likelihood of unplanned pregnancy (Wellings et al., 2013) and non-consensual activity (NATSAL, 2014). However, recent assessments (OFSTED, 2013) have criticised the quality and effectiveness of sex education, identifying the need for improvement in more than one third of UK schools. School sex education is often infrequently timetabled and delivered in group settings, largely precluding ongoing or tailored interventions. With abstinence-only sex education programmes ineffective (Kirby, 2008; Kohler, Manhart, & Lafferty, 2008), and with knowledge-only education showing minimal benefits to adolescent sexual health (Oringanje et al., 2009), comprehensive approaches which address the complex nature of sexual behaviour are needed (Brown et al., 2012; Kirby, 2008; Kohler et al., 2008).

Public health providers and policy makers concur on the merits of engaging parents as sex and relationship educators (Department for Children Schools and Families, 2010). Good parent–child dialogue on sex and relationships is associated with reduced likelihood of unsafe sex (Macdowall et al., 2015; Parkes et al., 2011), but many parents report difficulties in discussing such topics (Christensen, Wright, & Dunn, 2016). Thus, for young people to develop positive sexual health attitudes, delay sexual debut and to use contraception school and home-based support must be strengthened.

6.1.ii. Theory of Planned Behaviour

Within a large body of health behaviour frameworks, the Theory of Planned Behaviour (Ajzen, 1991) has shown particular utility in predicting safer sex behaviours (Espada, Morales, Guillén-Riquelme, Ballester, & Orgilés, 2016; Tyson, Covey, & Rosenthal, 2014), including in adolescent samples (Fekadu & Kraft, 2001). Despite the demonstrated value of the TPB - over, for example, its predecessor the Theory of Reasoned Action (Ajzen & Fishbein, 1980) - at the time of this research, the TPB had been widely applied to condom use but rarely to the pill and EC. This provided a clear rationale for exploring these latter contraceptive types by extending the application of this model. The TPB (Figure 1) conceptualises individuals as rational information processors whose intentions directly determine the likelihood of a behaviour occurring. Intention itself is a function of three factors: attitude, subjective norm and perceived behavioural control. Attitude reflects overall opinion about the behaviour and is comprised of outcome beliefs (views

about what the behaviour will achieve) and evaluations of outcome (whether that outcome is valued). Subjective norm reflects the effect of other, influential people on behaviour and consists of normative beliefs (individual's perceptions of others' views about the behaviour) and motivation to comply (willingness to act in accordance with others' wishes). Perceived behavioural control reflects the level of perceived ability one has to enact the behaviour, and consists of self-efficacy (perceived confidence in oneself to perform the act) and external factors (barriers and facilitators to action). Individuals will take protective action for their health if they hold positive attitudes about the utility of the behaviour, feel it is endorsed by important referents, and feel they have sufficient individual control to carry it out. This model combines cognitive, social and perceived external barriers and facilitators, and therefore represents a framework for exploring the interplay of variables in adolescent populations.

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Figure 1: Theory of Planned Behaviour

Source: Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, p. 179-211.

Central to the TPB is the clear definition of a measurable behavioural goal. Best practice for TPB survey development (Conner & Norman, 2005; Francis et al., 2004) involves a series of exploratory and confirmatory steps to elicit beliefs, establish referent groups and narrowly define the behaviour in terms of *Target, Action, Context and Time* (TACT) within a specific population. For much of the timescale of this portfolio, the TPB was a particularly pervasive model, attracting considerable research attention and underpinned by a growing evidence base for its utility (McEachan, Conner, Taylor, & Lawton, 2011).

However, criticisms of the models' falsifiability and levels of predictive power led to a call for it to be retired (Sniehotta, Presseau, & Araújo-Soares, 2014). A range of strong rebuttals swiftly followed (Abraham, 2015; Ajzen, 2015; Armitage, 2015; Conner, 2015; Gollwitzer & Oettingen, 2015; Ogden, 2015) showing a disinclination towards TPB retirement, albeit with recognition that the TPB needs to expand beyond its original structure. Thus, the strength of the TPB evidence base justifies continued use, but with need to reinvestigate its application in both simple and extended form.

6.1.iii. Intervention development

To change behaviour, theoretical knowledge must be converted into interventions. Evidence based practice is the cornerstone of effective implementation (Grol & Grimshaw, 2003) and de-implementation (Montini & Graham, 2015) of healthcare (Department of Health, 2006), and vital for the appropriate development of new products, processes and behavioural interventions (Michie et al., 2014; Montori, Brito, & Murad, 2013). Health psychology interventions are largely targeted towards highly specific and context-limited behavioural goals, but are defined as complex due to their multiple "interacting components" (Campbell, Fitzpatrick, Haines, & Kinmonth, 2000). The Medical Research Council (ibid, see Figure 2) outlines a five-phase process through which complex interventions progress from theory to long term implementation. Updated guidance in 2008 (Craig et al., 2008) more specifically recognises context-sensitivity and iteration between stages, but otherwise retains the same linear process from inception to effect.

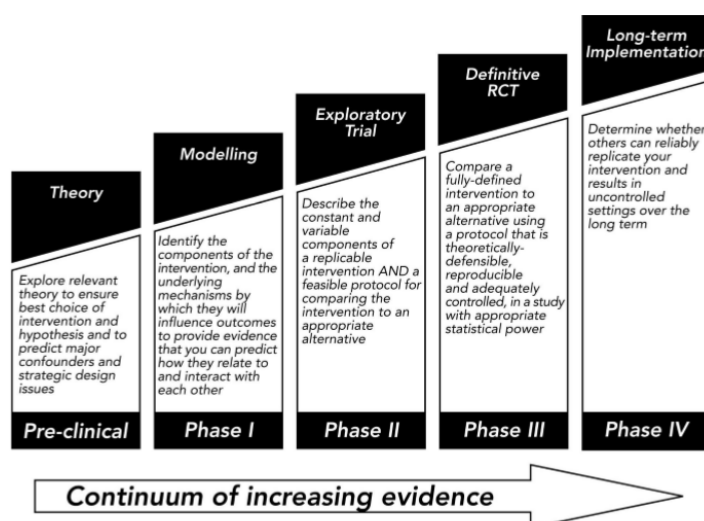


Figure 2: MRC Complex Behaviour Change guidance

Source: <https://www.mrc.ac.uk/documents/pdf/rcts-for-complex-interventions-to-improve-health/>

Evidence shows that behaviour change interventions built on or derived from psychological theory are more likely to be effective than those without theory based content (Webb, Joseph, Yardley, & Michie, 2010). Within health psychology, evidence-led approaches require closer integration of basic and applied research and the evaluation of the processes of change mechanisms (Rothman, 2004). Similarly, the benefit of integrating and centralising end-users into the development process is well understood and increasingly expected practice (INVOLVE, 2012).

However, the varied ways by which theory can be integrated into user-informed change programmes has implications for theory fidelity, replicability, and user acceptability. One approach is to develop *theory-specific* interventions, in which change programmes are built on a single theory. By drawing on a discrete set of variables, developers can experimentally test internal constructs within the theory and comparatively assess its utility against alternative models. However, theory-specific interventions are - by definition - restricted in the range of influences considered. Whilst additional theories can be added to extend a models' reach, theory-specific approaches risk reductionist framing of behaviour through an a-priori lens. In contrast, broader *theory-agnostic* approaches draw on multiple, cross-disciplinary theories to configure programmes which may better reflect the range of influences on users. By shifting away from the rigour of a singular tested model however, these approaches risks diluting strong theory with weaker evidence and methods of change.

One of the more visible theory-agnostic frameworks is Intervention Mapping (Bartholomew, Parcel, Kok and Gottlieb, 2001; Eldredge, Markham, Kok, Ruiter, & Parcel, 2016). IM provides a framework to integrate multiple theories into a behaviour change tool and consists of a sequence of six stages (see outputs 3 and 6 for a full description):

- i. A needs assessment to establish problem from the user perspective
- ii. Development of a matrix of change objectives based on the behavioural goals and their relative determinants
- iii. Identification and selection of theory based methods to address each change goal
- iv. Consolidation of the objectives and methods into a coherent programme
- v. Implementation planning
- vi. Evaluation planning

Through this process, developers can root an intervention in user need, and design strategies to sustain the programme in practice.

In response to the lack of standardised terminology, reporting and reproducibility of behaviour change interventions, attention has also recently turned more acutely to the mechanisms of action themselves. Through a series of increasing rationalisations of intervention literature, the Behaviour Change Technique Taxonomy v1 (Michie et al., 2013) articulates 93 discrete techniques used within change programmes using a standardised vocabulary. A further innovation of this programme of work – the Behaviour Change Wheel (BCW, Michie, van Stralen, & West, 2011; Michie et al., 2014) - focuses more specifically on how behaviour change is enacted via individual capability, opportunity and motivation to change, referred to as the COM-B model. Appropriate intervention functions (e.g. education, modelling) are selected and connected to higher order policies (e.g. fiscal measures, service provision). To further improve the likelihood of implementation, the BCW also includes a checklist to assess the affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety and equality (collectively called the APEASE framework). APEASE highlights the need to explicitly consider those factors which affect uptake, and is mirrored in broader efforts such as the RE-AIM framework reflecting reach, efficacy, adoption, implementation and maintenance (Gaglio, Shoup, & Glasgow, 2013).

Health psychology is thus increasingly driving towards intervention transparency, user-situated programmes of change and implementation effectiveness. Whilst much of the presented portfolio predates the inception of the BCT/BCW, the body of work mirrors these aims within adolescent sexual health.

6.1.iv. Research impact and knowledge mobilisation

Interventions can only change behaviour if they are successfully implemented and adopted. However, impact is rarely the result of simple linear processes, instead requiring effortful knowledge brokering and connections with beneficiaries (Phipps, Cummings, Pepler, Craig, & Cardinal, 2016). Alongside increasing interest in frameworks to guide impact (Raftery, Hanney, Greenhalgh, Glover, & Blatch-Jones, 2016) dominant terminology is also shifting away from simplistic, unidirectional knowledge ‘transfer’

models towards more interactional ('exchange') and multidirectional ('mobilisation') phraseology (Greenhalgh & Wieringa, 2011).

During the timescale of this portfolio, interest in research impact intensified through its introduction into national assessment (Research Excellence Framework, or REF 2014). Previously synonymous with outcomes or influence, the Higher Education Funding Council of England (HEFCE) introduced a more prescriptive definition of 'impact' as "*an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia*" (Higher Education Funding Council for England (HEFCE), 2011). With expectations for research impact increased, and with similar expectations from funders (e.g. Research Councils UK) and internationally (e.g. Horizon 2020), researchers are increasingly obligated to position work within the impact agenda. Whilst such external drivers may sharpen resolve, academia requires clarity on *how* research leads to effect if impact is to be realised.

Much impact rhetoric is underpinned by simple logic models which express linear input-output-outcome-impact paths (WK Kellogg Foundation, 2004). The Payback Framework (Buxton & Hanney, 1996) is particularly pervasive in the health domain (for example, underpinning impact assessments by the National Institute for Health Research). Within the Payback model, research projects are designed and conducted to address a specific topic, learning is consolidated into outputs which are then disseminated, leading to policy making, products and subsequent adoption. Final measurable outcomes mark the end of the process, and a 'reservoir' of knowledge is built throughout.

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The Payback model has considerable merit for understanding a sequential of stages which may lead to impact, particularly with impact often taking many years to mature (Hughes, Kitson, Bullock, & Milner, 2013). However, such stepwise logic models belie the iterative nature of applied social research and offer insufficient granularity to guide the process of knowledge mobilisation. Health related knowledge mobilisation is far less unidirectional than traditional commercially-based models of knowledge transfer and reflects a more socially engaged, multi-partner process (Morton, 2015; Phipps et al., 2016). Similarly, results from the analysis of REF 2014 (Kings College London & Digital Science, 2015) show 3,709 unique impact paths from 6,647 case studies, thus demonstrating how impact resists templating. The continued drive to shift rhetoric away from linear 'input-output' models is supported by a growing body of supportive tools and frameworks (Buxton & Hanney, 1996; Phipps et al., 2016), debates on metrics (Wilsdon et al., 2015) and growing communities of practice such as the UK Knowledge Mobilisation Forum established in 2014.

Thus, the academic sector is coalescing on the need to (a) understand how research knowledge mobilises into non-academic settings, (b) establish appropriate and robust tools to support research translation, and (c) generate impact. With REF having formalised (c) in the UK, it is now timely to establish the evidence base to connect (a) and (b) within health psychology to optimise the benefits of theory-rigorous research.

7. Rationale and research objectives

At the outset of this research, UK teenage pregnancy rates were high (Office for National Statistics, 2007), and those in the local area (Coventry UK) were particularly high compared to national average. Despite extensive strategic and operational efforts via the Teenage Pregnancy Strategy (Social Exclusion Unit, 1999), adolescent conceptions and sexual health were still posing considerable public health challenges. Service-level strategies such as the 2001 deregulation of emergency contraception to allow pharmacy (rather than prescription) provision improved access but with improved uptake hindered by a range of socio-cognitive barriers (Schenk, 2003). Similarly, austerity measures within the UK placed substantial pressure on providers to deliver effective services with minimal resources. Thus, there remained unmet needs in enhancing safe sex practices and improving access to the appropriate and sustainable services. However, with health psychology in a prime position to fortify and innovate provision, at the outset of this research there were clear gaps in knowledge essential for the effective delivery of theory informed interventions.

Firstly, there was a paucity of empirical research on u16s attitudes to pregnancy, sexual health and contraception. With sex being illegal for u16s, and thus raising key issues around service access and disclosure, this overlooks the particular sexual health difficulties this age group may face. In parallel, sexual health and pregnancy literature tended to focus on condoms, most likely due to its dual pregnancy/STI prevention qualities and (relative) predominance in adolescent sex. However, this narrow contraceptive focus peripheralized other forms such as the contraceptive pill and emergency contraception, resulting condom-centric research in older (legal) adolescents. Thus, there was need to extend contraceptive research into younger adolescents, and to extend investigation into multiple contraceptive types.

Secondly, intervention development frameworks such as Intervention Mapping (Bartholomew et al., 2001; Eldredge et al., 2016) were gaining momentum, and health psychologists were identifying the varying practices in operationalising theory into practice (Michie & Abraham, 2004). Thus, there was need to determine transparent and replicable processes for combining theory and evidence into effective programmes of change.

Thirdly, whilst health psychology already embraced the value of research-informed social benefits, the introduction of a more formal impact agenda increasingly obligated academics to drive and monitor effects. Complexities inherent to public health and the difficulties in tying the effects of single interventions to distal effects however weakened impact narratives within health psychology. Thus, it was increasingly essential to understanding the journey from theoretical conceptualisation to sustained delivery and impact.

The original rationale of this research was to extend and apply the evidence base in theory-based interventions to improve adolescent sexual health. However, the scope grew to reflect a series of disciplinary and sector developments: a call for strengthened connections between theory, techniques and interventions (e.g. BCT); increased clarity on the contextual fit for interventions (e.g. BCW); epistemological challenges to single theory utility (e.g. TPB); and the introduction of a formalised impact agenda (REF 2014).

This portfolio presents a series of original outputs which i) add progressively to the empirical understanding of contraception intention amongst young people, ii) extend scientific knowledge on theory/evidence based intervention development for adolescent sexual health, and iii) position this within a context of impact. This portfolio addresses four research objectives to add original, significant and rigorous academic study in this area. The first three are to:

1. Apply and extend health psychology models to identify salient determinants of under 16 contraceptive intentions
2. Apply intervention development frameworks to develop tools to support young people's sexual health
3. Assess issues related to feasibility, acceptability and translation of interventions and implications for impact

This is followed by a fourth developed through the process of delivery and associated reflections from the above:

4. Establish an impact-literate approach to health psychology theory-based intervention development and implementation.

The aim here is not to criticise theory specific approaches, aggrandise intervention focused strategies or suggest that health psychology research is obligated to achieve widescale impact. Instead the aim is to explore how theory-specific and theory-agnostic approaches to behaviour change each contribute - but offer challenges - to the sector and reflect on how the impact of health psychology interventions can be increased. This is demonstrated by intentionally focusing on a singular theory (TPB), a singular intervention development approach (IM) and a single behavioural area (adolescent sexual health).

8. Outputs and Portfolio structure

This portfolio consists of seven outputs (see Table 1 and Appendix C for copies of outputs)

Table 1 Portfolio outputs

Output	Role	SciMago Journal rank	Scopus citations	Google Scholar citations
1. Bayley, J., Brown K.E. and Wallace, L.M. (2009). Teenagers and emergency contraception; focus group findings. <i>The European Journal of Contraception and Reproductive Health Care</i> , 14(3), 196-206.	PI, applicant / grant holder, ethics, design data collection tools, data collection (focus groups), transcription, data analysis (qualitative), lead author.	2	8	21
2. Bayley, J., Baines, D. and Brown. K.E. (2017). Developing the evidence-base for school sex education programmes: Contributions of an augmented Theory of Planned Behaviour, gender and school year across three contraceptive methods. Accepted for publication in <i>Sexual Health</i>	PI, co-applicant/grant holder, ethics, design data collection tools, pilot study lead, data collection, supervised data collection and data entry, data analysis (statistical), lead author	1	-	-
3. Newby, K., Bayley, J. and Wallace, L.M. (2011). "What Should We Tell the Children About Relationships and Sex?" ©: Development of a Program for Parents Using Intervention Mapping." <i>Health Promotion Practice</i> , 12(2), 209-228.	Co-PI, co-applicant/grant holder, ethics, co-design of intervention, lead for theory content, co-author	2	4	12
4. Bayley, J. Wallace, L.M. and Choudhry, K. (2009). "Fathers and parenting programmes: barriers and best practice." <i>Community Practitioner</i> 82(4), 28-31.	PI, co-applicant/grant holder, ethics, designed data collection tools, supervised research assistants, data collection, data entry, data analysis, lead author	-	21	48
5. Bayley, J. and Brown, K. E. (2015). Translating group programmes into online formats: establishing the acceptability of a parents' sex and relationships communication serious game. <i>BMC Public Health</i> , 15(1), 1.	PI, lead applicant/grant holder, game content and design lead, study design lead, data collection, lead author.	1		
6. Brown, K.E., Bayley, J. and Newby, K. (2012) "Serious Game for Relationships and Sex Education: Application of an Intervention Mapping Approach to Development." In S. Arnab, I. Dunwell, K. Debattista (Eds.), <i>Serious games for healthcare: Applications and implications</i> , IGI Global, Hershey, PA	Co-applicant, researcher, design of intervention mapping process, review of needs assessment, co-author	-	-	12
7. Bayley, J.E. and Phipps, D. (2017) Building the concept of impact literacy. Accepted in Evidence and Policy	Lead author	-	-	-

These outputs are presented in two parallel strands:

I. **Application of theory-driven health psychology research in an adolescent sexual health context (*theory led*): Outputs 1 and 2.**

Strand 1 represents a traditional theory-specific approach to health psychology research which prioritises model utility through testing, extending or rebuilding a theoretical framework. Theory based research balances itself between parsimony of a model and theoretical expansions to enhance prediction of action. This strand addresses objective 1 (*apply and extend health psychology models to identify salient determinants of under 16 contraceptive intentions*). Outputs 1 and 2 show research applying the Theory of Planned Behaviour to adolescent contraception intention. Output 1 (Bayley, Brown, et al., 2009) presents a qualitative study to elicit beliefs about emergency contraception (EC). Output 2 (Bayley et al., 2017) presents an extended-TPB quantitative survey on adolescent intentions to use multiple contraceptives, and generates gender and age relevant profiles to underpin sex education design. Together these papers provide evidence to support the modification of school based sex education and extend the evidence bases for TPB utility in adolescent sexual health.

II. **Application of intervention development frameworks and impact-focused approaches to enhance adolescent sexual health (*intervention-led*): Outputs 3-6.**

Strand 2 represents a more innovative and theory-agnostic approach which centralises the user and deprioritises theory specificity. Strand 2 addresses objectives 2 (*apply intervention development frameworks to develop tools to support young people's sexual health*) and 3 (*assess issues related to feasibility, acceptability and translation of interventions and implications for impact*). Outputs 3 to 6 demonstrate a series of studies to develop sexual health interventions and identify factors affecting feasibility and implementation. Output 3 (Newby, Bayley, et al., 2011a) and 6 (Brown et al., 2012) describe the process of using Intervention Mapping to develop a parents' communication package and sexual coercion prevention programme respectively. Output 4 (Bayley, Wallace, et al., 2009) describes a qualitative project to explore how fathers' engagement with such interventions can be improved, and output 5 (Bayley et al., 2015) describes the process of converting a traditional group programme into an interactive, online and theory-preserved Serious Game. Taken together, these

outputs provide both a series of interventions to address teenage pregnancy and sexual health (objective 3). Implications for theory-led vs intervention-led approaches to adolescent sexual health are discussed. The outcomes, experience and learning from the research in strands 1 and 2 are then drawn together (output 7) to address objective 4 (*establish an impact-literate approach to health psychology theory-based intervention development and implementation*). The portfolio concludes with two conceptual models and experientially derived recommendations for an 'impact literate' approach to developing health psychology interventions.

The first six outputs also interrelate around several key themes:

- 1) Applying the TPB to improving adolescent sexual health (*Outputs 1,2,5*)
- 2) Translating theory and research evidence into an intervention using IM (*3,5,6*)
- 3) Enhancing parents' skills and confidence in SR communication to support young people's sexual health (*3,4,5*)
- 4) User-led interventions and implementation (*3,4,6*)
- 5) Development of serious games (*5,6*)
- 6) Intervention redevelopment and revision to improve engagement (*4,5*)
- 7) Improving sex education (*1,2,6*)

This series of linked in-depth studies adds progressively to the empirical understanding of contraception intention amongst young people, extends scientific knowledge on theory/evidence based intervention development for adolescent sexual health, and position theory based health psychology research within a broader impact perspective. This portfolio not only confirms and links extant research on teenagers' contraceptive intentions, but highlights the challenges and opportunities for improved intervention development and implementation. The studies offer original contributions to knowledge and show the rigorous application of both established and more innovative approaches. This work offers distinct contributions to the significant teenage sex/conception public health agenda and in combination, offer a novel approach to understanding and improving the impact potential of research.

9. Ontology and epistemology

Throughout this research, I primarily adopted a subjective ontological position and relativist epistemological stance. Given the sensitivity and influence of social actors within adolescent sexual health, this interpretivist, social constructionist perspective allowed me to understand the topic from the user perspective and ensure interventions were bedded upon users' subjective, phenomenological experience. Accordingly, my primary axiological position is that of data as value-laden, wherein information is judged as individual constructs of a context rather than objective value-free facts (see Table 2 for a summary of philosophical approaches for each paper). The intervention development studies are underpinned by a pragmatic philosophy, which is most appropriate for a mixed methodology approach (Saunders, Lewis, & Thornhill, 2009) and particularly useful for adjusting methods to meet the needs of younger populations.

Across the portfolio, I adopt three main methodological approaches:

- Exploratory qualitative research (outputs 1 and 4): Qualitative methods were used for papers 1 (EC) and 4 (Fathers), since the main aim was to explore barriers, facilitators and attitudes in the target populations.
- Intervention development (outputs 3, 5 and 6): Papers 3 (WSWTC) and 6 (Coercion) applied multiple methods to identify user needs and systematically translate these into a coherent programme mirror. Paper 5 (Game) employed both qualitative and quantitative techniques to explore acceptability of translated interventions.
- Quantitative research (output 2): Whilst there are elements of quantitative study in outputs 4 and 5, output 2 is the only paper which fully deviates ontologically and epistemologically. Output 2 reflects a realist ontological position and a positivist, value-free approach, using a questionnaire to measure and statistically validate determinants of adolescent contraceptive intentions.

Table 2: Summary of philosophical approaches per output

Output	1	2	3	4	5	6
Ontology	Subjective	Objective	Subjective	Subjective	Subjective	Subjective
Epistemology	Relativist	Realist	Relativist	Relativist	Relativist	Relativist
Axiology	Value laden	Value free 'authoritarian'	Value laden	Value laden	Value laden	Value laden
Philosophy	Interpretivist	Positivist	Pragmatist	Interpretivist	Pragmatist	Pragmatist
Approach	Inductive	Deductive	Inductive	Inductive	Inductive	Inductive
Methodology	Qualitative	Quantitative	Qualitative	Qualitative	Qualitative and quantitative	Qualitative
Method (main)	Focus group	Questionnaire	Mixed (intervention development)	Focus group	Mixed (intervention development)	Mixed (intervention development)

The following section of the portfolio summarises each output, presented within strand 1 (theory led) and strand 2 (intervention led).

10. Strand 1: Application of theory-driven health psychology research in an adolescent sexual health context (*theory led*)

10.1. Output 1: Exploring adolescents' attitudes to emergency contraception using a TPB framework

Full reference:

Bayley, J., Brown, K., & Wallace, L. (2009). Teenagers and emergency contraception in the UK: A focus group study of salient beliefs using concepts from the Theory of Planned Behaviour. *The European Journal of Contraception & Reproductive Health Care*, 14(3), 196-206.

Output 1 (Bayley, Brown, et al., 2009) offers an original contribution to knowledge on the application of the Theory of Planned Behaviour to emergency contraception in u16s. I was the principal investigator, grant holder and lead author. The project was funded by Coventry Primary Care Trust Small Grants scheme. I led all stages of the work including writing the proposal, obtaining ethical approval, designing data collection tools, running focus groups and conducting analysis. Katherine Brown and Louise Wallace provided guidance on the development of the schedule, ethics application and analysis and provided reviews of article drafts.

10.1.i. Brief rationale, aims and summary

Emergency contraception (EC) was deregulated in 2001 to allow access via pharmacies instead of general practice or family planning providers. This service level change was premised on physical barriers being the primary impediment to use, and that opening provision would improve use and in turn reduce conceptions. However, removing practical obstacles is only effective if barriers are physical, rather than attitudinal in nature. Anxiety, embarrassment or ambivalence may inhibit EC use even when availability is improved. This is even more marked for u16s, for whom having sex below the age of consent may cause further concerns when seeking contraception. Thus, it was essential to understand under-16s' attitudes to EC, and how these may influence pharmacy access. With scarce existing literature on EC from a theoretical or young teen perspective, this first study therefore sought to examine u16s attitudes and identify factors which may facilitate or deter EC use. Based on evidence of utility in sexual health, the TPB (Ajzen,

1985) was chosen to structure data collection methods and analysis. Specific aims were to (i) identify salient beliefs of both males and females, reflecting the dyadic nature of sexual health decision making and (ii) establish the viability of the TPB as an explanatory framework for EC. In accordance with best practice for developing a TPB survey, this paper outlines the initial 'belief elicitation' stage to generate a pool of belief items for further (quantitative) investigation. Thirty 13-16 year old school pupils participated in semi structured discussions, and findings suggested that EC motivation is related to negative attitudes about teenage parenthood, EC is socially acceptable but incurs negative reactions, barriers are more likely to deter those ambivalent about pregnancy, and that confidentiality and practicalities may affect service use. Results also highlighted the complex means by which adolescents may navigate perceived access difficulties.

10.1.ii. Methodological commentary

The practical and ethical challenges of research in younger populations (Kirk, 2007) required me to make a series of methodological decisions. Focus groups were selected over researcher-led interviews as the latter were judged to be too intimidating for younger teens. The risks of power differentials within focus groups were acknowledged, but were judged more manageable and ethical than a single researcher-pupil dynamic. Single sex groups were selected both for practical reasons - to elicit differing views of males and females - and to minimise anticipated adolescent discomfort in discussing sensitive topics with the opposite sex. In agreement with teaching staff, sessions were led independently by the researcher to optimise free responses and avoid the inhibitive effect of teacher presence. Thematic analysis was chosen to enable coding whilst acknowledging restricted language skills within an adolescent cohort prohibiting deeper analysis. I submitted the study to the National Research Ethics Service (NRES) and successfully defended the research at a panel meeting. I also identified that there was no pre-existing British Psychology Society (BPS) duty of care for researchers in a field (school) setting, leading me to alert the BPS and generate a working duty of care position in agreement with the school and BPS. These decisions drew the most appropriate balance between ethical safeguards and practical data collection issues.

10.1.iii. Originality, significance and rigour

Originality: EC attitudes had not previously been explored in younger adolescents, nor had the TPB been applied to this contraceptive type. This paper therefore demonstrates

the first application of the TPB to EC attitudes in u16s, extending the scarce theory and evidence base on EC and young teenagers who may be influenced by different legal and social ramifications from their older counterparts.

Significance: The work significantly contributes to ongoing public health concerns around teenage pregnancy, adding attitudinal data to help optimise service expansion.

Rigour: Rigour was ensured through compliance with TPB best practice for belief elicitation (Conner & Norman, 2005; Francis et al., 2004). The semi structured schedule was derived directly from TPB constructs and using TACT principles, and the selected method of analysis was ontologically and epistemologically appropriate for the level of data and communicative maturity of the sample. Whilst this empirical study has a small sample, the 13-16 year old age group supports ecological validity and generalisability of results for this population.

10.1.iv. Insights into impact and knowledge mobilisation

Whilst this paper demonstrates an early stage in the development of theory based intervention, it highlighted a range of implications for generating real world change. This project offered me a rapid set of early insights into the practicalities and difficulties of conducting theory based research in the under 16 population, including (i) that a reductionist theory-led approach may not capture the broader range of salient determinants, and (ii) theory-specific wording may be inaccessible for younger people. Thus, for research in this population it is necessary to amend and extend theory based approaches whilst also beginning to conceptualise how such knowledge may be mobilised into an intervention.

10.1.v. Chronology and reflection on development as research practitioner

This study was my first TPB research project, and my first as Principal Investigator. At this more novice stage, my primary focus was on developing a theory-informed schedule, ensuring appropriately worded TPB items and considering group dynamics for data collection. However, on reflection, I recognise my assumption at the outset of this work was that by simply following best practice in the development of a TPB measure, this would identify salient variables to be subsequently incorporated into an intervention. The experience of undertaking this project challenged this simplistic approach and increased

my awareness of the challenges of theory-led change-focused research with younger populations.

10.1.vi. Links to the portfolio

This is the first of two outputs within Strand 1, outlining a traditional approach to the application of the Theory of Planned Behaviour. The findings of this belief elicitation study are directly integrated into output 2 to construct a valid TPB survey, and concerns around sexual pressure are reflected in output 6.

10.2. Output 2: Developing the evidence-base for school sex education programmes: Contributions of an augmented Theory of Planned Behaviour.

Full reference:

Bayley, J., Baines, D. and Brown. K.E. (2017). Developing the evidence-base for school sex education programmes: Contributions of an augmented Theory of Planned Behaviour, gender and school year across three contraceptive methods. Accepted for publication in Sexual Health

Output 2 (Bayley et al., 2017) applies an extended TPB to adolescent contraception intention via a cross sectional questionnaire. This paper offers an original contribution to knowledge on intentions towards multiple contraceptives and extends the evidence base underpinning tailored sex education. I was the principal investigator, co-applicant/grant holder (with Katherine Brown) and lead author. I developed data collection measures, conducted a pilot study and both undertook and oversaw a team of research assistants undertaking data collection. I also oversaw data entry and cleaning and conducted statistical analysis (under the supervision of Dr Katherine Brown and Professor Darrin Baines).

10.2.i. Brief rationale, aims and summary

Whilst literature in the area had grown substantially since output 1, there remained (i) no assessment of adolescents' intentions towards multiple contraceptives, (ii) no comparative models for different contraceptive types, and (ii) insufficient clarity on how intention and underlying determinants differed by school year or gender. In the absence of this information, school based sex education could not be effectively targeted nor successfully tailored to accommodate gender and age differences. This study thus aimed to measure cognitions underpinning the three most common adolescent contraceptives - condom, pill and EC (Office for National Statistics, 2009) - and assess differences by gender and age. The paper outlines a large scale quantitative cross sectional survey study (n=1368 12-16 year olds), and results show three distinct intention profiles for each contraceptive type, alongside gender and age differences relevant for tailoring sex education.

10.2.ii. Methodological commentary

To address concerns over theory reductionism highlighted in output 1, the standard TPB was extended with the Prototype Willingness Model (PWM) to reflect social reactive paths beyond rational processing (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008) and Anticipated Regret to add a temporal element and account for those not yet sexually active (Sandberg & Conner, 2008). The merits of this decision were borne out during TPB retirement calls during the timeframe of this research. Concerns over adolescent engagement and comprehension were addressed by pilot testing a draft survey with school pupils. This review highlighted a range of difficulties within the target population in understanding theory based questions, with repetitiveness, complex language and survey length weakening survey acceptability and sensitivity. A range of revisions were thus made ahead of full administration, and whilst practical issues (e.g. school withdrawing) raised challenges for data analysis, statistical verification methods were applied to ensure results were robust.

10.2.iii. Originality, significance and rigour

Originality: This is the first study to compare adolescent intentions to use condoms, the pill and EC, and the first to do so using an extended TPB model. The study adds directly to both the TPB evidence base and the broader knowledge corpus of knowledge needed to tailor sex education by gender and age.

Significance: The study offers a significant contribution to public health by establishing the relative strength of determinants by age and gender, and thus how current provision may be modified to optimise effectiveness.

Rigour: Rigour was ensured by applying best practice for TPB survey development (Conner & Norman, 2005; Francis et al., 2004). Three contraceptive-specific behaviours were scripted according to the TACT principle, and PWM and AR items were derived from existing formats within published literature. The survey also drew directly from the previous belief elicitation study (output 1) and wider relevant literature on adolescent contraceptive beliefs. The pilot consultation improved measure validity and reliability, and the anonymous survey was administered in exam-like conditions to minimise response bias.

10.2.iv. Insights into impact and knowledge mobilisation

The consultation phase particularly highlighted the challenges for theory based behaviour change in adolescence. Output 1 had already highlighted the difficulties in engaging u16s in theory-led research, and this was reinforced in the pilot stage which found further potential disconnect between restricted and prescriptive theory-specific measures, adolescent comprehension and willingness to engage with data collection. Extending the theory with PWM and AR helped to ameliorate reductionism, and revisions to specific items helped to improve engagement and comprehension of respondents. However, the scale of revisions requested by adolescents underscores the complexity of operationalising theory within adolescent populations. Whilst theory rich (vs. non theory based) interventions may more powerfully address behavioural determinants (Oringanje et al., 2009), developers face challenges in converting knowledge into interventions perceived as relevant, valuable and not cognitively burdensome.

10.2.v. Chronology and reflection on development as a research practitioner

Whilst presented as output 2, this paper was the last of the papers produced for this portfolio. The work was undertaken in 2011-2 but due to the periods of leave and secondment not produced as a paper until 2016. At the outset of this study I had already become aware of the restrictions of a theory-specific approach, which was wholly reinforced by the time of publication and underscored by the calls for the retirement of the TPB. However, with interventions known to be enhanced by being underpinned with theory, I wanted to revisit a theory-specific methodology to see how it resonated with an impact focused agenda. This paper therefore both demonstrates my development as a theory based health psychology researcher, and my purposeful drive to position this work in a broader impact context.

10.2.vi. Links to the portfolio

This is the second of the two outputs within Strand 1 and draws directly from the qualitative findings of output 1 in three ways. Firstly, the beliefs elicited in output 1 were converted into survey items to measure attitudes, social norms and perceived control. Secondly, in recognition of the challenges of theory-based data collection with adolescents, a pre-administration consultation stage was included to assess usability and revise the survey accordingly. Thirdly, in recognition of the challenges of single theory

reductionism, the TPB was extended with Anticipated Regret and Prototype Willingness. This is the only positivist, uniquely quantitative study within the portfolio.

10.3. Summary strand 1

The combined results of outputs 1 and 2 demonstrate the utility of the TPB in understanding adolescent contraceptive intentions, first as a framework to guide research in an underexplored behaviour (EC use) and secondly as the base for an extended, parsimonious model. This body of research addresses objective 1 (*To apply and extend health psychology models to identify salient determinants of adolescent (under 16) contraceptive intentions*). Findings elucidate the differential influence of determinants by contraceptive type, gender and age, and present avenues for further research on the interplay between rational and more socially reactive paths. With clear implications for the tailoring of school sex education, these papers demonstrate a significant, rigorous and original contribution to theory based adolescent contraception research and intervention potential. These outputs also represent a traditional theory-led approach to behavioural exploration, and illustrate a range of reductionist and user-focused challenges for interventions.

11. Strand 2: Application of intervention development frameworks and impact-focused approaches to enhance adolescent sexual health (*intervention led*)

Notwithstanding the implicit strength of a theory led approach (strand 1), research which continually tests and reconfigures models on a narrowly focused behavioural issue has two major drawbacks. Firstly, theory specific approaches define a discrete set of variables from the outset, and may insufficiently consider broader factors which may be powerful (de)facilitators to change. Secondly, theory specific approaches centralise the academic, rather than the user, skewing how behavioural problems are framed within discipline-bound solutions. To address this, I embarked on a parallel body of research (strand 2) from an intervention-focused, theory agnostic perspective. This has the advantage of broadening the range of variables to those relevant to a specific behaviour and population, rather than constraining approaches to within narrow theoretical bounds. Outputs in strand 2 demonstrate studies which prioritise users and stakeholders and draw on a broader range of theory and evidence to effect change.

11.1. Output 3: “What Should We tell the children”: development of a parents’ sex and relationships communication intervention

Full reference:

Newby, K., Bayley, J., & Wallace, L. M. (2011). “What Should We Tell the Children About Relationships and Sex?”[©]: Development of a Program for Parents Using Intervention Mapping. *Health Promotion Practice*, 12(2), 209-228.

Output 3 (Newby, Bayley, et al., 2011) applies an Intervention Mapping methodology to the development of a parents’ sex and relationships communication programme. The work was funded by Coventry Teenage Pregnancy Partnership Board, and the outcome was a six-session training programme to improve parents’ confidence and ability in discussing sex and relationships with their children. I was the co-PI, co-grant holder and had an equal role in user and stakeholder engagement, process mapping and intervention design with Katie Newby throughout the project. Whilst second author on the paper, I performed a joint authorship role on the full output, whilst concentrating most on producing the methodology section of the paper.

11.1.i. Brief rationale, aims and summary

This study was commissioned by Coventry Teenage Pregnancy Partnership Board. At the time, Coventry’s teenage pregnancy rate was considerably higher than the national average and needed further support within the community. Whilst school sex education is a primary medium for information, year-specific class based provision precludes tailoring to individuals and cannot sufficiently address heterogeneity of experience, maturity and understanding. Whilst sex education itself can be enhanced (see output 2) complementary avenues of provision are needed to enable tailored and ongoing support. The Board reported being aware of a sex and relationships parents training programme operating nationally but, for a number of practical reasons, had decided it would not be appropriate for the local setting and commissioned a new programme. Early research with local parents identified that the major aim of the programme should be to improve parents’ confidence and skills in talking with their children, not simply increase knowledge of key sexual health facts. Intervention Mapping was used to design a communication training programme, resulting in a fully manualised programme launched within the local region.

11.1.ii. Methodological commentary

With users' needs central to the intervention, and with a single theory unlikely to adequately address the breadth of influences in parent communication, we instead decided to adopt an intervention (rather than theory led) approach. At that time, Intervention Mapping (Bartholomew et al., 2001; Eldredge et al., 2016) was gaining reputation as a comprehensive programme development framework, and its inherent theory agnosticism offered a rigorous means to integrate the most appropriate theories and evidence. This decision was borne out when early into the process we identified that the scope of the original commission – to develop a course on contraception and STIs - did not meet user needs and instead needed revising towards broader skills in communication itself. Further research identified that there were no existing suitable interventions fulfilling this need, and that despite a wealth of parent support programmes, few programmes were theory-based or prioritised communication skills over information provision. Thus, the rationale for this study was to develop a new programme for local parents to *'improve the quality and quantity of parent-child communication about SR'*. As this project pre-dated the inception of the BCT body of work (Michie et al., 2013), there was no behaviour change technique framework to draw from. I led and independently undertook a mapping exercise of theoretical elements drawn from health psychology, adult learning, cognitive development and health promotion to elicit constructs which may underpin behaviour change. I searched, reviewed and mapped these constructs to potential techniques and identified implications for such methods within this target population. This map formed the basis of teaching content and delivery format, with decisions made in consultation with user and stakeholder groups. This enabled development of a programme which maintained the fidelity of the theory base whilst also ensuring it was tailored for the population.

11.1.iii. Originality, significance and rigour

Originality: Output 3 offers an original contribution to knowledge on the rigorous development of theory and evidence based public health interventions and adds significantly to the evidence base on the utility of user-led, theory agnostic perspectives to intervention development.

Significance: WSWTTC contributes directly and significantly to efforts to reduce teenage pregnancy and improve sexual health and has triggered further areas of investigation

(see outputs 4-6). The WSWTTC programme has been delivered in Coventry and Warwickshire with over 400 parents, and feedback in 2010 showed that parents' confidence in discussing sexual health matters and related interactions with their children improved as a result. Output 3 was also included in Coventry University's REF 2014 Unit of Assessment 3 sexual health impact case study. As a result of WSWTTC I was also commissioned by Coventry City Council to produce a further training tool (parent's communication DVD) and a single session version of WSWTTC to be integrated into existing parenting provision.

Rigour: Rigour was ensured through the IM process being fully applied and documented to ensure reproducibility and the resulting intervention is derived explicitly from the underpinning theory, techniques, and user and stakeholder guidance. The programme also includes a series of measures to preserve fidelity (e.g. facilitator training and full manual) as the programme runs in the community.

11.1.iv. Insights into impact and knowledge mobilisation

The IM approach offered considerable benefits in identifying and addressing determinants of communication from the user perspective. Local users and stakeholders (parenting course delivery experts, strategic leads in public health, school nurses and parents) advised on content and established opportunities for programme implementation. However, despite this, the scale of stakeholder engagement throughout did not translate into immediate or widescale adoption by users. Similarly, despite an inclusive approach to recruitment, fathers proved particularly difficult to recruit to the programme. A series of successive local authority staff changes and restructuring of public health provision disrupted the partnerships established during the process and diluted strategic commitment to implementation. Programme ownership was obscured by strategic responsibility for teenage pregnancy shifting between local authority and primary care. Gatekeepers engaged throughout the programme development were either lost, moved post, or proved not to have sufficient decision making power for implementation. Conversely, several partners - primarily school nurses - who had maintained their connection to the project due to implicit agreements that they could use the intervention at no cost, were not allowed to do so due to the financial decisions of new commissioners. This counteracted the goodwill nurtured during the process and substantially hindered intervention launch. When the board was disbanded and staff changed multiple times,

this left no clear decision maker and led to several years of Intellectual Property difficulties. The key faulty assumptions which led to these problems were that: stakeholder enthusiasm reflected authority to implement (rather than just advocate) the programme; that stakeholder engagement throughout would ensure sufficient acceptability for uptake by users; that programme ownership was uncomplicated; and that as a commissioned project there was already an identified commissioning need which would ensure implementation. The post-study difficulties in launching and safeguarding provision acutely marked the challenges in driving even those interventions with the most potential for impact into implemented and sustainable practice.

11.1.v. Chronology and reflection on development as a research practitioner

This output showcases the first study in which I adopted an ‘intervention-led’ approach, and was pivotal in my developmental shift towards theory agnostic intervention development. This study also generated the first of a series of strong links with public health providers triggering a series of additional studies (outputs 4-6). It also represented a step change in my research governance, as whilst I had been PI before, the development of WSWTTC was a far more complex and iterative process than output 1. Output 3 required far more engagement with stakeholders and commissioners and a more complex methodological process requiring multiple evidence based decisions. This study not only set the academic approach which would underscore outputs 4-6, but also an approach which has since underscored my broader interests in impact. Output 3 also marks the point of establishing strong links with public health and parenting leads regionally.

11.1.vi. Links to the portfolio

Whilst outputs 1 and 2 focus on the young people directly, output 3 addresses concerns over the utility of sex education in delivering ongoing and tailored support, and refocuses attention on parents as health educators. This paper is the first intervention-focused paper in the portfolio and my first experience of applying IM. The outcomes and experience of output 3 led directly to studies in outputs 4 and 5, with IM fully applied again in output 6.

11.2. Output 4: Understanding barriers to fathers' engagement in parenting support

Full reference:

Bayley, J., Wallace, L. M., & Choudhry, K. (2009). Fathers and parenting programmes: barriers and best practice. *Community Practitioner*, 82(4), 28-32.

Output 4 (Bayley, Wallace, et al., 2009) is a peer reviewed practitioner-focused paper which addresses difficulties engaging fathers in parenting support (as demonstrated in output 3). This mixed methods study was funded by South Warwickshire Primary Care Trust and run jointly with a fathers' support lead in the public health team. I led this project from funding proposal to final report. I was the PI, grant holder and lead author on both the final report and output. I was supervised by Louise Wallace and I supervised a research assistant in collecting data. I coordinated all user and stakeholder consultations, data collection, data entry and performed all analysis.

11.2.i. Brief rationale, aims and summary

Despite a rigorous approach to intervention development, and engagement of key stakeholders throughout the process, WSWTTC was not implemented as fully as planned. Whilst adopted locally, it primarily attracted a homogenous audience (white, middle class mothers already engaged in parenting support) and largely failed to attract harder to reach groups. Fathers were particularly absent from user groups, undermining the effectiveness of programme in changing the culture of communication within the home. Thus, further exploration was needed to identify challenges to fathers' engagement and how these may be addressed. An initial literature search identified scarce evidence on best practice for fathers' engagement. This study was therefore conceived to explore relevant barriers and facilitators to identify how to better recruit fathers into parents support programmes (including WSWTTC). More specifically the aim of this practitioner-focused output was to qualitatively and empirically assess fathers' concerns and service-level challenges for engaging with parenting support, and how specific current local provision meets or conflicts with fathers' needs. With a paucity of pre-existing evidence on fathers' needs, I applied IM logic to conduct a needs assessment and triangulate data to provide actionable recommendations to improve fathers' engagement.

11.2.ii. Methodological commentary

As the a priori rationale for the study was difficulty engaging fathers in parenting support, I judged that similar difficulties would be encountered whilst recruiting to the research. Within the financial and practical parameters of the study, I therefore determined that the most realistic approach to primary data collection was to access those fathers already engaged in fathering groups. The obtained sample is small and represents already motivated service users, raising caution for the generalisability of conclusions. However, sample bias is balanced through triangulation with existing academic evidence, guidance documentation from key organisations and interviews with service providers.

11.2.iii. Originality, significance and rigour

Originality: This empirical output demonstrates the first IM informed approach to understanding fathers' engagement in parenting support and offers an original and data-led contribution to the planning of fathers' outreach. It is also the first to triangulate primary data from fathers and providers with both academic literature and service policy.

Significance: This paper significantly contributes to decisions regarding frontline delivery of public health strategies (including, but not restricted to sexual health). It provides a data-led articulation of challenges and solutions from the user perspective, and in so doing offers essential insights into how existing provision can be modified in terms of content, delivery or branding. Whilst data-led recommendations for policy are included, the paper is intentionally framed around actionable and achievable modifications which are minimally invasive for a service to implement. Higher order changes may result in longer term and more substantial changes, but in resource-limited environments, advocating smaller and achievable goals is more likely to result in more immediate and achievable revisions.

Rigour: Rigour was achieved by triangulating data from primary and secondary sources to accommodate biased and small samples. The needs assessment stage from IM was explicitly drawn upon to frame the exploratory nature of the study and to help elicit previously unsolicited referents' attitudes. Recommendations are data led, and conclusions are appropriately caveated to reflect known limitations.

11.2.iv. Insights into impact and knowledge mobilisation

The challenges of engaging fathers in WSWTTC (output 3) highlighted the need to fully understand different user profiles to thus address discrepancies in intervention uptake. Selective use of services –through avoidance, ambivalence or system level barriers – presents significant implications for the utility and value of health programmes. This paper highlighted the need for service providers to explicitly consider the inclusivity of marketing (de-conflating ‘parent’ and ‘mother’), practical barriers (e.g. childcare) and competing priorities (e.g. needing to be at work). The choice of a practitioner level journal also reflected the need to mobilise this knowledge to those in service and commissioning roles.

11.2.v. Chronology and reflection on development as a research practitioner

This paper reflects my intensifying interest in the implementation of academic interventions and my growing pragmatic, theory agnostic approach. Following the increased research autonomy shown in output 3, output 4 also reflects a further step change in my research leadership. I independently led and configured a multi method project within a financial and time limited context, and with an already disengaged user group. This project afforded me the opportunity to develop and apply knowledge on tailoring of research processes to retain rigour in a resource-limited public health setting.

11.2.vi. Links to the portfolio

This output stems directly from WSWTTC (output 3) and is the first paper to directly reflect issues with intervention engagement and uptake. It draws on IM principles and, as with outputs 3 and 5 focuses on supporting parents as health educators.

11.3. Output 5: Translation, development and acceptability testing of a parents' sex and relationships communication serious game

Full reference:

Bayley, J. E., & Brown, K. E. (2015). Translating group programmes into online formats: establishing the acceptability of a parents' sex and relationships communication serious game. *BMC public health*, 15(1), 1225.

Output 5 (Bayley et al., 2015) demonstrates the translation of a traditional, manualised programme into a serious online game. This is a lead author, peer reviewed journal article resulting from a study funded by West Midlands (South) Health Education and Innovation Cluster. This paper offers an important contribution to knowledge of processes and challenges creating a serious communication game and translating research into implementable practice. I was the PI, grant holder and lead author. I led development of the game structure and content, liaised with the Serious Games Institute, games design company, stakeholders and users, developed all evaluation tools and undertook all analysis. I conducted all user consultation and independently translated the original WSWTTC intervention map for conversion into the game subsequently produced by the design company.

11.3.i. Brief rationale, aims and summary

Feedback from WSWTTC suggested that six sessions may be a prohibitive commitment for many parents who struggle with childcare, working patterns and broader apprehension about attending a group programme (as highlighted in the fathers' study). Furthermore, a facilitated and manualised programme is resource intensive and may struggle to be sustained within decreasing public health budgets. Thus, alongside seeking to improve engagement (as in output 4), there was a clear rationale to redevelop the programme into a more accessible format. Online provision increased accessibility and avoided embarrassment associated with group attendance, but simple information provision on a website would not adequately mirror the theory richness or interactivity of the standard programme. Thus, a sophisticated translation which both preserved the fidelity of the original intervention maps and offered a tailorable format was needed. A serious online game offered the means to deliver in both respects, but there was no evidence on how feasible or acceptable such a translation would be. Output 5 outlines the process of converting the pre-existing WSWTTC theory and evidence map into a serious game, and

assessing acceptability with users. A series of qualitative and quantitative assessments were undertaken including (i) consultations over character and background image choices (ii) message framing preference surveys (iii) gameplay feedback sessions and (iii) quantitative pre-post testing with 182 parents. Qualitative findings showed clear content and gameplay preferences and potential for the game to support translation of learning into real life. Quantitative findings showed clear message framing preferences and confirmed acceptability was unrelated to baseline demographics, computer skills or TPB variables. In contrast to expectations, attrition was higher in the game condition, which is likely due to the volume of text within the feedback sections of the game. Final conclusions from the study were that the process of converting a manualised group programme is viable, produces an emotionally and cognitively acceptable intervention, but must consider information dosing.

11.3.ii. Methodological commentary

This study aimed to demonstrate proof of concept of a game format for parental sex and relationship communication education, articulate a robust translation process and establish acceptability ahead of any future large scale developments. With no precedent for the process of converting manualised programmes into serious games, I independently selected appropriate methodology both for game development and user view elicitation. Selection of the exercises – as described in the paper – involved balancing practical feasibility and reflection of the underlying learning objectives. I made final decisions here after consultation with facilitators and game developers. I elected to use both qualitative and quantitative approaches with parents to explore issues around acceptability and identifying user preferences for elements of the game itself. For this I ran a series of parent consultations on content, scripts, imagery and message framing preferences. This engagement with end users directed a series of choices over game realism, player perspective, and the nature of tailored feedback. In parallel I also worked directly with the software development team to feed parent data into script and gameplay options choices. Acting as an intermediary in this way highlighted various tensions around intervention ownership and conflicting preferences by technical experts and end users. Where such issues arose, I made final decisions based on judgements over acceptability and feasibility. Identifying a robust comparator (control) for the game proved challenging. Judging the game against a non-intervention control group would not capture the presumed benefit of the game structure over a non-interactive version. However,

establishing an active control was similarly challenging as the manualised group programme was substantially more comprehensive and socially engaged, thus not offering an experimental match. Thus I determined that, whilst the rationale for the game was to improve accessibility and engagement, the key functional difference from standard online provision was the interactive, tailored element. Consequently, I developed a comparator control version in which the same imagery and text was provided online as a set of static webpages. This study thus required me to both establish robust methodology from the start, but also to apply, develop and adjust approaches independently as the game was developed. Due to both financial constraints and caution regarding over-developing a solution, only a subset of original programme components were converted to produce a viable game for testing.

Originally the game had been designed to be tested in a four arm RCT (game only, control only, game followed by control, control followed by game) to compare each format, and identify the extent to which, if any, tailored interactivity outperformed simpler, static tools. However, projected audience numbers fell far short of expectations, and thus despite extensive marketing only 182 participants were recruited instead of several thousand. In addition, a technical fault led to participants not receiving a follow up (3 month) survey, and thus only baseline and immediately post intervention data was obtained. Whilst this reduced the extent to which the effectiveness of the intervention could be experimentally verified, it did highlight a range of unanticipated but valuable ecological insights into engagement of the wider public and reliance on automated processes.

11.3.iii. Originality, significance and rigour

Originality: This empirical study shows (i) the development of an original, innovative intervention, (ii) the first application of serious gaming to parent sexual health communication, (iii) the first articulated process for translating an existing manualised theory-based public health intervention into a game. It adds to scarce literature on redeveloping traditional public health interventions into digital formats, and contributes directly to research on feasibility, acceptability, practicability and public engagement for implementation.

Significance: This output is significant in describing a process by which resource heavy, facilitated group public health programmes may be translated into resource-light versions

with extended potential reach. Establishing the viability of digital conversions in this way is a significant step forward for implementation focused research. Further significance is also demonstrated by a follow up commission to produce a parents' communication DVD, in turn leading to me setting up the BeSavvy website (www.besavvy.org) now the primary repository for Coventry's sex and relationships information. This study inherited the rigour of the original WSWTTC programme theory and evidence map (output 3), the fidelity of which was preserved throughout the transparently articulated conversion process.

Rigour: Rigour was also achieved by using mixed methodology (qualitative and quantitative) to elicit appropriate data from parents. This ensured good data-led decisions over content, and coherence between user preferences and the technical solution.

11.3.iv. Insights into impact and knowledge mobilisation

This output explicitly targets issues relating to uptake and impact, and as such reinforces the challenges faced by traditional group based programmes. For public health providers, there is likely to be a tension between delivering well established methods, and committing to innovation to widen uptake. This output suggests that conversion into interactive online formats is possible and likely to be acceptable; however, it does not imply a simple or effortless translational process. Format conversion must be approached as a collaboration between users, stakeholders, technicians, academic experts and commissioners to reach an optimally acceptable and effective solution.

11.3.v. Chronology and reflection on development as a research practitioner

Having progressed through theory-focused and intervention focused work, output 5 demonstrates a fuller shift into intervention translation and implementation research.

This study represented increased leadership in theory based intervention design, particularly in governing the balance between theory fidelity, user need and technical viability.

11.3.vi. Links to the portfolio

Output 5 is derived directly from output 3, and addresses issues of theory fidelity, intervention design, user engagement, uptake and the need for innovation to improve impact. As with outputs 3 and 4 it focuses on equipping parents as educators, and draws

from the IM theory map from output 3. Outputs 4 and 5 couple to demonstrate innovation via enhanced audience understanding and modified formats respectively.

11.4. Output 6: Development of a sexual coercion prevention sex education serious game

Full reference:

Brown, K. E., Bayley, J. E., & Newby, K. (2012). Serious game for relationships and sex education: Application of an Intervention Mapping approach to development. In I. Dunwell & S. Arnab (Eds.), *Serious Games for Healthcare: Applications and Implications*. (pp. 135-166): IGI Global

Output 6 extends the application of intervention mapping and serious games to sexual coercion prevention education. This co-authored book chapter describes the development process and considerations for implementing such programmes and is included here to demonstrate further application of the intervention mapping method to sex education. This project was led by Katherine Brown, with myself and Katie Newby as co-researchers. I was primarily involved in the early stage intervention mapping (needs assessment and intervention planning) but due to maternity leave did not participate in the intervention launch or evaluation. I helped to define the health problem and its component targets, sub-goals and behavioural determinants. I was a co-applicant on the funding bid and strongly contributed to the write up of the chapter, producing the background/context section of this output.

11.4.i. Brief rationale, aims and summary

School based sex education remains the primary (Tanton et al., 2015) and preferred (Newby, Wallace, Dunn, & Brown, 2012) source of sex and relationship information for young people, but requires improvement (OFSTED, 2013). Integrating behaviour change into provision has considerable potential for enhancing effectiveness (Brown, Hurst, & Arden, 2011) and is strategically endorsed (National Institute for Health and Care Excellence, 2007a). In parallel, the rise of digital natives (Prensky, 2001) places a growing pressure on educators to harness innovative technical solutions to address young people's health and wellbeing. Having recognised the need for improved and academically-informed sex education, local public health leads invited the research team to devise a new intervention to incorporate into existing provision. This paper describes the application of IM to develop a sex education serious game. The needs assessment highlighted particular concerns about preventing sexual coercion, and thus the intervention was focused on building young people's capacity to avoid exerting or falling

prey to pressure. The IM process guided decisions on content, learning and behaviour change techniques and acceptability considerations for incorporation within standard sex education curricula. The resulting programme - 'Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships' ('PR:EPARe') consists of a two part game (quiz and story mode) in which young people consider, discuss and articulate coercion, and review how to successfully navigate potential risks.

11.4.ii. Methodological commentary

The sixth paper of this portfolio combines the focus on improved sex education within strand 1 with the intervention focus of strand 2. The original commission was for a generic serious game for inclusion in existing sex education, but – with the WSWTTC experience of needing to accurately identify the behavioural need – it was crucial to consult with users and stakeholders before committing to an intervention focus. Young people and educational advisors concurred that sexual coercion was a high priority, and that year 9 was the most appropriate time to deliver this within the curriculum. The process of development mirrored that for both WSWTTC (output 3) and the associated game (output 5), balancing user need, pragmatic delivery issues and technical possibilities. All development activities were rooted in the change matrices developed, grounding all decisions about content and format in evidence and user need.

11.4.iii. Originality, significance and rigour

Originality: This output demonstrates the first application of both IM and serious game innovations to sexual coercion prevention through education.

Significance: Sexual coercion is a significant public concern (Home Office, 2015) and this paper contributes directly to educational efforts to reduce both perpetration and resistance. It also adds to the evidence base for developing theory and evidence based games deliverable within existing school curricula, and to commentaries about the value of disrupting the traditional dyadic teacher-student relationship. With sex education provision being so varied in quality (OFSTED, 2013), this game also contributes to measures of standardising delivery of sexual coercion education. Significance is also demonstrated through inclusion of this game in a Coventry University REF 2014 (Allied Health) impact case study, which cited that 900 teachers were trained in the programme in 2010, and that the course has been positively received by teachers.

Rigour: Rigour is shown through the full and articulated application of IM, which (as with output 3) ensured data was appropriately collected, analysed and triangulated, and that the final game was rooted in user need. Mixed methods of consultation and intervention development optimised goal clarity, choices over mechanisms of change and acceptability to the user population. The game which has since been tested in a cluster RCT (Arnab et al., 2013) and has been used by teachers as a resource to aid sex education/tackling pressure and coercion in teenage relationships.

11.4.iv. Insights into impact and knowledge mobilisation

Marrying theory based approaches with practicable and scalable delivery is challenging, and this study reinforced the need for early user engagement to appropriately frame the behavioural problem. As with output 3, when explored with users, the generic remit of the original commission was found to be misfocused. The triangulated IM needs assessment process again demonstrated utility in understanding user need and engagement issues, and re-emphasised the challenges of developing an intervention to meet multiple stakeholder needs. For young people to receive and benefit from the intervention, both content and delivery format must be suitable for both them *and* the teaching staff who must incorporate and deliver the programme. This flags the potential for tension where user and stakeholder preferences differ, and highlights the challenge for developers in determining which voice is superior.

11.4.v. Chronology and reflection on development as a research practitioner

As a collaborative project, this project reflects my increasing capabilities in intervention development rather than chronological progression as an independent researcher per se. Output 3 represented my first application of the intervention mapping approach, and output 5 my translation of the existing WSWTTC map into a game format. In output 6, I combined these two skillsets to apply an experience-led approach to problem framing, methodological choices, data synthesis and format/content design. This output marks a strengthened methodological expertise (IM) and my ability to apply this across new topic areas to develop theory-rich, acceptable and implementable interventions aimed to improve young people's sexual health.

11.4.vi. Links to the portfolio

Output 6 represents a second full application of the IM process (see output 3), with methodological choices reflecting the experiences of delivering the interventions in outputs 3 and 5. Output 6 also mirrors the rationale of output 2 to improve sex and relationships education, albeit here focused on coercion and delivery format rather than building profiles of contraceptive intent. As with outputs 1 and 2, this study also recognises the importance of targeted exploration of behavioural determinants with u16s to effectively improve sexual health.

11.5. Summary strand 2

The outputs in strand 2 demonstrate significant, rigorous and original contributions to intervention-focused research in adolescent sexual health and address objectives 2 (*apply intervention development frameworks to develop tools to support young people's sexual health*) and 3 (*assess issues related to feasibility, acceptability and translation of interventions and implications for impact*). These outputs highlight not only the value of applying an intervention framework, but also the need to comprehensively incorporate user and stakeholder views, thresholds for gatekeeper acceptability and measures to improve uptake and implementation. Whilst this body of work suggests considerable benefits of a theory-agnostic and user-engaged approach, there remain challenges for the processes of translating academic interventions into sustainable public health benefit. Intervention content and format must be sufficient to enable engagement; engagement must then be sufficient to enable impact. Output 3 demonstrates how the engagement does not necessarily translate into implementation, and outputs 4 and 5 demonstrate efforts needed to address delivery and engagement difficulties. Strand 2 therefore illustrates the value of a theory-agnostic approach to intervention development, whilst also highlighting the ongoing challenges in brokering interventions into realisable impact

12. Summary of strands 1 and 2

These six empirical studies align on the development of theory and evidence based interventions to improve adolescent sexual health. Each output articulates a distinct and original contribution to knowledge and practice in health psychology, intervention development and sexual health, and is set within a theory-led (strand 1) or intervention-led (strand 2) approach. The overall aim of the research programme was to elucidate determinants and develop intervention solutions to improve adolescent sexual health. The first three research objectives were met as below:

1. Apply and extend health psychology models to identify salient determinants of under 16 contraceptive intentions

Strand 1 demonstrates the application of the TPB to identify salient determinants of condoms, the contraceptive pill and EC. Qualitative exploration in output 1 (Bayley, Brown, et al., 2009) and extended quantitative investigation in output 2 (Bayley et al., 2017), highlighted a range of key determinants and differential age, gender and contraceptive type profiles. This work provides a significant and original contribution for health psychology research in adolescent contraceptive use and sex education modification.

2. Apply intervention development frameworks to develop tools to support young people's sexual health

Strand 2 demonstrates the application of IM to develop and improve the implementation of interventions. Outputs reflect the value of targeting both young people themselves (Brown et al., 2012) and parents-as-educators (Outputs 3-5, (Bayley et al., 2015; Bayley, Wallace, et al., 2009; Newby, Bayley, & Wallace, 2011b) to reinforce ongoing, comprehensive education. Three tools were developed; a group-based, manualised, facilitated parents training intervention (3), a serious online game version of this programme (5) and a sex education serious game to prevent sexual coercion (6). Outcomes accord with evidence that further scientific investigation is required to fully address issues of implementation and reach (Kohl, Crutzen, & de Vries, 2013). This work provides a significant and original contribution to intervention and implementation knowledge bases, and each intervention remains live in the public domain.

3. Assess issues related to feasibility, acceptability and translation of interventions and implications for impact

Strand 1 shows the value of theory-rich exploration, but how adolescent populations may struggle to connect with a theory-specific approach. Strand 2 shows the value in rigorous user led intervention development, but that these may still not be sufficient for implementation. Output 3 (Newby, Bayley, et al., 2011b) reflects the importance of correct stakeholder classification and outputs 4 (Bayley, Wallace, et al., 2009) and 5 (Bayley et al., 2015) demonstrate strategies to improve feasibility through changes to both engagement and format. Impact emerges as a function of strong and practically feasible interventions, co-produced for acceptability, and effortfully translated into practice. This work provides a significant and original contribution to implementation focused research, and highlights a range of challenges to realising impact from theory-based interventions.

At the outset of this work, I expected to produce a traditionally linear set of studies which sequentially progressed the evidence base for theory-based (TPB) research. However, whilst the portfolio bears out the value of *both* theory specific (objective 1) and theory agnostic approaches (objective 2) to behaviour change in sexual health, the challenges of implementation (objective 3) undermine impact ideologies inherent to traditional theory-based intervention development. To effectively navigate from theory to scalable change, efforts to engender change must connect into higher order impact pathways, and shift away from a reliance on rigorous development processes being sufficient for implementation in a conducive environment.

However, this portfolio demonstrates that such aims are obstructed by (i) reductionist theoretical approaches which may not fully mirror audience need; (ii) poor understanding of the processes, barriers, challenges and facilitators by which research is converted into practice; and (iii) expectations that environmental conduciveness will lead to adoption. This work thus challenges simplistic input-output rhetoric about how research matures into wider scale impact. More specifically the work highlights the unscripted distance between phases III (intervention proven to be effective) and IV (implementation) of the MRC complex behaviour change guidance and advocates caution in framing impact delivery and evaluation around stepwise models such as the Payback framework (Buxton & Hanney, 1996). In November 2015 I was invited to critique the Payback model for NIHR, and - drawing directly on my research experience - I identified a series of key risk points

for impact. Figure 4 presents an annotated version of the model, in which I conceptualise the progressive dilution of effects as a 'leaky impact pipeline':

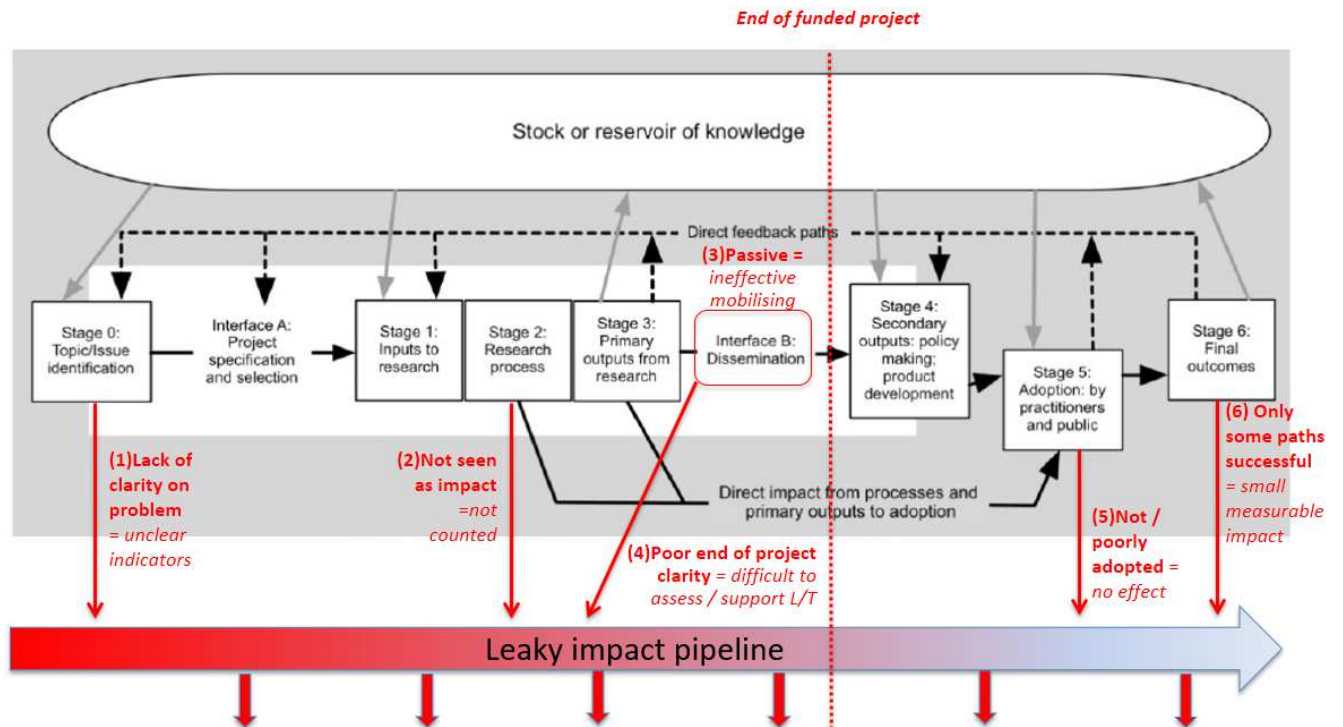


Figure 4: Annotated Payback model - 'Leaky pipeline'

Following this model from start, if there is lack of clarity on the problem from the outset (1), the nature, indicators and beneficiaries of impact will not be properly established. This contributes to missing potential effects (2) within the project lifetime, confounded by passive dissemination (3) rather than active knowledge mobilisation. At project closure, poor clarity on what has or should be achieved as a legacy of the work (4) means potential impact is often overlooked, disregarded or under resourced for follow up. Where work does move forward, uptake is not guaranteed, and without sufficient effort, adoption will be poor (5) and preclude impact occurring. As a function of these 'leaks' across the impact pipeline, only a small and diluted subset of effects are measurable at the end of the research process (6), skewing the way intervention effectiveness and outcomes are understood. Such linear models also overlook the difficulties of pursuing impact against objecting voices who – particularly in areas of sensitive or controversial areas - may seek to block the adoption of research.

Ultimately health psychology impact is a function of good research, which may be operationalised into interventions. These must be successfully fitted to the audience and

effortfully driven forward into sustained practice. Approaches must explicitly recognise that access to public or patient beneficiaries is often governed by gatekeepers (e.g. health service leads, headteachers), and that effort is needed to understand roles, views and expectations at all levels. As we continue to head away from the formal period of the UK Teenage Pregnancy Strategy, into epistemological challenges for singular theories (Sniehotta et al., 2014) and within an academic landscape increasingly expectant of impact, it is ever more vital that intervention developers understand how to connect their work into an impact pathway. Within the sector, we must both improve understanding and strengthen mechanisms for achieving meaningful and sustainable effects from theory-rich research. Furthermore, academics must be mindful of how their work fits into an impact pathway to effectively consider user need, implications for intervention scope, usability, implementation and impact. Accordingly, the learning across this portfolio fulfils the final objective:

4. Establish an impact-literate approach to health psychology theory-based intervention development and implementation.

The next section expands on this final objective and discusses implications for health psychology intervention development.

13. Establishing an impact-literate approach to health psychology interventions (Output 7).

Academics and intervention developers must be far more cognisant of – and position their work explicitly within - the longer pathway from theoretical conception to sustained implementation. This portfolio thus concludes with output 7 (Bayley & Phipps, 2017a) advocating the new concept of '*impact literacy*' and reflecting ability to critically assess how research is navigated into scalable real world effects. Drawing from established work in health literacy (Guzys, Kenny, Dickson-Swift, & Threlkeld, 2015) impact literacy moves beyond generic models (e.g. Payback) and instead reflects the individual-level understanding necessary to develop meaningful, appropriate and realistic impact pathways. Producing impact from research requires a combination of effort by individuals, via varied activities and with clearly articulated endpoints. Thus, impact literacy is conceptualised as the product of three intersecting elements (Figure 5):

1. The identification, assessment, evidencing and articulation of impact endpoints ("what")
2. The practices that create impact ("how")
3. The successful integration of these by research impact practitioners ("who")

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Figure 5: Impact literacy (Bayley & Phipps, 2017a)

Impact can be pursued without being literate, but this is likely to lead to poor execution, missed opportunities, poor resource use and misaligned or underachieved outcomes. Proceeding without all three elements has distinct consequences:

- i. **HOW** and **WHO** in the absence of **WHAT** leads to insufficient understanding of the impact endpoints, effects, indicators and evidence.
- ii. **WHO** and **WHAT** in the absence of **HOW** leads to insufficient understanding of the bespoke and nuanced processes by which impact is achieved
- iii. **HOW** and **WHAT** in the absence of **WHO** leads to insufficient understanding of the roles and skills required to plan, generate, execute and assess impact

This simplified model of how impact elements interconnect for literacy supports calls to make better sense of impact pathways (Nilsen, 2015) and lays foundations for building sector capacity and knowledge mobilisation competencies (Bayley & Phipps, 2017b).

13.1. Conceptual models for impactful health psychology

This concept of impact literacy offers a step change in how we can optimise the pathway from theoretical conceptualisation to sustained use of an intervention. To consolidate this and extend thinking across the research-to-impact lifespan, it is necessary to connect existing models for theory-based processes, intervention development and impact. It is then necessary to operationalise this knowledge into a new guiding framework from the health psychologists' perspective to not only explain the process of impact, but to support an impact literate approach from the outset. This portfolio therefore culminates in the synthesis of selected existing models spanning inception to sustained delivery (conceptual model 1), followed by a new model to guide the development of impactful health psychology interventions (conceptual model 2).

13.1.i. Conceptual model 1: Synthesis of theory-led processes, Intervention Mapping, MRC Guidance and Payback

The ever-evolving nature of the healthcare context (e.g. changes in policy, funding and restructuring of the health service) present ongoing challenges for intervention implementation and governance beyond the immediate project. Programmes must be derived from strong evidence and reflect user needs, but for adoption must also be sensitive to contextual and strategic limitations. Intervention development approaches must therefore shift beyond establishing contexts which are *conducive* to achieving impact from theory and evidence based programmes, and more explicitly address those factors which enable the *generation* of impact in a real-world setting.

Whilst there are many models available, to date there is no overarching framework connecting processes from the inception of theory based research through to sustainable and impactful practice. In isolation, each model offers an insight into part of the process, but none adequately span the path from inception to sustained use. To reflect the key guidance and frameworks for developing theory based behaviour change interventions, this new conceptual model synthesises the following elements (*NB. TPB and IM are presented as exemplars of theory vs intervention led approaches, but not presented as the only frameworks available*):

- Traditional theory-led (TPB) approach to intervention development (strand 1)
- Intervention-led (IM) approach to programme development (strand 2)

- MRC Guidance for developing complex behaviour change interventions
- Impact evaluation (Payback)

The processes are connected across five main stages (see Figure 6).

1. Theory development and modelling

Populated primarily by theory-specific processes, this first stage reflects the fundamental and exploratory stage of theory-based. Here, research focuses on the development, extension and testing of health-related theories (*MRC: Theory Preclinical*), and aims to develop theory-bound profiles for health behaviours (*MRC: Modelling Phase 1*). Research culminates in theory based outputs usually focused on assessing the usefulness or accuracy of a theory/model. The goal of a subsequent intervention (*Payback: Topic ID*) is rooted in the outcome of these processes, whilst also drawing from the needs assessment in stage 2. The common endpoint of this phase is theory based outputs which both report outwards findings ready for adoption into further research, and supporting the identification of the behaviour to be targeted in a subsequent intervention.

2. Intervention Development

The development of methods to address health behaviours can progress through two primary routes. Route A is theory specific, in which a planned intervention is operationalised directly from a selected theory base and draws on behaviour change technique theory and evidence to devise suitable content and delivery (similar to *IM3 Theory based methods and practical strategies*). The devised intervention is pilot tested, which may result in amendments to the project plan, ahead of next stage evaluation. Route B is theory-agnostic, in which a planned intervention is developed based on the directly assessed needs of users (*IM1: Needs Assessment*) in combination with theoretical knowledge (*Payback: Inputs to research*, as informed by stage 1). The needs assessment may inform the topic and any revised theoretical input required, until a firm intervention focus (*Payback: Project specification*) is determined. Key intervention goals (*IM2: Programme objectives*) are derived from the identified needs, leading to the selection of appropriate content, format and behaviour change mechanisms (*IM3: Theory based methods and practical strategies*). These elements are then coordinated into an intervention (*IM4: Programme plan*). The content and format are pilot tested with users and the programme revised, before

being implemented with the target audience (*IM5: Programme Implementation*). NB routes A and B share common elements, but have contrasting philosophical bases to be shown here in contrast.

3. Evaluation

The evaluation stage reflects the exploratory and confirmatory testing of the direct effects of the intervention (*MRC Phase 2 Exploratory Trial, MRC Phase 3 Definitive RCT, IM6 Evaluation plan*). This may either demonstrate the efficacy of an intervention, marked by summaries of the efficacy and utility of the intervention (*Payback: Stage 3 Primary outputs from research*), or identify ineffectiveness requiring intervention conversion / reinvention.

4. Uptake and implementation

If an intervention has proved effective within a test phase, it may move towards potential adoption. For uptake to occur the work must receive attention from potential adopters (NB engagement with stakeholders is crucial throughout, but operates here as an uptake mechanism). From here, the work is implemented (*Payback: Stage 4- Adoption by practitioners and public*) and begins the process of integration into provision, monitored throughout to track effects of the intervention beyond the test phase (*Payback: Direct impact from processes and primary outputs to adoption*)

5. Establishment and sustainability

Once sufficiently integrated into provision (*MRC: Phase 4 Long term implementation*), the intervention becomes systematically used and continues to generate impact (*Payback: Direct impact from processes and primary outputs to adoption*). The work may influence policy (*Payback Stage 4: Secondary outputs, policy making and product development*), which may in turn inform (*Payback stage 1: inputs to research*) the strategic context and problem framing into which further research is conducted.

Cross stage activities

The full path from inception to behavioural outcomes can be conceptualised as an extended research and feedback process (*Payback: Stage 2 Research process*). Engagement occurs throughout this extended pathway, led primarily by academics in the early phase and shifting to user ownership in the latter. Dissemination (*Payback Interface*

B: Dissemination) and ongoing contributions to the academic knowledge base (*Payback: Stock or reservoir of knowledge*) occur throughout the pathway, with a series of indicative outputs delivered at distinct stages of the research to impact process. Whilst policy links (*Payback Stage 4: Secondary outputs, policy making and product development*) are presented here in the final stage, the processes of relationship building and informing policy-related practices (e.g. guidelines) is likely to begin far earlier in the process.

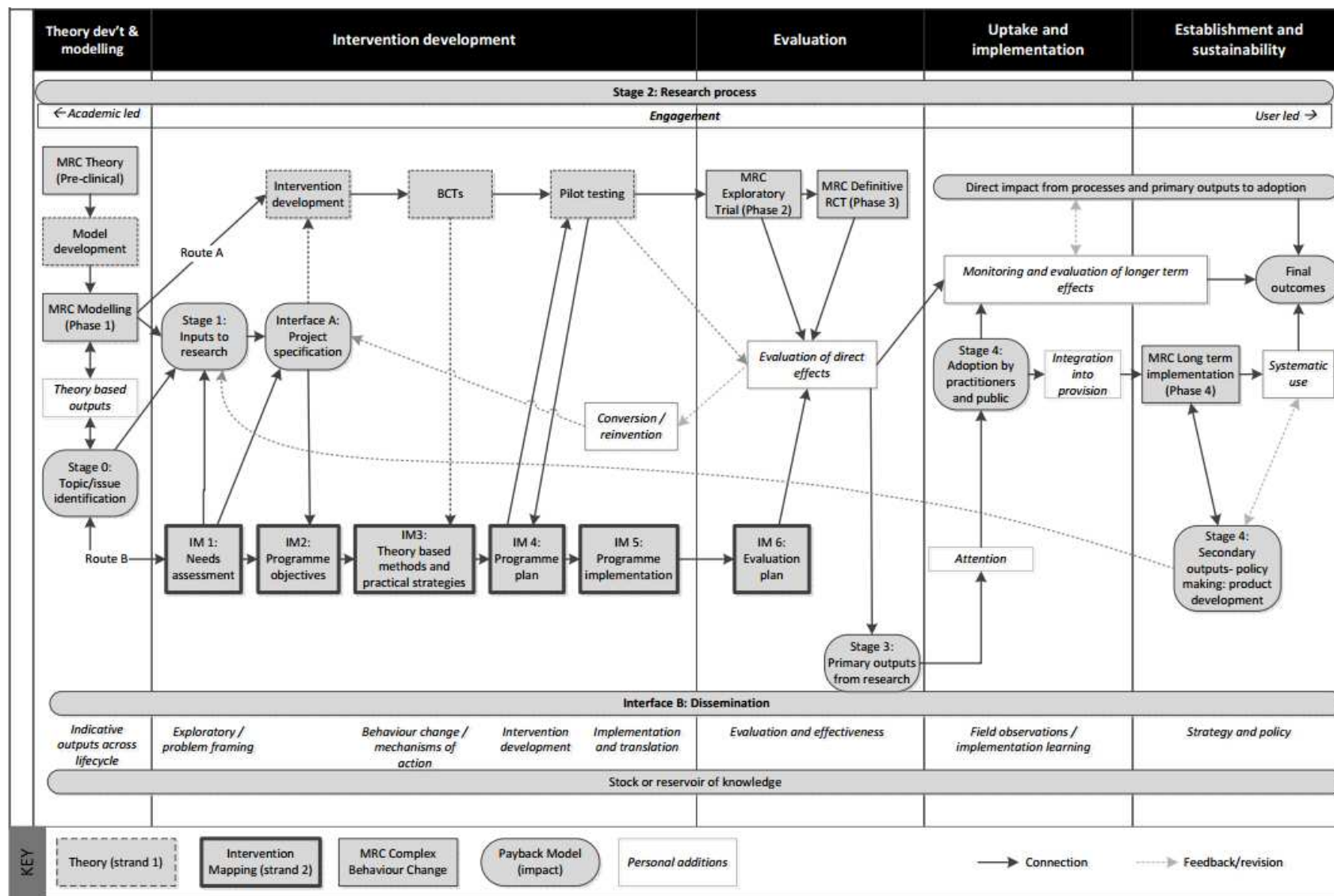


Figure 6: Conceptual model 1 - Synthesis of theory-led processes, Intervention Mapping, MRC Guidance and Payback

13.1.ii. Conceptual model 2: Integrated model for the generation of impactful health psychology interventions

Model 1 connects multiple frameworks across the extended research pathway from inception to impact. However, it acts as an explanatory model rather than researcher-focused guide and thus does not easily support researchers in conceptualising how their interventions may progress along an implementation pathway. Model 2 (Figure 7) addresses this by rationalising model 1 into a flow model of the connective pathways from theory to sustained implementation, including risks and iterative feedback loops. To reflect the engagement and transfer processes, the model is structured so that elements in the upper half of the diagram are more academically led, whilst those in the lower half have more user-level input or leadership. The model also includes feedback and revision loops to reflect the iterations inherent to designing and launching a user-facing programme.

Narrative description of model

An intervention topic is determined (*Topic ID*) through a combination of academic led *theory and evidence*, and user, stakeholder (and/or policy) defined *problems*. Once identified, the process of ***Intervention Development*** begins. Here, through varying methods (such as needs analysis, evidence review, new data collection, co-production activities and usability testing) the developer selects the *mechanisms of change* (e.g. BCTs), the *format and delivery method*, the behavioural/impact *goals* (and the associated evaluative *indicators*), and how this package will best fit the context it is entering (*system fit*). This intervention is then evaluated (***Evaluation***); early *pilot evaluation* may identify revisions needed ahead of higher order *efficacy* and *process evaluation*, alongside assessing *feasibility* of (i) conducting a trial of efficacy/effectiveness and (ii) implementing into practice, fidelity of delivery, and reviewing *acceptability* to the target audience(s). Results of these evaluations may identify further revisions needed to strengthen the intervention or improve launch feasibility.

Even if the intervention has proven effectiveness and acceptability, uptake is not guaranteed. For incorporation into practice, an intervention developer must at minimum meet a subjective user's *threshold* (e.g. context fit, usefulness for local population, possibility of integration into existing provision, replacement to existing provision, cost effectiveness, resource availability, fit with current strategy). Whilst much of this is

reviewed and established in the intervention development and evaluation stages, here it acts as a go/no go barrier through which the intervention does/does not progress towards real world application. If the intervention meets the threshold for potential **uptake**, it must then receive *attention* from relevant users, stakeholders and commissioners, subsequently elevated to purposeful *consideration*. If positive consideration is given by a decision maker, the intervention may move *directly* to *implementation*. Alternatively, if the intervention is viewed positively by a gatekeeper in a non-commissioning capacity (*indirect consideration*), they must *endorse* the intervention to the commissioner to facilitate implementation.

If the intervention is implemented, and over time integrated into provision, it may result in systematised use. Further scaling is achieved through *duplication* (repeat administration of the intervention) or *replication* (administration to additional groups, such as to different conditions, and which may require redevelopment). Best practice examples can inform policy making, which may in turn reframe guiding strategy into which future interventions must be situated.

Across the whole pathway, the generation of outputs and briefings will extend both the *academic theory, intervention and implementation knowledge base* and *practitioner guidelines, best practice, service delivery specifications, strategy and policy* learning. Non-academic benefits generated across this pathway increase in significance and depth from trial-scale, implementation-scale to wider system-scale impact. The process of implementation, and the monitoring of impact, should be monitored by the academic post-evaluation.

Feedback and revisions

At any stage post-evaluation, the intervention may fail to receive attention, be considered, be endorsed, be implemented or be sustained (*No/limited uptake*). Proactive planning, ongoing monitoring and user/stakeholder consultation is required to determine which of the following modifications are necessary to improve intervention viability:

- **Restrategise:** If the intervention does not fully align with current policy and guidance, or if the policy has changed, the work must be realigned accordingly.
- **Refocus:** If the intervention target or behavioural goal is misaligned with audience/service need, the scope of the intervention must be reassessed.

- **Convert:** If implementation is blocked because of delivery format or content, these must be reassessed with expectations of modifications / translation into a different mode of delivery.
- **Refit:** If the intervention is judged not to meet users' access or acceptability needs, feasibility assessments must be revisited and updated to improve feasibility and likely engagement.
- **Re-engage:** If there is poor attention or consideration, the research team must assess the suitability of their stakeholder communications strategy and revise to engage more effectively.

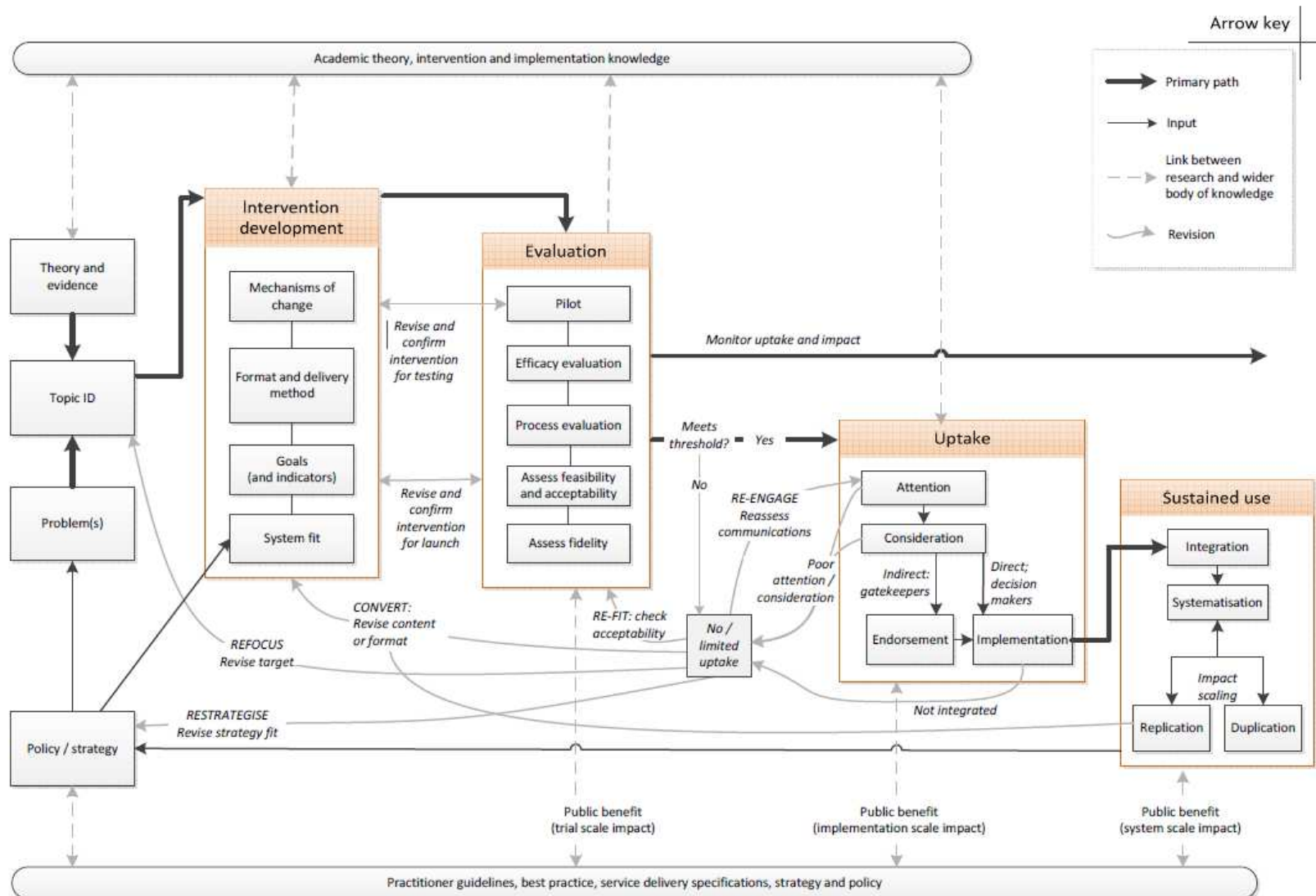


Figure 7: Conceptual model 2 - Integrated model for the generation of impactful health psychology interventions

13.2. Final recommendations and next steps

As Abraham (2015) states, “*Health psychologists will be valuable to health services only to the extent that they can apply psychological science to co-create and evaluate interventions capable of generating clinically relevant health behaviour change*” (page 163). This portfolio demonstrates both the value of health psychology interventions to address public health concerns, and the challenges intervention developers face in driving their work into adopted practice. Impact is not a simple process of knowledge transfer, and requires researchers to shift away from an academic-centric approach and recognise the active, cyclical and risk-laden paths from theory to effect.

Key recommendations for health psychologists therefore are to:

- Continue to build theory and evidence bases on behavioural determinants, mechanisms of action, theory utility, implementation processes and pathways for long term impact
- Improve impact literacy and knowledge mobilisation competencies individually and within health psychology more broadly
- Approach research translation and intervention implementation as a complex, cyclical, iterative process requiring proactive context monitoring and engagement
- Adopt a realistic, risk-based approach to impact planning, to shift away from conduciveness towards meaningful and achievable pathways.
- Report – via published papers or supplementary materials - implementation successes, failures and points of learning
- Explicitly position studies along the research-to-impact continuum
- Classify stakeholders in terms of intervention ownership, authority, influence, usage or interest, and identify where custody may need to change for programmes to be fully adopted

Ultimately, research must continue to test and extend behavioural models, apply and reconfigure intervention models and explore how the combined results can be best mobilised into effective practice. Both theory-specific and theory-agnostic research should continue to enhance the knowledge base on the proportionate influence of behavioural determinants and the most effective means to change behaviour itself.

Similarly, research must extend beyond recognition of the knowledge to action gap (Bowen & Graham, 2013) and towards developing stronger paradigms for intervention co-production (Phipps et al., 2016). Direct attention must also be placed on the challenges of pursuing impact pathway in objecting environments. Such additions would enhance implementation science and shift away from default logic about the implementation surety.

This continuing body of work will complement existing frameworks such as the BCW, APEASE and REAIM, and inform the inter-phase gaps within existing development guidance (e.g. MRC). For example, the APEASE framework may be usefully extended by (i) viewing it as a base threshold for implementation likelihood, (ii) adding an assessment of the stability of the receiving context and (iii) including explicit classification of stakeholder roles. Similarly, MRC guidance may be enhanced by specifying the risks and fluidity between phases. Whilst only Intervention Mapping was formally applied in this portfolio, other approaches such as the Theoretical Domains Framework (Cane, O'Connor, & Michie, 2012; Michie et al., 2005) offer much to the process of identifying appropriate intervention content and should be similarly explored.

At a more granular level, future research must identify the discrete mechanisms of action for *research translation* to enable the development of tools, guidance and frameworks. Evidence based tools, underscored by impact literacy, are needed for the academic community to optimally produce and implement effective interventions. Research in this translational space spans disciplinary boundaries, and is strengthened by importing practice from broader areas. Intervention designers must not only share good practice, but must also feedback into the community of practice about implementation risks and barriers to eschew the risks associated with positive publication bias (Franco, Malhotra, & Simonovits, 2014).

More broadly, academic intervention developers should draw on growing knowledge (such as that shown in conceptual model 2) to connect their work into impact journeys not just into the behavioural evidence base. Over time this will reinforce the contribution of academic research to public health concerns, and help solidify research pathways most likely to produce impact.

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15. Appendix A: Supplementary outputs related to the portfolio

JOURNAL ARTICLES

Accepted/ in press

1. **Bayley, J.E.** and Phipps, D. Building the concept of impact literacy. Accepted in Evidence and Policy May 2016
2. **Bayley, J.E.**, Phipps, D., Batac, M. and Stevens, E. Development of a framework for knowledge mobilisation and impact competencies. In press, Evidence and Policy

Published / in press

3. Newby, K. , Brown, K. E. , **Bayley, J.E.**, Caley, M. , Danahey, A. , Hunt, J. and Critchley, G. (2016) Development of an intervention to increase sexual health service uptake by young people. Health Promotion Practice (In Press)
4. Brady, G, Brown, G. and **Bayley, J.E.** *'I love my boyfriend and I felt like it was the right time for me': exploring young people's views about sex and teenage pregnancy.* Submitted to Journal of Health Research (Q1)
5. Wallace LM, McNulty,C., Hogan, A. and **Bayley J.** (2012) Exploring attitudes & practices of General Practice staff towards offers of opportunistic screening for chlamydia: a UK survey. Primary Health Care Research & Development, 13(3), 255-268, doi:10.1017/S1463423611000612
6. Martin, F. , Caramlau, I.O. , Sutcliffe, P. , Martin, S. , **Bayley, J.E.** and Choudhry, K. (2010) 'Self-management interventions for people living with HIV/AIDS (Protocol)' in Cochrane Database of Systematic Reviews. Wiley: Art. No.: CD008731
7. Brown, G. Brady, G and **Bayley, J.E.** (2010) Teenage Kicks. *Professional Social Work*, p25
8. Brown, G. Brady, G and **Bayley, J.E.** (2010) Teenagers Uncovered. *Nursing Standard*, 52(24), 24-5
9. Wallace, LM, Spurgeon P, Adams S, Earll LE and **Bayley, J** (2009) Survey evaluation of the NPSA's Root Cause Analysis programme in England and Wales. *Quality and Safety in Healthcare*, 18(4), 288-91

10. Brady G., Brown G., Letherby, G., **Bayley, J.E.** and Wallace, L.M. (2008) Too young to choose? Young people, termination and miscarriage. *Human Fertility*, 11(3), 186-190
11. Wallace, L.M., Law, S., Kosmala-Anderson, J., Mills, S., **Bayley, J.** and Baum, A. (2008) Mutually Exclusive? A United Kingdom Survey of Women's Experiences of Breastfeeding and Working. *Midwifery Digest*, 18, 1, 99-103
12. **Bayley, J.E.** Wallace, L.M., Spurgeon, P., Barwell, F. and Mazelan, P. (2007) Teamworking in the NHS: Longitudinal evaluation of a teambuilding intervention. *Learning in Health and Social Care*, 6.4, 187-201

CONFERENCE PRESENTATIONS, INVITED TALKS AND PAPERS

13. **Bayley, J.E.** (2016). Knowledge Broker competencies and Impact Literacy. Presentation at ARMA Improving impact practice and strengthening impact delivery Good Practice Exchange, 7th December 2016, York
14. **Bayley, J.E.** (2016). Building an impact literate culture. Invited presentation for the Australian Research Impact Summit event, November 2016.
15. **Bayley, J.E.** (2016). Impact across the project lifecycle: what, how, when and who? Event lead and presentation at ARMA Routes to Impact Good Practice Exchange, 14th October, London
16. **Bayley, J.E.** (2016). Planning and mapping research impact: implications for assessment. Presentation to NIHR impact leads, NIHR, January 2016, London
17. **Bayley, J.E.** and Phipps, D. (2016). Knowledge broker competencies and impact literacy. Invited presentation to NIHR impact leads, NIHR, April 2016, London.
18. **Bayley, J.E.** Secondino, F and Rozenberga, D. (2016). 'AIM to Impact: Applying Impact Models in research management. Coventry University reflections on an integrated lifecycle approach'. Oral presentation accepted for 22nd European Association of Research Managers and Administration (EARMA) conference, Luleå University of Technology, Sweden June 20-23rd
19. **Bayley, J.E.** and Phipps, D. (2016). Developing standards for knowledge broker competencies; results of cross-national survey. Oral paper presented at the UK Knowledge Mobilisation Forum conference, 10-11th May, London

20. Garcha, E. and **Bayley, J.E.** (2016). Research Impact Special Interest Group session. Co-lead at ARMA annual conference, June 6-8, Birmingham
21. Phipps, D. and **Bayley, J.E.** (2016). Research Impact Literacy. Paper presented at the 2016 Canadian Knowledge Mobilization Forum, June 28-29th, Toronto, Canada.
22. **Bayley, J.E.** (2016). Changing Researchers' Behaviour to Make Open Access Successful: O2OA case study. Invited presentation at the Next Steps for Open Access in Higher Education forum, Inside Government, 20th January, London
23. **Bayley, J.E.** (2015). From Call to Impact: building impact into research from the start. Event lead and sessions delivered at ARMA Routes to Impact Good Practice Exchange, 20th October, York
24. **Bayley, J.E.** (2015). Embedding impact. Session delivered at ARMA Advanced Impact Good Practice Exchange, 1st October, London
25. **Bayley, J.E.** (2015) Research impact: Reflections on culture, models and future steps. Invited presentation at the NIHR 4th Annual Health Research Management Workshop, 23-24 November 2015, Institute of Cancer Research, London
26. **Bayley, J.E.** (2015) "Drawing on behavioural and intervention development approaches to support OA delivery". Presentation and workshop at 'OA Researcher Behaviour' event, Oxford Brookes, May 15
27. Fairburn, R., **Bayley, J.E.**, Fuchs, M., Marshall-Brown, A. and Albutt, S. (2015) Towards knowledge exchange and impact culture change: From challenges to opportunities. Oral presentation at the annual *Association of Research Managers and Administrators (ARMA) conference*, Brighton Hilton, 1st-3rd June
28. **Bayley, J.E.** (2015). What is impact? Oral presentation at the Coventry University Research Conference, June 2016
29. **Bayley, J.E.** and Lau, H. (2015). Impact and knowledge transfer. Oral presentation at the Coventry University Research Conference, June 2016
30. **Bayley, J.E.**, Hitchins, C. and Ryall, J. (2015) Applying Research Methods to Impact (ARM-2-Impact): combining academic and research support expertise to map sustainable impact. Oral presentation at the annual *Association of Research Managers and Administrators (ARMA) conference*, Brighton Hilton, 1st-3rd June

31. Young, D., Fahmy, S., **Bayley, J.E.** and Walker, K. (2015). Jisc Open Access Pathfinders: Developing Models of Good Practice for OA. Oral presentation at the annual *Association of Research Managers and Administrators (ARMA) conference*, Brighton Hilton, 1st-3rd June
32. **Bayley, J.E.** (2015). Towards a taxonomy of impact. Presentation at the ARMA Impact Special Interest Group event, Edinburgh April 2015
33. Morgan, Y. and **Bayley, J.E.** (2015, June). *Bringing steadiness in uncertain times: strategies for being an academic's 'critical friend' in the post REF period*. Poster presented at the ARMA 25th Annual Conference, Brighton Hilton, 1st-3rd June
34. **Bayley, J.E.**, Hitchins, C. and Ryall, J. (2014). "From Call to Impact: building impact into research from the Pre Award stage" - Association of Research Managers and Administrators (ARMA) 'Routes to Impact' Good Practice Exchange workshop. 30th September 2014, Charles Dickens House, London.
35. Fedorciow, L. and **Bayley, J.E.** (2014). Strategies for the management and adoption of impact capture processes within research information management systems. Oral presentation at the *12th International Conference of Current Research Information Systems (CRIS 2014)*, Rome, 13-15th May
36. **Bayley, J.E.** (2014) Embedding Research Impact at Coventry University; system development and behaviour change learning. Invited paper presentation at *Research Impact Network 'What have we learnt about impact and where do we go from here?'* conference, University of Warwick, 26th February
37. **Bayley, J.E.** (2014). Making a difference; integrating impact with social science research. Invited paper presentation at the *2nd Centre for Social Relations Conference, "Social Relations, Transformation and Trust"*, Coventry University, 28th-29th March
38. **Bayley, J.E.** and Ryall, J. (2014). Embedding impact; effecting institutional change through the development and rollout of an Impact Capture System at Coventry University. Oral presentation at the annual *Association of Research Managers and Administrators (ARMA) conference*, Blackpool Hilton, 9-11th June
39. Fedorciow, L. and **Bayley, J.E.** (2014). Strategies for the management and adoption of impact capture processes within research information management systems (Conference paper) *Procedia Computer Science*, 33, 25-32

40. **Bayley, J.E.** and Ryall, J. (2014). ERIC: Developing an impact capture system. *Vistas: ARMA 2014 Conference Proceedings*
41. Joshi, P., Kehal, I., Newby, K., **Bayley, J.E.**, Arnab, S., Clarke, S. and Baxter, A. (2013). Evaluation of a serious game intervention to improve psychological preparedness for avoiding sexual coercion. *Psychology and Health*, 28, 234.
42. **Bayley, J.E.**, Brown, K.E., Newby, K., Joshi, P., Arnab, S., & Clarke, S.. (2013). Early Evaluation of the PR:EPARe Serious Game: Addressing sexual coercion through Relationships and Sex Education (RSE). Paper presented at *British Psychological Society, Division of Health Psychology Annual Conference*, 11-13th September, Holiday Inn Brighton Seafront, Brighton, UK (**CONFERENCE POSTER PRIZE – OUTSTANDING CONTRIBUTION TO HEALTH PSYCHOLOGY**)
43. Fedorciow, L. and **Bayley, J.E.** (2013). 'Benchmarking social, environmental and financial performance'. Invited paper presentation at the '*Pragmatic Impact Tools*' event, Brunel University, 9th December
44. Arnab, S., Brown, K.E., Clarke, S., Judd, B., Baxter, A., King, R., Joshi, P., Newby, K., & **Bayley, J.E.** (2012). Tackling Sensitive Issues using a game-based environment: Serious Game for relationships and sex education (RSE). Paper presented at the 6th European Conference on Games-Based Learning (ECGBL), Cork, Ireland, 4-5th October 2012.
45. Brown, K., Arnab, S., **Bayley, J.E.**, Newby, K., Joshi, P., Judd, B., Baxter, A. and Clarke, S. (2012). Tackling sensitive issues using a game-based environment: Serious game for relationships and sex education (RSE). Paper presented at the 17th Annual CyberPsychology and CyberTherapy Conference (CYBER17), September 25th-28th, Brussels, Belgium.
46. Brown, K., Arnab, S., **Bayley, J.E.**, Newby, K., Joshi, P., Judd, B. and Clarke, S. (2012). Tackling sensitive issues using a game-based environment: Serious game for relationships and sex education (RSE). *Stud Health Technol Inform*, 181, 165-171.
47. Joshi P, Brown, K., **Bayley, J.E.**, Newby, K., Hancock, J., Choudhry, K. & Baxter, A. (2011). Needs Assessment, Development & Implementation: Sexual Health Interventions in Action. Poster presented at the DHP annual conference, Southampton, September 2011

48. **Bayley, J.E.**, Newby, K. & Wallace, L.M. (2011). Development of a theory- and evidence-based programme to improve parent-child communication about sex and relationships. Sexual Health Interventions in Action. Symposium conducted at the British Psychological Society Annual Conference, May, Glasgow
49. Wallace, LM, Newby, K, McNulty CAM, **Bayley, J.E.** (2011) Elaborating the targets for a practice intervention to improve opportunistic Chlamydia screening by GP practices. Poster session presented at the HSRN SDO Network Conference, Liverpool, June
50. **Bayley J.**, Wallace L.M., Newby K., Hogan A.H. & McNulty C.A.M. (2010) Development of a TpB based intervention to increase opportunistic Chlamydia screening in GP practices; baseline scores and implications for practice. Presented at Division of Health Psychology Conference, September, Queen's University, Belfast.
51. Newby, K., Sewell, A., **Bayley, J.E.**, Choudhry, K., Stanley, D. & Wallace, L.M. (2010, June) Policy and Practice recommendations to address social ecological conditions linked to under 16 teenage conceptions. Presented at Joint Health Service Research Network and Service Delivery Organisation Conference, Manchester Central Convention Centre, Manchester
52. Wallace L M, Newby K, **Bayley J**, Hogan AH, McNulty C.A.M. (2010, June). Development of an intervention to increase opportunistic Chlamydia screening in GP practices. Poster session presented at the Faculty of Public Health Conference, London.
53. **Bayley, J.E.**, Newby, K. and Wallace, L.M. (2009). What Should We Tell The Children? Development of a Theory- and Evidence-Based Programme to Promote Parent-Child Communication about Relationships and Sex. Oral paper accepted at SRE 2009; IVth Biennial International Sex and Relationships Education Conference, September 7-9th, Birmingham
54. **Bayley, J.E.** Brown, K and Wallace, L.M.(2009) Towards improvement of planned and emergency contraceptive use in adolescents: Findings from a questionnaire study. Oral paper accepted at European Health Psychology Society Conference, September 23rd -26th, Pisa
55. **Bayley, J.E.** Brown, K and Wallace, L.M. (2009) Towards real-world improvement of condom, oral contraceptive and emergency contraceptive use in adolescents:

Findings from a questionnaire-based study. Oral paper accepted at Division of Health Psychology Annual Conference, September 9-11th, Aston

56. **Bayley, J.E.** Brown, K. and Wallace, L.M. (2009). Developing a theory-based sex education intervention; findings from a questionnaire study on adolescents' intentions to use condoms, oral contraception and emergency contraception. Poster accepted at SRE 2009; IVth Biennial International Sex and Relationships Education Conference, September 7-9th, Birmingham
57. Pottinger, E. **Bayley, J.E.**, & Newby, K. (2009) What Should We Tell The Children? – Preliminary evaluation of an Evidence-Based Programme to promote Parent-Child Communication about Relationships and Sex, Poster accepted at SRE 2009; IVth Biennial International Sex and Relationships Education Conference, September 7-9th, Birmingham
58. Pottinger, E., **Bayley, J.E.**, Wallace, L.M. (2009) Development of a Standalone Version of the 'What Should We Tell the Children...About Relationships and Sex' Programme. poster accepted at Division of Health Psychology Annual Conference, September 9-11th, Aston
59. Brown, K.E., **Bayley, J.E.**, & Wallace, L.M. (2008). Improving effective use of condoms, oral contraception and emergency contraception in adolescents: Findings from a questionnaire based study. Presented at the Asia-Pacific Congress on Contraception, Macau, China
60. Letherby, G., Brady, G. Brown, G, **Bayley, J.E.**, Wallace, L.M. (2007). Support prior to and following termination and miscarriage for pregnant teenagers and young parents in Coventry and Warwickshire. Keynote presentation at the Coventry Teenage Pregnancy Conference, May 14th, Technocentre, Coventry.
61. **Bayley, J.E.** Newby, K., Wallace, L.M. What Should We Tell the Children...About Relationships and Sex” programme. (2006) Presentation at the Programme Launch event, Coventry TPCT, February 20th
62. **Bayley, J.E.** Newby, K., Wallace, L.M. (2006) Development of the What Should We Tell the Children...About Relationships and Sex” programme. Oral presentation Midlands Health Psychology Network Annual Conference, April 12th

63. **Bayley, J.E.** Wallace, L.M., Brady, G., Brown, G. Letherby, G. A qualitative study of staff attitudes to providing termination of pregnancy services to young women in the English Midlands. Poster presented at the 9th Division of Health Psychology Conference, University of Essex, September 13-15th 2006.
64. Brady, G., Letherby, G., Brown, G., **Bayley, J.E.**, Wallace, L.M. Support for Young Women Before and After a Termination or a Miscarriage. Oral presentation at BSA Medical Sociology Group Conference, Edinburgh, September 14-16th, 2006
65. **Bayley, J.E.** Newby, K., Wallace, L.M. Consultancy work: Development of a Theory- and Evidence-Based Programme to Promote Parent-Child Communication about Relationships and Sex. Presentation at the DHP postgraduate subcommittee conference, University of Derby, April 21st 2006
66. **Bayley, J.E.**, Dodd, L., Newby, K., Brown, K. & Wallace, L.M. (2006, September). What Should We Tell The Children? Pilot evaluation of a theory and evidence based programme. Poster session presented at the Health Psychology in Action Forum at the 9th Division of Health Psychology Conference annual conference, University of Essex.
67. Newby, K., **Bayley, J.E.** and Wallace, L.M. (2005, September). What Should We Tell the Children? Development of a Theory- and Evidence-Based Programme to Promote Parent-Child Communication about Relationships and Sex. Poster session presented at the 8th Division of Health Psychology Conference, Coventry University.
68. **Bayley, J.E.** and Wallace, L.M. Applying the Theory of Planned Behaviour to Emergency Contraception Use in Teenagers; an exploration of attitudes and beliefs. Poster presented at the 8th Division of Health Psychology Conference, Coventry University, September 7-9th 2005.
69. **Bayley, J.E.** and Wallace, L.M. Teamworking in Healthcare: Longitudinal evaluation of a teambuilding intervention. Poster presented at the 8th Division of Health Psychology Conference, Coventry University, September 7-9th 2005.
70. Wallace, L.M., Earll, L., **Bayley, J.E.** and Higbed, L. Investigation of patient safety incidents: Development of training evaluation model using the Theory of Planned Behaviour. Paper presented at the 8th Division of Health Psychology Conference, Coventry University, September 7-9th 2005.

SELECTED ONLINE ARTICLES

71. **Bayley, J.E.** (2016). A call to build an impact literate research culture. 7th December 2016, available from <http://blogs.lse.ac.uk/impactofsocialsciences/2016/12/07/a-call-to-build-an-impact-literate-research-culture/>
72. **Bayley, J.E.** and Hitchins, C. (2015) Embedding research impact: A 'how to' guide. Invited blog for Research Media <http://www.researchmedia.com/blog/embedding-research-impact-a-how-to-guide/>
73. Hitchins, C. and **Bayley, J.E.** (2014). *The role of the Research Funding Officer in building robust and dynamic foundations for impact*. [Blog] 28th August 2014. Available from LSE Impact of Social Sciences <http://blogs.lse.ac.uk/impactofsocialsciences/2014/08/28/research-funding-officers-foundations-for-impact/>[Accessed: 28th August 2014].
74. **Bayley, J.E.** (2014). How-to guide for building a university-administered impact management tool for academics. LSE Impact of Social Sciences blog <http://blogs.lse.ac.uk/impactofsocialsciences/2014/02/07/eric-impact-management-tool-for-academics/> 7 February
75. **Bayley, J. E.** (2014). Behaviour change and Open Access; lessons for academic engagement [Blog]. <http://openaccess.jiscinvolve.org/wp/2014/09/03/behaviour-change-and-open-access-lessons-for-academic-engagement/>

BOOK REVIEWS

76. **Bayley, J.E.** (2015) Teenage Pregnancy (Review for Taylor and Francis)
77. **Bayley, J.E.** (2012). Is this normal? Understanding your child's sexual behaviour. *Sex Education*, 13(3), 369-370.

16. Appendix B: Selected research funding

1. **Bayley, J.** (2017). Mapping Invention for Innovation (i4i) paths - review of legacy projects. Impact review commissioned by National Institute for Health Research (NIHR), £30,000
2. **Bayley, J.** (2011). Early interventions in teenage pregnancy, alcohol and drug use: a scoping study to provide the evidence base. Coventry City Council and NHS Coventry, £12,500
3. **Bayley, J.**, Brown, K. and Wallace, L. (2010). Feedback, evaluation and revision of the parents' sexual health game. HIEC, £18,000
4. **Bayley, J.** (2010). Development of a Parents' Communication DVD. NHS Coventry, £35,000
5. **Bayley, J.** and Wallace, LM.(2010). Evaluation of the Parents' Sexual Health Serious Game. Warwickshire PCT, £25,000
6. **Bayley, J.** and Newby, K. (2009). Regional project to research under 16 conception rates in the West Midlands. Government Office West Midlands, successful tender, £20,000
7. **Bayley, J.** (2009). "What Should We Tell the Children about Relationships and Sex?". Development of a standalone session. Coventry City Council, £7,500
8. **Bayley, J.**, Wallace, L.M. (2009). GP Audit of Stool Specimen Submission. Health Protection Agency, £16,000
9. Brown K, **Bayley, J.**, Newby, K. and Wallace LM (2008-2010) Feasibility and beta-testing of a volitional intervention for patient benefit in sexual healthcare settings: Implementation intentions applied to contraceptive pill and condom use in adolescents. Warwickshire PCT Research and Development Committee, £24,887
10. Brown K, **Bayley, J.**, Wallace LM (2008). Continuation of intervention development grant. Bayer Healthcare Ltd £25,000
11. Wallace LM, **Bayley, J.**, Bryce C (2008) Consultancy on training needs survey. Thomas Pocklington Trust £3,500

12. Wallace LM, **Bayley, J** and Brown K (2007). Development of a theory based school sex education intervention- baseline survey. Bayer Healthcare. £10,300
13. Wallace, LM, **Bayley, J**, Thunhurst C (2007) Evaluation of Brunswick Healthy Living Centre. South Warwickshire PCT £10,000.
14. Wallace, LM, **Bayley, J.** and Thunhurst C (2007) Evaluation of Nuneaton and Bedworth Healthy Living Centre. Warwickshire PCT £11,500.
15. Lunt, F., **Bayley, J.** and Wallace, L.M. (2006) Evaluating barriers and best practice for recruiting fathers to parenting programmes in South Warwickshire. South Warwickshire PCT Research Grant Awards, £7500
16. **Bayley, J.** (2006) Examination of young men's use / non-use of condoms. Sexual Health and Drugs Outreach Work (SHADOW), £3,000
17. **Bayley, J.**, Newby, K. (2006) Evaluation of the pilot stage of the "*What Should We Tell the Children*" project. Coventry TPCT, £3,000
18. **Bayley, J.** and Wallace, L.M. (2005) Applying the Theory of Planned Behaviour to teenagers' use of emergency contraception. Warwick West Midlands Primary Care Research Network, £4900
19. **Bayley, J.**, Newby, K. and Wallace, L.M. (2004) Development of a theory- and evidence-based programme to assist parents to talk to their children about sex and relationships ("*What Should We Tell the Children*"). Coventry Teenage Pregnancy Partnership Board, £9,000
20. **Bayley, J.**, Wallace, L.M. and Sewell, A. (2003) Applying the Theory of Planned Behaviour to teenagers' use of emergency contraception- exploring healthcare providers' attitudes. Coventry PCT £2,800

*NB this list does not include directly support for bids totalling over £15million in the 2014/15 year or projects I was PI/supervisor but not the grant applicant**

17. Appendix C: Portfolio outputs in numerical order

1. Bayley, J., Brown K.E. and Wallace, L.M. (2009). Teenagers and emergency contraception; focus group findings. *The European Journal of Contraception and Reproductive Health Care*, 14(3), 196-206.
2. Bayley, J., Baines, D. and Brown. K.E. (2017). Developing the evidence-base for school sex education programmes: Contributions of an augmented Theory of Planned Behaviour, gender and school year across three contraceptive methods. Accepted for publication in *Sexual Health* (PRE-PRINT VERSION²)
3. Newby, K., Bayley, J. and Wallace, L.M. (2011). "What Should We Tell the Children About Relationships and Sex?"©: Development of a Program for Parents Using Intervention Mapping." *Health Promotion Practice*, 12(2), 209-228.
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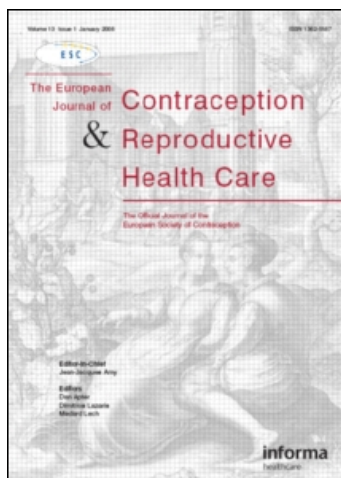
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Teenagers and emergency contraception in the UK: A focus group study of salient beliefs using concepts from the Theory of Planned Behaviour

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If you do use [a condom] and it split they never believe you anyway... It's annoying because they don't believe you. (Female no. 3, group 1)

Self efficacy for accessing EC was also mediated by the support of others. Girls noted that accessing EC without additional support required bravery, although this could be buffered by having an open dialogue with parents:

It depends if your parents are open and you can talk to them... because if you can't, then you've got to do it by yourself and you have to have the courage to get up and do it. (Female no. 2, group 3)

This was echoed by boys who recognised that they provide support by attending with their partner.

If she wasn't confident to get it I'd go with her. (Male no. 3, group 6)

Many participants also listed practical issues which impeded EC use, with transportation, distance and cost cited as major reasons for limited access. These access issues were further compounded by problems accessing EC during school time, which may require truancy if adolescents are unable or unwilling to tell a parent or teacher why they need to be off site. Participants reported that they would need to plan their access carefully and moderate the story they used to assist with access.

I'd be crafty... I'd say to teachers I need to go home and then as soon as I got home I'd say... can I go to bed, and then I'd find someone who could take me to town and have it all done then get back home and be in bed fast asleep. (Female no. 5, group 1)

We conclude that although self-reported confidence in accessing EC is high, confidentiality concerns are extremely important and beyond individual control. Self-efficacy varies based upon confidentiality concerns, openness of dialogue with supportive individuals and the ability to overcome practical barriers.

DISCUSSION

The findings from this study suggest that motivation to use EC is strongly related to negative attitudes to teenage pregnancy and parenthood. Teenagers perceived EC as socially acceptable, but also anticipated negative reactions from others upon access. Participants also report high perceived self-efficacy in access, but have concerns about confidentiality and practical barriers (such as obtaining EC during school time). Data suggest that these barriers may be insurmountable for teens who are ambivalent about pregnancy, although further research is required to fully determine this. Data also highlight the complexities of partner communication about contraception, and the limited communication in casual relationships. These difficulties influence the level of partner support following unprotected sex. Thus, social-cognitive beliefs are likely to influence access to EC when needed.

The findings are consistent with those from earlier research. Adolescents know that EC exists¹⁷ but vary in their level of knowledge about time limits. There is also a knowledge imbalance between males and females, which has implications for communication about EC and subsequent decision making and actions. The impact of limited knowledge may also be compounded by perceived effectiveness of EC. Whilst overall teenagers held positive attitudes about the effectiveness of EC to prevent pregnancy, they still reported some anxiety about possible ineffectiveness. As knowledge of access time limits is directly related to the effectiveness of EC, service and education providers must emphasise that link to encourage individuals to obtain EC as soon as possible after unprotected sex.

Beside knowledge differences, it is difficult to draw out gender differences in attitudes to EC. Boys provided fewer responses to questions and found it difficult to hypothesise their feelings or reactions to EC use by a partner. Male responses suggest that they would support their partner in accessing EC, but beyond this there is little consideration of potential problems, facilitators and the impact of others' beliefs. Further research is needed to explore boy's potential and actual support of EC use.

There was evidence of anticipated pressure by partners and peers to engage in sexual activity, as widely reported by other researchers^{23,24}. Both boys

and girls noted that they would only speak to individuals they felt they could trust, and the information and advice they received would only be followed if they considered it appropriate. Boys' motivation to support their partners' choice was complicated by fears over exerting pressure and appearing to have selfish reasons for encouraging EC use.

Whilst participants report a high level of self-efficacy in accessing EC, they also believed that other teenagers may be less able to obtain it. This belief in their own ability and parallel belief in others' lack of ability is echoic of Weinstein's¹⁴ concept of *unrealistic optimism*, and is supported by their perceived capability to create and adopt strategies to communicate with health providers on a sensitive topic. However, image management techniques and the use of friends to access EC have negative implications for healthcare provision. If clients do not provide sufficient details, staff cannot adequately discuss EC use or risky sexual behaviour. If presenting clients are not the intended final recipient of the intervention, messages given in the consultation are unlikely to be passed on, and there is a risk of unnecessary administration of the product.

There are limitations in the design of this study. The use of a cross-sectional design with a relatively small, socially homogenous and interested volunteer group limits the level to which the findings can be generalised. However, the level of consensus with previous research and between the groups reinforces the validity of conclusions drawn. It is not clear why some eligible students declined to participate, although both the sensitivity of the topic and a timetable clash with preferred subjects were suggested by those who did participate. In addition whilst each group provided useful data, some were dominated by particular individuals. This was not unexpected within the context, but despite facilitator efforts, some of the group were not able or willing to be as vocal. This has clear implications again for the level to which the results can be generalised. However, this study is exploratory; additional research is advocated to further qualify results.

Further research on EC within a TPB framework is essential. Although analysis suggests that the model is suitable for understanding EC use, many elements should be further explored. The impact of ambivalence must be assessed as otherwise interventions which may reliably target perceived control and social

influence, may be ineffective in groups where the reward of avoiding pregnancy is not valued. Further research must also consider the salience of the behaviour and associated attitudes to teenagers. EC use is by definition an emergency behaviour, and attitudes to EC are not overtly considered until unprotected sex occurs. As such, measuring cognitions about EC and designing an intervention accordingly is extremely difficult, especially as such an intervention is most likely to be delivered in a school-based, group setting. Measuring and manipulating the way adolescents think about EC in a classroom setting is always aside from the context of private relationships and communication. This does however provide a good rationale for advance provision of EC, which would overcome the problem of accessing EC within the necessary time limit.

Practical interventions aimed solely at publicising EC effectiveness and availability more widely can only have a limited impact³⁵. The facilitated access following deregulation has not had a substantial impact on conception rates, further emphasising the need to target more social and cognitive factors. To reduce unwanted pregnancy, interventions must also target attitudes and control beliefs as well as apprehensions, such as the assumption that parents would be informed if teenagers asked for EC whilst under 16 years old. The level of concern about breaching confidentiality in the sample population was high, and service providers must address such beliefs if EC uptake is to improve.

It is important to note that interventions to promote the use of EC run the risk of promoting unsafe sexual activity. Whilst using EC is seemingly considered acceptable after unprotected sex, it is also considered irresponsible through its relationship to lack of precautionary contraception. EC is emotive in the way that other contraception is not, in that it is regarded by some as very early abortion³⁶. This poses problems for some faith groups. Consequently, interventions must be carefully designed to ensure that EC use is not conveyed as a primary method of contraception, but rather embedded within a wider intervention to encourage the delay of sexual activity, safe sex and effective contraceptive use.

In summary, our research suggests that motivation to avoid teenage pregnancy is strong enough to override concerns over access. However, adolescents' perceive accessing EC as difficult, are concerned about

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TABLE 1
Protocol Based on Intervention Mapping Procedure Used for Development of the Program

<i>IM Step</i>	<i>Purpose</i>	<i>Intended Outcome</i>	<i>Methods Used</i>
1. Needs assessment	To identify if a need for the program exists and if so, what it should address	Facilitating, reinforcing and enabling factors related to the underlying problem	<ul style="list-style-type: none"> • Focus groups with parents • Consultation with community partnership group • Literature review
2. Matrices	To clarify the program goal and performance objectives and to identify the immediate change objectives that need to be achieved to realize the program goal	Program goal and performance objectives and matrices of change objectives	<ul style="list-style-type: none"> • Consultation with community partnership group
3. Selecting methods and strategies	To identify strategies linked to change objectives that are most likely to bring about the desired behavioral change via the identified determinants	A theory-based strategy map	<ul style="list-style-type: none"> • Literature review • Consultation with subsection of community partnership group
4. Program development	To develop and finalize the program structure and content	The final program	<ul style="list-style-type: none"> • Focus groups with parents • Consultation with community partnership group
5. Adoption and implementation	To identify threats to program uptake and sustainability and strategies to target these	An adoption and implementation plan to inform program rollout	<ul style="list-style-type: none"> • Focus groups with parents • Consultation with community partnership group • Review of existing programs
6. Evaluation	To develop and use measures for process and outcome evaluation	Findings of process and outcome evaluation that can be used to further refine and develop the intervention	This program is yet to undergo process or outcome evaluation

refined through discussion with the community partnership group and by using evidence from the literature review. Examples of factors identified are presented in Table 2 (see Appendix A1 for further details). The factors were then more broadly categorized into determinants. IM procedure entails the categorization of factors into personal and external determinants. Although external influences on parent–child communication about sex and relationships were identified and recorded, these were excluded from categorization as they were judged to be outside of the remit of the intervention. Table 2 presents the personal determinants identified, along with examples of predisposing, reinforcing, and enabling factors on which they are based.

In summary, the determinant Attitude encompassed beliefs regarding the unique and important role of

parents as educators; Knowledge encompassed knowledge of sexual and reproductive health; Skills encompassed listening, judging the level of appropriate information, and dealing with difficult questions; and Self-efficacy encompassed beliefs regarding one's own ability to communicate on this subject and to pass on personally important beliefs and values.

Step 2: Creating Matrices of Change Objectives

As this study was commissioned by Coventry Teenage Pregnancy Partnership Board, the program goal was set from the outset: to increase the quantity and quality of parent–child communication about sex and relationships. Based on the needs assessment and with input from the community partnership group, this

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RESEARCH ARTICLE

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Translating group programmes into online formats: establishing the acceptability of a parents' sex and relationships communication serious game

Julie E. Bayley^{1*} and Katherine E. Brown²

Abstract

Background: With ongoing concerns about the sexual health and wellbeing of young people, there is increasing need to innovate intervention approaches. Engaging parents as agents to support their children, alongside capitalising on increasingly sophisticated technological options could jointly enhance support. Converting existing programmes into interactive game based options has the potential to broaden learning access whilst preserving behaviour change technique fidelity. However the acceptability of this approach and viability of adapting resources in this way is yet to be established. This paper reports on the process of converting an existing group programme ("What Should We Tell the Children?") and tests the acceptability within a community setting.

Methods: Translation of the original programme included selecting exercises and gathering user feedback on character and message framing preferences. For acceptability testing, parents were randomised to either the game ($n = 106$) or a control (non-interactive webpage) condition ($n = 76$). At time 1 all participants completed a survey on demographics, computer literacy and Theory of Planned Behaviour (TPB) items. Post intervention (time 2) users repeated the TPB questions in addition to acceptability items. Interviews ($n = 17$) were conducted 3 months post intervention to gather qualitative feedback on transfer of learning into real life.

Results: The process of conversion identified clear preferences for first person role play, home setting and realistic characters alongside positively phrased feedback. Evaluation results show that the game was acceptable to parents on cognitive and emotional dimensions, particularly for parents of younger children. Acceptability was not influenced by baseline demographics, computer skills or baseline TPB variables. MANOVA analysis and qualitative feedback suggest potential for effective translation of learning into real life. However attrition was more likely in the game condition, potentially due to feedback text volume.

Conclusions: A manualised group programme can be viably converted into a serious game format which is both cognitively and emotionally acceptable. The intervention may be more effectively targeted at parents with younger children, and further game developments must particularly address information dosing. Establishing the viability of digitally converting a group programme is a significant step forward for implementation focused research.

Keywords: Translation, Impact, Implementation, Parents, Sex and relationships, Communication, Teenage pregnancy

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Background

Despite slow progress in reducing under 18 conceptions in the UK in the early 21st century [1, 2] 54 % fewer under 18 s now conceive each year in England for example, compared with 18 years ago [1, 3]. Associated negative health and social consequences of teenage pregnancy [4, 5] continue to present a public health concern however; this data is included as one of three Government indicators of population sexual health [6] and UK rates of teenage pregnancy remain the highest in Western Europe [3]. In parallel, 15–24 year olds continue to have the highest rates of Sexually Transmitted Infections (STIs), forming the majority of chlamydia, gonorrhoea and genital warts cases diagnosed at UK Genito-Urinary Medicine (GUM) clinics [7]. Effort must therefore be maintained and interventions extended to support a stronger downward trend.

Tackling teenage sexual health is complicated by the breadth of factors which inhibit safe sex practices. Research evidence highlights the significant effects of: (i) environmental and familial influences [8], ii) interactional and situational variables [9, 10] and (iii) adolescent-specific cognitive processes [11, 12], the coalescence of which may increase the likelihood of risky behaviour. Increasingly educators are also seeking to inculcate skills to resist sexual pressure and engender positive relationships [13]. The success of safer sex interventions therefore is tempered by their ability to effect change in this complex ecological system [14].

Increasingly best practice in public health is underpinned by drives to embed behaviour change theory into programmes [15]. However, brief interventions struggle to counteract the combined and deep-rooted influences on safer sex behaviour [16, 17]. Outcomes tend to be more positive where interventions are more intensive and theory driven [18, 19], but the resource demands of facilitated approaches [20] may prohibit such approaches. Thus there is need to innovative methods for providing theory-rich, individualised support.

Despite international evidence of the positive impact of school based sex education, provision remains patchy within the UK [21]. Accordingly the value of engaging parents as educators – in addition to targeting young people directly – is crucial and has been strategically recognised [22]. Good parent–child dialogue on sex and relationships (SR) is associated with reduced likelihood of unsafe sex [23, 24]. Systematic review evidence suggests that parent communication interventions can yield improvements in frequency, quality and comfort of parent–child SR communication [25]. Endpoints of research in this area tend to concur on the need to further innovate parental communication programmes and more broadly disseminate best practice to extend their reach [25, 26].

“What Should We Tell the Children?” (WSWTTC [27]) – a group based parents’ SR communication programme co-devised by the lead author – was developed to enhance the availability of theory and evidence based training. Using an Intervention Mapping approach [28], WSWTTC was created through an iterative process based fundamentally on users’ (parents’) needs and incorporating published evidence, theory and stakeholder expertise. The programme was (and continues to be) delivered as a facilitated multiple session group course. However, despite pilot testing showing benefits to attitude [29], WSWTTC has faced both practical difficulties (e.g. venue costs) and reluctance to engage from certain sub-sections of the population (e.g. fathers [30]). Thus, the programme had restricted reach and needed innovating to overcome barriers to engagement.

Online approaches offered the potential to remove practical barriers and offered a less daunting mode of learning for those less willing to attend group sessions. More specifically serious games offer learning in a more entertaining format whilst preserving interactivity and content fidelity. SGs create more lifelike examples and help transpose learning more readily into real-world experience via exploratory and situative learning [31]. Evidence suggests that SGs are an effective and efficient means of delivering targeted behavioural outcomes with longer lasting effects [32]. They also reflect the broader appeal of electronic gaming to the general public [33] and the growing body of technology-savvy ‘digital natives’ [34].

Medical Research Council guidance [35] on the development of complex behavioural interventions advocates that programmes are built “*using a carefully phased approach, starting with a series of pilot studies targeted at each of the key uncertainties in the design*” (pg.8). Ahead therefore of a more sizeable research programme, it is essential to establish whether an online SR communication game would be acceptable to the target audience. Additionally the viability of converting existing programmes must be established, as despite the potential public health benefits such innovations may proffer little is known about the conversion process. This study explores the feasibility of translating a traditional group programme into a game format and examines the acceptability of the game itself. The overall aim was to establish whether a manualised group programme can be viably converted into an acceptable game format to improve parents’ SR communication. Specifically, the paper aimed to assess whether:

- i. a game format is acceptable to parents
- ii. game acceptability is influenced by underlying demographic variables, computer literacy levels or psycho-social variables

- iii. the game demonstrates the potential to effectively change attitudes, intentions and behaviour relating to parental SR communication

Methods

Original intervention

The WSWTTC group programme [27] consisted of six facilitated sessions including multiple exercises on initiating conversation, capitalising on opportunities for discussion and responding effectively to children's questions. With the needs assessment showing attitudes, self efficacy and knowledge to be determinants of communication, content and exercises were devised via Intervention Mapping [28] to target and improve these.

Translation into gaming format

Components from the WSWTTC group programme were reviewed for potential conversion based on parent acceptability, usefulness, viability of conversion into a gaming format and adherence to the original intervention map. Exercises chosen for conversion were those which satisfied the following conditions:

- Original exercise was well received and valuable in group based programme (*facilitator judgement*)
- Convertible into first-person role play (*developer judgement*)
- Mapped against key elements of the original intervention map (*researcher judgement*)

A total of five scenarios plus a quiz were identified for conversion covering the skills of responding effectively to child queries, initiating difficult conversations and building openness in communication for future discussions. A comparison of the original programme structure and selected conversion into the game is given in Table 1.

Characters and images

A range of character options and backgrounds were designed by the technical team, including both realistic and cartoon-style images. These were reviewed by 17 parents within two parenting groups, and a clear preference emerged for first person role play ($n = 16$), a home setting ($n = 14$) with realistic characters ($n = 16$).

Game script

Response options were based on a thematic analysis during the needs assessment [27] through which parents were found to react to children's questions in one of three main ways: (i)*functional* (parent opens up conversation and the child optimises understanding), (ii)*avoidant* (parent refuses to answer or changes the subject),

or (iii)*overreaction* (parent jumps to conclusions or reacts overly strongly, leading to the child becoming angry or disengaged). A branched dialogue script was developed, wherein the child responses depend on the parents' reactions.

Message framing of feedback text

To mirror group discussions in the original programme, feedback text was constructed to offer parents insight into the effect of their communication choices. An online survey with 62 parents explored preferences for the framing of these messages in terms of positive/negative reinforcement, numeric feedback style and extent of evaluation statements. Results (see Table 2 for feedback options) showed an overwhelming preference for positively framed questions (100 %), percentages (45.9 %) and evaluation statements with targeted questions (35.2 %). Game feedback text was then constructed accordingly.

A summary of the final game is given in Table 3.

Control condition

A non-interactive webpage version was produced as an active control, comprising the messages framed in the same way, but without interactive gameplay or tailoring of feedback.

Participants and procedure

The study was conducted in Coventry and Warwickshire (Midlands, UK) and ethics approval was given by Coventry University Ethics Committee. The game was marketed widely across the region, using established channels of public health marketing (print media, radio, posters, existing parenting groups and via major employers). Eligibility was restricted to over 18 year olds, parental responsibility for at least one child under 16 (no minimum age set to allow for those seeking to prepare for later conversations), access to the internet and the ability to read and understand English. All aspects of the study - including Participant Information and Consent processes - occurred online, accessible from any computer with internet access. Self-selecting parents visited the website, registered to participate and were then automatically randomised to the experimental or control condition. Participants completed baseline (T1) and follow up measures (T2) in a single sitting, with a subset also providing interview data at three months post intervention.

Measures

The needs assessment in the original programme [27] determined that the Theory of Planned Behaviour [36] most clearly matched the identified psychological determinants of sex and relationships (SR) communication.

Table 1 Original WSWTTC content and conversion details

Group Session	Exercise title	Summary	Conversion into game element
1: Is there more to it than the birds and the bees?	Birds and the bees and much more	Group discussion to identify topics within RS to increase parents' understanding of breadth of SR	Not converted
	Tree	Graphic representation (tree) to enable parents to visualise and track progress on the course	
	My job description	Small group discussion/individual work to develop a 'job description' for their unique role in SR communication.	
	Vocabulary	Group discussion of SR vocabulary to improve parents understanding, comfort and confidence in using appropriate terminology	
2: Is there a right time to talk about it?	My plan	Small group discussion and individual planning of age appropriate communication with children.	
	Identifying opportunities	Group discussion to identify opportunities for/increase confidence in initiating SR communication in everyday life.	
3: What do I say when I'm put on the spot?	Story	Story about children's reaction to poor school sex education and increase parents' understanding that ineffective communication can lead to children seeking out answers from less reliable sources.	Scenario 1: Child asks parent to explain a documentary in which lions are mating (<i>Story replaced with TV programme to make visual and home-based</i>).
	Basket of items	Group activity: parents pick an item from a box (e.g., condoms, bullying message on social media, adult magazine) and give their reaction as if they found this in their child's room. Objectives include developing parents' skills and confidence in responding calmly and effectively	Scenario 2: Parent finds variety of items (e.g., sexualised magazine, social media messages) in child's room (<i>Box changed to virtual bedroom</i>)
4: What do I say and will they take any notice?	Considering my message	Individual and group activity to help parents develop clear values/messages regarding SR	Scenario 3: Child asks parents about same sex relationships
	Improving your communication style	Role play: parents (acting as child) ask questions to the facilitator (acting as parent) to consider the effect of both bad and good communication.	Scenario 5: Child discusses emerging feelings for someone at school (<i>Question is asked by child rather than to facilitator</i>)
5: Can I do this and still protect their innocence?	Risk and protection quiz	Multiple choice quiz to provide accurate information on (e.g.) adolescent sexual activity and children's preference for parental communication.	Quiz: Quiz show rounds between scenes (<i>Change from paper based quiz to game show format</i>)
	Advice column	Group discussion using real 'agony aunt' questions, the group discusses the answers given and how their responses would differ.	Scenario 4: Child asks parents why they argue. (<i>Change from agony aunt questions to direct questions from children</i>)
6: Can I do this without it being embarrassing?	Role play	Consolidate and practice knowledge/skills developed	Not converted
	Action plan	Plan long term implementation of learning into the home	

This socio-cognitive model posits behaviour as a direct function of intention, which itself is derived from Attitude (ATT; belief in the value of an action), Subjective Norms (SN; beliefs about how others think they should behave) and Perceived Behavioural Control (PBC; confidence in ability to perform the activity). These factors were therefore targeted in the original programme and thus the game. TPB survey items were devised according to recommended practice [37, 38]. Each TPB construct

was measured through a series of 7 point Likert scales (1 = strongly disagree to 7 = strongly agree). Intention to talk with children about SR was computed from two items (*"I intend to talk with my children"* and *"I want to talk with my children"*). PBC was derived from two items (*"if I wanted to I could talk with my children"* and *"It is mostly up to me whether or not I talk with my children"*). SN was computed through two standard normative items (*"People who are important to me think I should"*

Table 2 Parents' message framing preferences

Framing component	Option types	Example	% pref
Positive vs. negative messages	Positive	If you talk with your children about sex and relationships, they will be better able to deal with difficulties	100 %
	Negative	if you don't talk with your children about sex and relationships, they will be less able to deal with difficulties	0 %
Numeric feedback (summary at end of game)	Percentage	You respond positively to your child 80 % of the time.	45.9 %
	Fraction	You respond positively to your child four-fifths of the time	0 %
	Ratio	You respond positively to your child four out of five times.	16.4 %
	Proportion	You respond positively to your child more than three quarters of the time	3.3 %
	General	You respond positively to your child most of the time	34.4 %
Evaluation statements	Statement only	You generally react negatively to difficult or embarrassing situations	11.1 %
	Statement + interpretation	You generally react negatively to difficult or embarrassing situations, probably because you don't feel able to deal with them	3.7 %
	Statement + suggested changes	You generally react negatively to difficult or embarrassing situations, and you need to think about how to understand things from your child's perspective	24.1 %
	Statement + targeted questions	You generally react negatively to difficult or embarrassing situations. Is this because you don't know what to say? You don't have the confidence? Or is it something else. Think about what is making you react so strongly at times	35.2 %
	Statement + reflection from child's perspective	You generally react negatively to difficult or embarrassing situations because you find it difficult to know how to respond. As a result you respond quickly, sometimes without finding out more information from your child first. You should think about how this impacts on your child	25.9 %

and "People who are important to me talk to their children") plus one moral norm item ("I should talk with my children"). ATT was calculated from four semantic differential items ("Talking with my children about SR is" (i) *Harmful/helpful*, (ii) *Bad/good*, (iii) *Not important/important*, (iv) *Embarrassing/not embarrassing*) in which scores reflect the extent of conceptual agreement with the term. In all cases higher scores indicated more agreement / positive levels of the construct. Mean scores were calculated for each scale and TPB scales showed good internal reliability. Cronbach's alpha levels were as follows: Intention (2 items, $\alpha = .885$), Attitude (4 items, $\alpha = .879$), Subjective Norm (3 items, $\alpha = .767$), PBC (2 items, $\alpha = .708$). Analysis showed that removing the moral norm item marginally improved SN scale reliability (to .780), but given the small difference and contextual relevance of this item it was retained. A measure of behavioural frequency was not included because (i) piloting in the original programme identified difficulty developing a meaningful measure of episodic, context-based dyadic behaviour, and (ii) as the intervention and pre-post measures were conducted in a single sitting it was not possible to capture actual behaviour change in that time. A single sitting design was chosen to maximise likelihood of engagement and survey completion. Acceptability of both the game and control version were measured by a series of 7 point Likert scale items (strongly disagree to strongly agree) covering ease of

use, usefulness, willingness to recommend the resource to others and discomfort/anxiety using the resource. These items were factor analysed to determine the underlying elements of acceptability. Real-life similarity of characters, setting, and dialogue were measured on 5 point scales (*completely different* to *very similar*). Computer literacy was calculated as a product of self reported computer literacy (*not at all good* to *very competent*) and length of time using a computer (*less than 6 months* to *more than 5 years*).

At baseline (Time 1, immediately before intervention) all participants completed measures on demographics (gender, ethnicity, age, number of children, child's ages), computer literacy (length of computer use, self rating of literacy), frequency of parent website access and direct TPB measures (ATT, SN, PBC, INT). At Time 2 (immediately post intervention), all participants repeated the TPB measures plus acceptability items for the relevant condition.

Telephone interviews were conducted three months post intervention to gather data on the translation of learning into real life settings, longer term impact and overall acceptability. All game participants were asked to consent at T1 to being contacted for a follow up phone interview. Those who consented were sent an email invite, followed by one repeat request to non responders, and no further contact was made for those not responding after this second invitation.

Table 3 "What Should We Tell the Children?" game summary

The game provides parents with realistic scenarios of sex and relationships communication with their children, all based around a virtual house. Once registered, players are then able to select from two versions of the game – one for parents of younger children (aged 5–9) and one for older (aged 10–14). Both versions have similar content and the same gameplay, with slight dialogue differences to reflect the nature of conversations at different ages. The game is a first-person role play, with players proceeding through rooms of a virtual house and talking to 'their children'. In each room they are faced with a different situation such as children asking awkward questions or finding objects of concern in their room (e.g., messages on social networking sites). Scenarios include:

1. Child asks parent to explain a documentary in which lions are mating.
2. Parent finds variety of items (e.g., sexualised magazine, social media messages) in child's bedroom
3. Child asks parents about same sex relationships
4. Child asks about parents arguing
5. Child discusses emerging feelings for someone at school

In each situation, the player must choose how to respond, and the scenario evolves accordingly with the child reacting to the parents' choices. Scenes are interspersed with short quizzes to increase knowledge and raise awareness of key issues. Players receive feedback on their choices at the end of each scene and full feedback at the end of the game with tailored advice on how to improve their skills. Voice-overs for the child characters and atmospheric music were added to make the scenarios more engaging. All spoken text was displayed on screen so the game can be played with or without sound. The game takes approximately 1 h to complete, but can be played at the parent's chosen pace.

The game can be viewed at <https://healthinterventions.coventry.ac.uk/sash/-/projects-parents-game.aspx>

Data analysis

Chi square tests were used to assess relationship between attrition and condition (game vs. static control), demographics and computer literacy. Factor analysis was run to determine underlying components within measures of acceptability. The influence of underlying demographic, computer literacy or TPB variables on acceptability was assessed with linear regressions. MANOVA analysis was undertaken to assess whether game acceptability differed by gender, ethnicity or child's age and to assess the effectiveness of the game on TPB variables.

All analysis was run on the dataset with missing T2 data and again replacing missing data with T1 scores (Intention to treat analysis) but no differences were found. All results presented here are without replaced data.

Results

A total of 180 registered for the study and completed a time 1 survey. Ages ranged from 'under 20' (10 %) to '61 and over' (1.1 %) with a normal distribution (mode = 31–35 years old). The majority (83.3 %) were female, and most were White British (88.3 %). Sample characteristics are presented in Table 4.

Table 5 shows the mean scores and standard deviations for TPB constructs at baseline and at time 2.

Retention and attrition

Figure 1 summarises participant flow. In the game condition, of 106 participants at T1, 64 completed the game and 46 completed the T2 survey (overall attrition rate of 56.6 %). In the control condition, of 74 participants at T1, 47 viewed the resource and completed the T2 survey (attrition rate of 36.5 %).

Table 4 Participant demographics

Total Demographics	T1		T2	
	N	%	N	%
Age				
Under 20	18	10.0	7	7.5
21–25	15	8.3	5	5.4
26–30	15	8.3	10	10.8
31–35	37	20.6	21	22.6
36–40	34	18.9	15	16.1
41–45	29	16.1	15	16.1
46–50	15	8.3	9	9.7
51–55	12	6.7	7	7.5
61+	2	1.1	2	2.2
(Missing)	3	1.7	2	2.2
Ethnicity				
White British	159	88.3	80	86.0
White other	6	3.3	5	5.4
Indian (Asian/British Asian)	8	4.4	5	5.4
Bangladeshi (Asian/British Asian)	3	1.7	1	1.1
Pakistani (Asian/British Asian)	2	1.1	2	2.2
Asian other/Asian mixed	1	0.6	0	0
Mixed Heritage	1	0.6	0	0
Number of children				
1	71	39.4	40	43.0
2	77	42.8	42	45.2
3 or more	32	17.8	11	11.8
Child's age				
Pre-School/Primary	107	59.4	58	62.4
Secondary/over	43	23.9	24	25.8
Both	19	10.6	8	8.6
(Missing)	169	93.9	3	3.2
Length of time using computer				
Less than 6 months	6	3.3	3	3.2
Between 6 months and 1 year	6	3.3	3	3.2
1–5 years	11	6.1	4	4.3
More than 5 years	157	87.2	83	89.2
Frequency accessing online resources				
At least once per day	18	10.0	8	8.6
At least once per week	21	11.7	11	11.8
At least once per month	32	17.8	15	16.1
Less than once per month	65	36.1	33	35.5
Never	44	24.4	26	28.0
Computer literacy				
Not at all good	9	5.0	6	6.5
Below average	1	0.6	1	1.1

Table 4 Participant demographics (Continued)

Average	27	15.0	11	11.8
Competent	55	30.6	28	30.1
Very competent	88	48.9	47	50.5
Gender				
Female	150	83.3	80	86.0
Male	30	16.7	13	14.0

Chi square tests were performed to identify if attrition was related to condition, demographics (gender, age, ethnicity, child's age) or computer literacy. Results showed a significant association between condition and attrition only (χ^2 (1, $N = 180$) = 7.06, $p = .006$), showing those in the game condition were more likely to dropout before completing T2. Further chi squares showed no significant relationship between attrition and any other variable (all $ps > .05$). Participant dropout was therefore unrelated to participant characteristics or computer literacy.

Research question 1: Is a game format acceptable to parents?

Descriptive data shows the game was acceptable to participants (See Fig. 2).

However, accuracy and appropriateness of feedback text was uniformly disliked. These items were excluded from subsequent factor analysis due to the lack of variance. The majority of scores also showed good similar/very similar ratings for environment (63 %), character (65.2 %), dialogue (69.6 %) and situations (63 %).

Research question 2: Is game acceptability influenced by underlying demographic variables, computer literacy levels or psycho-social variables?

Factor analysis of the acceptability items identified underlying elements of acceptability. Kaiser-Meyer-Olkin (KMO) coefficient scores (0.773) and Bartlett test of sphericity (0.00) indicated satisfactory confidence for the execution of factor analysis. Principal components analysis with varimax rotation was applied to the data. The number of retained factors was defined based on components with eigenvalues higher than 1 and scree

Table 5 Mean and standard deviation scores for TPB constructs at T1 and T2

Construct	GAME		CONTROL	
	T1	T2	T1	T2
INT	6.25 (1.14)	6.33 (1.25)	5.86 (1.38)	5.81 (1.52)
ATT	6.01 (1.22)	6.16 (0.99)	5.71 (1.57)	6.14 (1.10)
SN	5.64 (1.08)	5.70 (1.35)	5.41 (1.33)	5.54 (1.46)
PBC	5.92 (1.21)	6.22 (1.27)	5.57 (1.48)	5.63 (1.58)

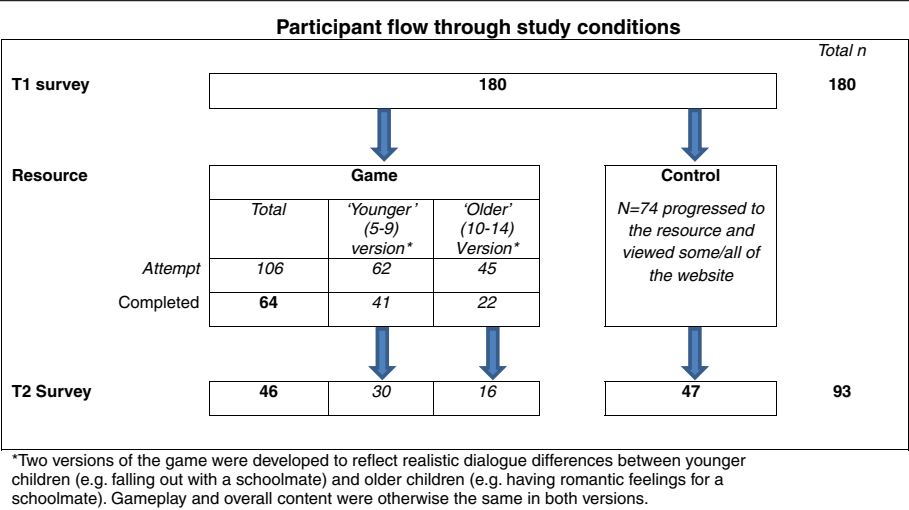


Fig. 1 Participant flow through study conditions. *Two versions of the game were developed to reflect realistic dialogue differences between younger children (e.g., falling out with a schoolmate) and older children (e.g., having romantic feelings for a schoolmate). Gameplay and overall content were otherwise the same in both versions

plot visualisation. Two factors with eigenvalues ≥ 1.0 were retained and the inflexion of the scree plot confirmed two factors. Analysis of the conceptual meaning of these factors was independently assessed by each author with clear agreement on the concepts. Two clear factors (acceptability types) emerged (See Table 6):

- Factor 1: *Cognitive acceptability* (items loading included; useful, amusing, recommend as parenting aid, recommend as fun)

- Factor 2: *Emotional acceptability* (items loading included; anxious/worried, uncomfortable – NB Items reverse scored, higher scores showing less anxiety / discomfort)

Linear regression analysis was conducted to determine whether game acceptability was predicted by underlying demographic, computer literacy or TPB variables. Gender, ethnicity, age, child’s age, computer use and TPB variables were regressed onto Cognitive (Factor 1) and

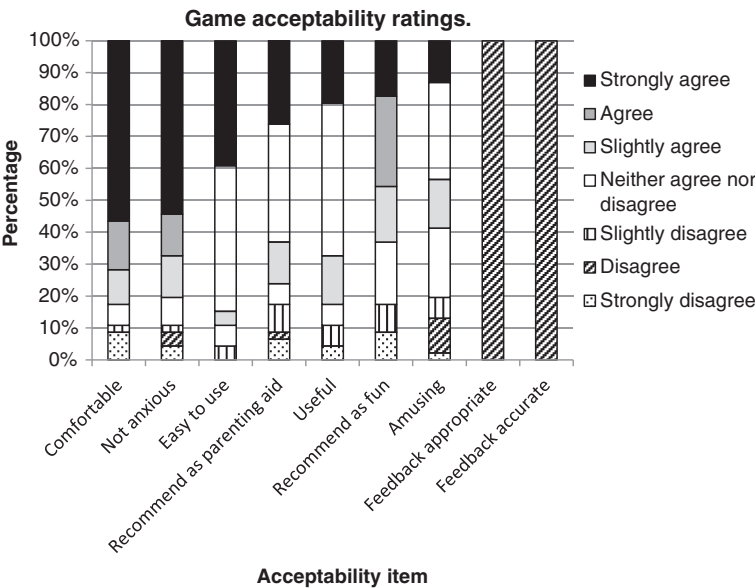


Fig. 2 Game acceptability ratings

Table 6 Game factor analysis loadings

Game acceptability	Mean	SD	Factor 1	Factor 2
I found the game useful	5.50	1.44	.895	-
I found the game amusing	4.80	1.63	.805	-
I would recommend the game to others as a parenting aid	5.33	1.74	.887	-
I would recommend the game to others as a fun experience	4.91	1.72	.884	-
I was anxious/worried playing the game (<i>reverse scored</i>)	5.78	1.74	-	.826
I was uncomfortable playing the game (<i>reverse scored</i>)	5.83	1.83	-	.848

Emotional acceptability (Factor 2). All results were non-significant ($p > .05$) with no variables predicting scores on either factor. Only 'frequency of accessing parenting materials' approached significance for Factor 1 (Table 7) and subjective norm for Factor 2 (Table 8).

Further analysis was conducted to assess whether game acceptability differed by gender, ethnicity or the child's age. MANOVA results showed a significant effect of child's age on Cognitive Acceptability (Factor 1), ($F(2, 38) = 3.764$, $p = .032$; partial $\eta^2 = .165$). Post hoc univariate analysis revealed that cognitive acceptability was significantly higher for parents of young children, ($F(2, 43) = 3.436$, $p = .0141$; partial $\eta^2 = .138$). Results for ethnicity and gender were not significant, and no effects were found for Factor 2 (emotional acceptability).

Data suggests acceptability is not predicted by underlying TPB cognitions or computer familiarity, but that being a frequent user of existing online parenting resources may be related to cognitive acceptability of the game.

Table 7 Linear regression results for cognitive acceptability of game (Factor 1)

Constant	B	Standard error	β	P-value
TPB				
Attitude (T1)	.172	.183	.152	.352
PBC (T1)	.142	.257	.117	.586
Subjective norm (T1)	.303	.294	.208	.310
Intention (T1)	-.309	.295	-.200	.301
Demographics				
Age	-.133	.147	-.166	.370
Number of children	-.204	.224	-.143	.368
Computer literacy/use				
Computer literacy	.305	.249	.189	.228
Frequency accessing online parenting resources	-.379	.197	-.298	.062

Table 8 Linear regression results for emotional acceptability of game (Factor 2)

Constant	B	Standard error	β	P-value
TPB				
Attitude (T1)	-.268	.208	-.219	.204
PBC (T1)	.060	.293	.206	.838
Subjective norm (T1)	.612	.335	.390	.075
Intention (T1)	-.524	.335	-.314	.126
Demographics				
Age	-.127	.167	-.146	.453
Number of children	-.018	.255	-.012	.943
Computer literacy/use				
Computer literacy	-.151	.284	-.087	.597
Frequency accessing online parenting resources	.201	.224	.147	.374

Research question 3: Does the game demonstrate the potential to effectively change attitudes, intentions and behaviour relating to parental SR communication?

To assess the likely effectiveness of a fully powered intervention on TPB constructs, a 2x2 (Time*condition) MANOVA was conducted. Results showed a small main effect of time only ($F(4, 88) = 2.515$, $p = .047$; partial $\eta^2 = .103$). Within subjects univariate tests showed a change in attitude by time ($F(1, 91) = 6.798$, $p = .011$, partial $\eta^2 = .07$) and time*condition interaction effects approached significance for attitude ($F(1, 91) = 3.616$, $p = .06$, partial $\eta^2 = .038$).

Qualitative data also offers insight into the transfer of learning into real life. A total of 17 parents consented at T2 to be contacted for follow up at three months. When contacted, 13 agreed to be interviewed, 2 declined and 2 did not reply. To supplement this feedback, 4 further interviews were conducted with stakeholders who represented key gatekeepers and delivery agents. These individuals consisted of a youth worker (who works with young parents), one community worker (who delivers interventions in the local area), one Sex Education teacher (for whom the game would add to their broader engagement programme) and one public health lead (for whom the game may form part of local provision). As those working at the interface between parents/provision and commissioning, they were able to offer an aerial insight into the reception and usefulness of the course. All played the game and were interviewed 3 months post intervention. Responses (summarised in Table 9) suggest the game offers parents the means to reflect on and improve their existing communication skills. Responses indicate instances of improved skills and actual behavioural changes underpinned by changes in attitude.

Table 9 Summary of qualitative feedback (3 months post intervention)

1. Benefit of Serious Game Approach
<ul style="list-style-type: none"> • 'Made it a bit more real than just the info you get in leaflets and books'. • 'I liked that fact that the situations presented were normal – watching TV, in the kitchen and so on'.
2. Changing attitudes and behaviours
<ul style="list-style-type: none"> • 'It's so easy to get yourself tied up with what you should say, what you shouldn't say, what will other parents think and so on. This game made me think more about how I say things and I how I keep things open with my kids...It's more important to make sure your kids can come to you and talk when they need to'. • 'The game I think helped most by making me realise it's more about making sure the channels of communication are open and discussing things rather than me just deciding what they need to know and sticking with that whatever they say'
3. Increasing awareness of opportunities
<ul style="list-style-type: none"> • 'It made me realise maybe I'm not even noticing opportunities to talk about sex at home. Actually there was something that day that when I got back home, if I hadn't played the game I don't think I'd have picked up on at all. I wouldn't have done anything with it, it would have passed me by, a comment my daughter made. Playing the game made me think about what I could be doing more'.
4. Adjustment to own communication style:
<ul style="list-style-type: none"> • 'My daughter is ... starting to notice women in magazines and how glamorous/thin they are. When she was looking through a magazine I sat with her and chatted about the pictures. I wanted to shout they're airbrushed and fake! But I knew if I did she'd stop listening right away. So I took some of the tips as my feedback suggested I tend to be a bit overkill and I took a breath and asked her what she thought, if she thought the photo might have been changed, what was beautiful about the lady, what was beautiful about other people and just chatted it through. By the end of the chat I'd made my point and I think crucially she'd felt that she'd come to that decision herself.'

Discussion

Summary of findings

This study primarily sought to establish the acceptability of a computer game version of a manualised group programme. Results show the game was acceptable in both cognitive and emotional terms, uninfluenced by demographics and underlying psychosocial variables. The game was most acceptable to parents of younger children, and qualitative results indicate the game has potential to support SR communication changes longer term. Overall this study suggests a manualised group programme can be viably converted into an acceptable serious game format. Establishing the viability of converting a programme in this way and the associated public acceptance is a significant step forward for implementation focused research.

Implications for future developments

This small feasibility study identifies a range of issues which need further exploration in a larger, higher powered programme of research. Despite high acceptability of the game, attrition rates were higher in the game compared to the control condition. The length of the game,

compared to the more swiftly read static version, may have led to disengagement over time and thus contributed to attrition. Data also shows that feedback text – a key difference between the intervention and control – was routinely disliked. This is likely to have been a significant contributor to dropout in the game condition. Whilst the message framing had been assessed by users, the cumulative text volume may have deterred parents from continuing. This raises questions for information 'dosing' and intensity in future versions with a recommendation that the overall length of the game be shortened by reducing the amount of in-game text *alongside* managing user expectations about realistic time commitment. Ultimately intervention designers must balance content volume with message necessity to produce change.

The game was more acceptable for parents of younger children, but the reasons why are unclear. A potential explanation is that - with sexual behaviour being more distal - parents of younger children feel less anxious than those of older children. Evidence suggests that procrastination can lead to long term build up of anxiety about sex and relationships communication [39]. Parents of older children may therefore feel both the pressure to communicate and the unease of doing so after previous non-communication. As such, the game may be better suited as a preparatory tool ahead of the imminent need for such conversations to build earlier family communication.

There is also a discrepancy within research question 3 between qualitative findings (which highlight the benefit of the game in changing attitudes and confidence) and quantitative results (which show no effect by condition). This is potentially a result of the process of measurement. This study was intentionally a rapid 'one sitting' pre-post study based on our experience of engagement with longer term programmes. However, this necessitated minimal TPB items and precluded capture of broader effects such as those emerging from the qualitative feedback. A broader, more comprehensive and longer term quantitative assessment is crucial in future research to assess the impacts beyond a reductionist theory-specific approach.

Strengths

The study has two primary strengths. First, the conversion process and user feedback offers insight into the process of translating an existing theory based intervention into an online version. For practitioners, this demonstrates that programmes struggling to reach the desired community can be transformed transparently and preserve the underlying knowledge base. Second, the setting and methods of the study have particular ecological validity. The game was based on user needs, marketed, released and recruited using existing standard public health approaches, and used online platforms which are widely available. Besides capitalising on

existing marketing options and directly contacting some of the key gatekeeping organisations to promote the work, no artificial inflation of the recruitment was attempted (for instance no incentives were offered). This allowed a more valid assessment of game uptake and highlighted needs for further rollout. The study demonstrates the potential for translating existing programmes for delivery in this format, not having to ‘start from scratch’. The mix of both qualitative and quantitative methods enabled an assessment of underlying constructs and acceptability alongside real world translation of learning and actual change in behaviour.

Weaknesses

There are a number of study limitations, primarily resulting from the small self-selected sample and ‘one sitting’ design. Whilst the recruitment strategy simulated real world approaches, the small sample – coupled with small expected effect sizes in behavioural research [40] – have limited the ability to detect any effects. Similarly homogeneity of the sample in terms of gender, computer literacy and particularly ethnicity reduce the generalizability of the conclusions. The voluntary nature of participation also precluded assessment of what prevented people from engaging; thus we cannot determine what deterred potential users from participating. The project was designed as a prototype, but the resulting limited character options, restricted bank of dialogue choices and prescribed gameplay settings reduced the simulative benefit of SGs. Qualitative feedback implies it still had merit over static options, but the mixed ratings on similarity items suggest there is considerable opportunity to enhance the gameplay and within-game options. Additionally whilst the system was supposed to be automatically randomising, the difference in sample sizes between conditions suggests a fairly large difference in allocation. Statistical checks demonstrate no differences between groups on key variables and no other patterns were found in manual checks of the data. Thus whilst true automatic randomisation of participants is uncertain, data checks suggest no major problems with bias.

Future research/next steps

With qualitative feedback suggesting a simulative game approach supports parents to adopt more positive communication styles, and quantitative data indicating likely influences on attitude towards communication about sex and relationships, the game has the potential to effect real change. Future iterations of the game – particularly with revisions to feedback text – could substantially enhance these emerging impacts. Development of this approach is fourfold. First, as the game is a prototype, it needs revising and extending in both content and broader gameplay experience. Whilst overall acceptability was good, the loss of

participants from pre to post intervention dilutes conclusions over effectiveness. Attrition rates therefore suggest there is need to focus on gaming elements which sustain motivation to engage [41]. Mechanisms to achieve this in a non-facilitated virtual environment need further investigation. These edits and foci should strengthen the conservative positive effects suggested in this pilot study. Second, future rollouts of the programme must include a larger and more representative sample, with long term effects tested with a more powerful research design. A Cluster RCT could be particularly appropriate given the regional (cluster) nature of many public health programmes and further need to elucidate within-family dynamics [42, 43]. A study of this scale is needed to ascertain the true potential for benefits possible through this approach. Third – given the limited uptake despite extensive marketing - future rollout requires more innovative recruitment strategies. Data suggests parents with younger children are a key audience, and may benefit from targeted approaches. Finally, the process of converting manualised programmes as outlined here should be replicated across other public health interventions to improve uptake. Such approaches are crucial for improving the successful implementation of interventions beyond the academic context.

Conclusions

A serious game translation of an existing parenting intervention is a viable and acceptable tool for public health practitioners, particularly for parents of younger children. A broader programme of research is needed to develop and test a more comprehensive game. Translating traditional formats – so crucial for improving the implementation of academic interventions – must shift beyond information provision online into engaging and technically enhanced approaches. This pilot study has demonstrated the potential for translating traditional programmes into innovative and engaging approaches and offers a procedural insight on conversion for intervention developers.

Abbreviations

SR: Sex and relationships; TPB: Theory of planned behaviour; WSWTTC: “What Should We Tell the Children?”.

Competing interests

The authors declare that they have no competing interests.

Authors’ contributions

Principal responsibility for study design, data collection and project management was assumed by JB. KB supervised JB, overseeing delivery of the project and supported decisions on study design, analysis and decisions about project modifications. JB led the authoring of the paper, with KB commenting on drafts and suggesting amendments and approving the final manuscript for submission. Both authors read and approved the final manuscript.

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