Why adolescents stay with romantic partners that use coercive control?

A SYSTEMS DYNAMICS MODEL

INTRODUCTION

What is coercive control?

Coercive control is a pattern of behaviours with the aim of manipulating, typically to constrain, the actions of a partner in a way they do not want (Hamberger, Larson and Lehrner, 2017). The pattern includes emotional abuse, intimidation and, often, physical violence (Day and Bowen, 2015). This pattern of behaviour may be consciously enacted by a controlling partner, though not necessarily so. When a partner has been subjected to controlling actions, they have impeded ability to make decisions, low independence, low self-image. They are also likely to be isolated from their friends (Hamberger, Larson and Lehrner, 2017).

Recently, governments in the UK have updated legislation to criminalise controlling behaviours that make a partner dependent as opposed to single incidence of violence or intimidation (*The Domestic Abuse (Scotland) Act*, 2018; *The Serious Crime Act*, 2015). Furthermore, schools in England and Scotland are required to be educated about healthy relationships and to understand how abuse and coercive control function (Department for Education, 2019; The Scottish Government, 2014).

Why is it important?

Identifying coercive control or what has historically been called abuse can be difficult as it is not given by a single event, but a pattern of behaviours. Furthermore, the pattern of behaviours does not exclusively involve negative behaviours but could include a tactical combination of positive and negative behaviours. Adding to the difficulty is the disagreement about whether the success of attempted control is necessary to meet a definition or whether controlling partner's actions alone are sufficient (Hamberger, Larson and Lehrner, 2017).This has implications for intervention. It has become a priority of policy makers to increase understanding of coercive control, particularly among young people (NHS Scotland, 2018; The Scottish Government, 2016) and service providers currently use a range of models to intervene in this area.

Difficulties in defining coercive control are made more stark when considering possible points of intervention, especially in law enforcement where nuance is difficult to capture in statute, and authorities are wary of ambiguity forcing them to hold risk (Stark, 2007). Beyond a legalistic framework, which often take a static or event-focussed approach, research needs to

expand on, and frontline staff need a good understanding of the forms coercive control take over time to intervene effectively.

Misperceptions of how control operates also contributes to a sigma that subjects of control face and, particularly among young people, serves as a barrier to help-seeking (Barter *et al.*, 2009). Among peer groups of young people, normalisation to controlling, abusive or violent behaviour can contribute to acceptance of these behaviours (Vagi *et al.*, 2014) and impede someone who want to leave these relationships, as peers are the primary source of support (Barter *et al.*, 2009).

Coercive control has been found to be quite prevalent in young people. Almost half of young people aged 13 to 14 who have been in a relationship report having been victims of domestic abuse (Fox *et al.*, 2014), which is likely to underrepresent coercive control given it's broader definition and that it is commonly misunderstood. Elsewhere, 25% of all young people aged 11 to 18 report having been in a controlling relationship (Dartington Service Design Lab, 2018).

The lifetime victimisation rate for girls aged 12 is the about same as for those aged 16 (Barter *et al.*, 2009), suggesting that victimisation begins young and determines future victimisation. Elsewhere, there is evidence that peak offending of domestic abuse occurs in adolescence (Fox *et al.*, 2014). Being subject to childhood abuse, physical and sexual violence are risk factors for future perpetration (Stith *et al.* 2004), but past victimisation is the most significant risk factor for perpetration (Spencer *et al.*, 2019) of physical intimate partner abuse and past perpetration is a risk factor for future victimisation (Stith *et al.* 2004). This highlights the need to intervene early.

Learning Theory of Coercive Control

Learning Theory is a framework for explaining controlling partners' behaviour. It posits that the frequent and often random seeming changes between positive and negative behaviours create an atmosphere where the subject is dependent on and compliant to their partner (Stark, 2007). These actions include physical violence, isolating behaviour and belittling comments (ibid).

Early on in relationships, including abusive ones, partners generally use affirming or positive language, which encourages a bond to form between partners. In controlling or abusive relationships, negative behaviours tend to emerge over time (Halligan, 2013). Furthermore, controlling partners will often shift back to positive, affirming behaviours following controlling, abusive or violent behaviour, particularly if it has led to their partner growing distant (ibid).

MODEL

Purpose and Aims

The primary purpose is to develop a theoretical understanding of the dynamics of coercive controlling behaviour in adolescent dating relationships.

The specific aims include:

- Theorise the causal structures of controlling patterns of behaviour operate in intimate relationships
- Demonstrate the effect of controlling behaviours in intimate relationships including the impact on whether someone stays or leaves
- Demonstrate how expectations of power or dominance, rather than a desire to hurt one's partner, give rise to controlling behaviours
- Demonstrate how tactics typified by positive behaviours are a part of a strategy of control
- Demonstrate some of the difficulties of leaving a controlling partner
- Demonstrate how mutually controlling relationships work and why they are prevalent

Methods

The model is largely developed based on the existent literature. Workshops were conducted with professionals in the system to develop some initial causal loop diagrams. One subject expert was consulted during the development of the model. Conditional to funding, the causal theory and assumptions will be presented in detail to practitioners and young people, for refinement and further development. System dynamics modelling is suitable because of the dynamic complexity involved. There are multiple feedback mechanisms, one partners behaviour is based on the stocks of the other partner; There are multiple stocks interacting and influencing decisions made.

Causal Loop Diagram

A causal theory was developed grounded in the Learning Theory model of coercive control in intimate relationships. This gives that controlling partners change the kind of behaviours they use toward their partners, as well as the intensity of these behaviours, based on observations of their partner's relationship to them – their attachment and dependency (Halligan, 2013). These actions then have an impact on the observed phenomena (Vagi *et al.*, 2014; Halligan, 2013; Stark 2007) creating a feedback structure.

There are three reinforcing loops and two balancing loops that operate (see figure 1). When partner A uses positive reinforcement, this increases their partner's attachment to them, making them feel more powerful in their relationship. In turn, as they are more secure in their

power, they use less positive reinforcement (B1). Conversely, their use of controlling behaviours causes their partner to become less attached, meaning they consider themselves become less powerful. As such they will be less controlling (B2).

R1 shows a feedback loop of dependency and power. The more dependent partner B becomes on A, the more powerful A is, and the more scope they feel they have to use controlling behaviours. If loop B2 were to dominate, then this would impose a limit on how much power partner A could build but if loop R1 dominates, then there won't be a limit to the power they can build.

There is also a reinforcing mechanism R2 that is a little unclear from the CLD. A component part of dependency is self-esteem. When partner A uses controlling behaviours, they lower B's self-esteem. As this stock drains, B's attachment becomes more elastic to A's positive reinforcement. This underscores how effective coercive control as modelled by Learning Theory is, because it is the changing between positive to negative behaviours that is effective. This loop has a delay, as the negative reinforcement changes one state which then moderates the impact of the positive reinforcement. This frames the trade off for using negative reinforcement shown in B2 is a short-term cost to a longer-term strategy.

Just as there is a trade off for building power with negative reinforcement, there is a trade off to positive reinforcement. Partner A's use of positive reinforcement also builds B's self-esteem, a component part of dependency. However, this relationship is modelled to be quite weak, and therefore the loop R3 does not dominate.

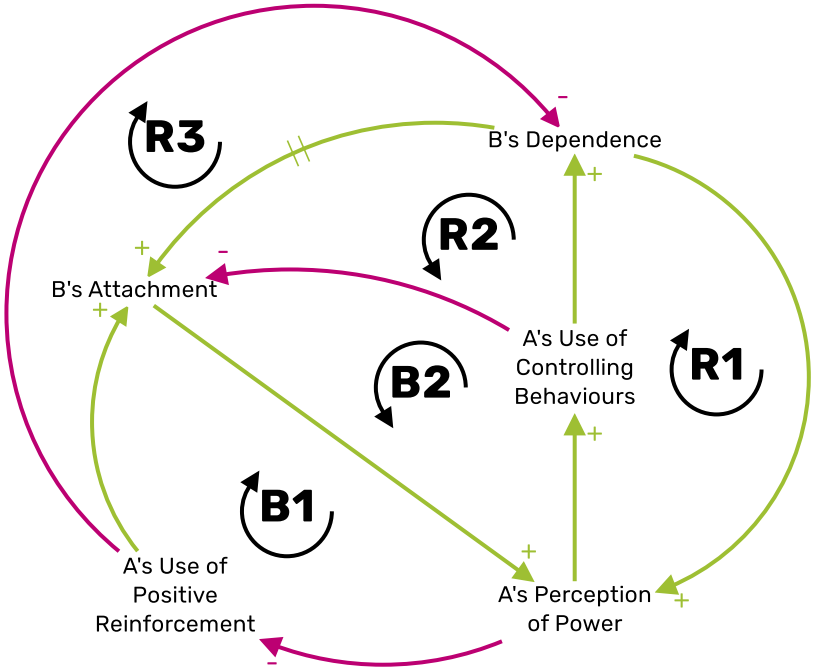


Figure 1 The single-perpetrator causal theory CLD

There is one more balancing mechanism around the perception of power. Each partner has an expected power. It is the gap between their expected power and their perceived power that motivates them to act increase their power. This acts as a balancing mechanism on controlling behaviours. This is a strong goal-seeking mechanism.

Dyadic Model

The model was constructed to represent dyadic romantic relationships, as such each partner is represented by the same structure. This serves several purposes. Firstly, it ensures that controlling and non-controlling partners are presented as behaving according to the same structures, and thus controlling behaviour is endogenous to the model. Secondly, it allows for mutual perpetration of control, which is commonly found in relationships (Fox *et al.*, 2014; Cutter-Wilson and Richmond, 2011).

Model formalisation

For the full list of variables, units and equations see supporting documentation (Appendix – model formalisation)

The model has four modules for each partner: Attachment, Dependence, Power and Leaving. One partner's ability to dominate their partner – their power over them – is calculated using two variables: partner's attachment and partner's dependence. Attachment gives how attached to the relationship one is, akin to love. Dependence comprises self-esteem and social support and represents an individual's autonomy. Leaving examines whether the partner wants to leave, based on level of attachment, and on their ability to leave the relationship, largely given by their dependence. Each of these modules is explained below.

Power

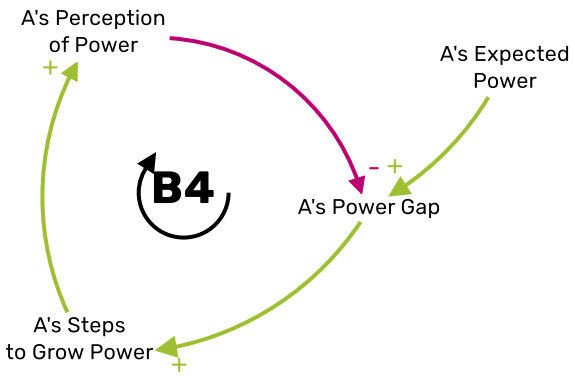


Figure 2 Balancing feedback as partner A achieves expected power

Partner A's power is given by the equation:

$$A's\_Perception\_of\_Power =$$
$$Effect\_of\_B's\_Perceived\_Dependence\_on\_A's\_Perception\_of\_Power +$$
$$Effect\_of\_B's\_Attachment\_on\_A's\_Perception\_of\_Power$$

Each partner monitors the other's attachment to and dependence on them. Each can proportionally be substituted for the other to calculate their perception of power; how dominant they believe they are over their partner, or how severe controlling behaviours they can use without jeopardising the relationship. Individuals have an expectation of power, which represents how dominant they expect to be over their partner. The strategy for achieving their expected power that controlling partners employ, whereby they alter their behaviour to reach an expected level of power without their partner leaving them. They achieve this strategy by employing three tactics:

1. Inculcation
2. Domination
3. Crisis Mode

The inculcation is employed when the perpetrator perceives that their partner is attached to them, but their power is low. This tactic is typified by lots of use of positive reinforcement, and less use of negative reinforcement and social control. This enables the controlling partner to build their partner's attachment to them. As their partner becomes more attached, the controlling partner uses less positive reinforcement and more negative reinforcement and social control. When these kinds of actions dominate, the controlling partner is using the domination tactic. The boundary between the domination tactic and inculcation tactic is not absolute but could be given by the point at which negative reinforcement and social control are more prevalent than positive reinforcement (see figure 3).

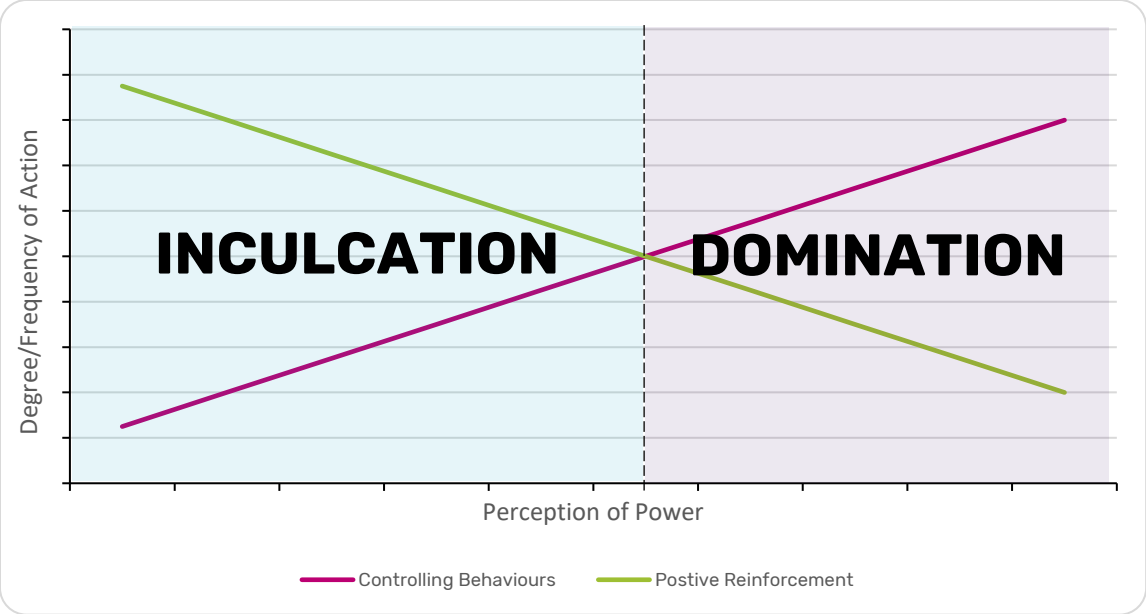


Figure 3: *Power and Use of Controlling Behaviours vs Positive Reinforcement*

The "Crisis Mode" tactic is employed when a controlling partner sees that their partner wants to leave them as they have decided they are not sufficiently attached to the relationship. This tactic comprises a high level of severe negative reinforcement and social control and no use of positive reinforcement. Functionally, this makes their partner more dependent on them, and less able to build the sufficient resources to leave the relationship. This is consistent with research that finds that often the most violent and severe behaviour from controlling partners come at the point the victim has decided to leave (Barbaro-Kukade, 2019), perhaps as a punishment for trying to leave (Miller, 2012).

Leaving

The equation for partner A choosing to leave the relationship is:

IF A's_Attachment.Attachment <= Threshold_for_Leaving, THEN 1, ELSE 0

This gives that they decide to leave if their attachment falls below a threshold. The threshold is a linear function of time, that starts 4 weeks into the relationship, following the "honeymoon phase."

In order to leave the relationship, A must gather sufficient resources, given by an if statement:

IF Active_Resources < A's_Leaving.Required_Resources_to_Leave THEN 1, ELSE 0

When one partner decides to leave, they will begin to gather the resources to leave. As outlined above, their ability to leave the relationship is given by how dependent they are on their partner, and when they decide to leave their partner will enter crisis mode to try to make them more dependent to leave.

Another key factor in the Leaving module is the accumulation of warning signs. Warning signs are given by an individual's understanding of control. The greater their understanding, the better their ability to correctly interpret the controlling actions of their partner as a warning sign of an unhealthy relationship and the longer it takes for them to forget past controlling behaviour. The accumulation of warning signs is linked to a drain on attachment. It also means that a partner can begin to build resources to leave before they decide to leave the relationship, which come into play when they make that decision.

Attachment

The attachment module is built around a single stock with one inflow and two outflows. One partner's positive reinforcement affects the other's gain of attachment. The effect of positive reinforcement on attachment is moderated by self-esteem. The higher the self-esteem, the less elastic the gain in attachment is to positive reinforcement. The effect of negative reinforcement is also moderated by self-esteem. Negative reinforcement causes a greater outflow of attachment, and this effect is larger still the higher self-esteem is. The second outflow from attachment is based on warning signs.

Dependence

The Dependence module is based around two stocks: self-esteem and social support, which comprise dependence. The equation for B's Perceived Dependence:

B's_Perceived_Dependence = B's_Effect_of_Social_Support_on_Perceived_Dependency + "B's_Effect_of_Self-_Esteem_on_Perceived_Dependency"

Lower self-esteem is a long-term consequence of violence in adolescent relationships (Cutter-Wilson and Richmond, 2011). Low self-esteem is often cited as a risk factor both for perpetration and victimisation of controlling or abusive behaviours, indicating a reinforcing feedback structure (Reynolds and Shepherd, 2011). In the model, self-esteem is one of two factors that contribute make up dependence, the other being social support. It makes an individual more vulnerable to coercive control through two mechanisms: firstly, it moderates how susceptible to positive reinforcement their attachment is – the lower their self-esteem, the higher the impact of attachment – secondly, it affects their dependence on their partner – making it more difficult for them to build the resources to leave their relationship.

Self-esteem changes according to three factors: positive reinforcement, negative reinforcement and social support. When a partner uses positive or affirming behaviour, self-esteem improves. When a partner uses negative or demeaning behaviour, self-esteem falls. Social support can be used to improve self-esteem, in that an individual can get their self-

esteem from sources other than their partner. Good social support can substitute for a partner, poor social support makes someone's self-esteem more responsive to their partner.

Social support is one of the two factors that make up dependence on one's partner, along with self-esteem. Social support is lost when it is not actively maintained, just as friendships are. Coercive control perpetrated by one's partner that prevents the maintenance of existing relationships that form the basis of social support, or inhibits one's ability to form new relationships, cause the stock of social support to decline. This kind of behaviour, especially when perpetrated through digital technology, is broadly accepted among young people (Barter *et al.*, 2015).

Isolation as a risk factor for and result of controlling or abusive relationships is consistent with the literature which finds that isolation is a risk factor for victimisation and is described by victims as being worse during abusive relationships (Reynolds and Shepherd, 2011). Abused women also report rebuilding relationships with family and peers as key to successfully leaving a relationship (ibid).

Model specification

Reference mode

The model's reference mode is dependency on one's partner. This comprises self-esteem and social support which were chosen because alienation from support networks was commonly raised as a target of coercive behaviour (Wood, Barter and Berridge, 2015; Stark 2007) as insults, belittling and embarrassment were for poor self-esteem (Barter et al., 2016; Wood, Barter and Berridge, 2015; Stark 2007). This suggests that dependency, in relationships that feature coercive control, would increase over time.

Self-esteem and social support are also risk factors for victimisation (Barter, 2015; Reynolds, 2011; Chung, 2007). In the literature, agency is linked to self-esteem (Reynolds, 2011) and victims report relying on friends and family for support (Wood, Barter and Berridge, 2015). Dependency also has an affect on each partner's ability to leave the relationship (Reynolds, 2011), which makes it key to whether or not a relationship ends. Young people have described returning to abusive or coercive partners because of a lack of social support (Wood, Barter and Berridge, 2015). This suggests that the starting value for dependency would effect it's trajectory.

In the model, this is why dependency makes up the larger part of each partner's power, because they perceive that they have control over their partner's actions including their partner's ability to leave. Because power is a goal seeking variable and it is what dictates the use of controlling behaviours that increase dependency, you would expect dependency to take a

logarithmic pattern for an individual in a relationship with a partner who has an expectation of power.

However, because the feedback structure involves slight delays caused by accumulations -- and because without interference social support grows and self-esteem increases with it and as a bi-product of a partner's attachment motivated positive reinforcement, when a partner is not actively working to increase their power -- in relationships where controlling partner's reach their expected power before the end of the simulation and before their partner leaves them, you would expect oscillations in dependence.

This gives rise to three reference modes depending on different expectations of power (Figure 4). One where the other partner does not have an expectation of power, one where the partner has an expectation that they do not meet, and one where the partner has an expectation that they do meet.

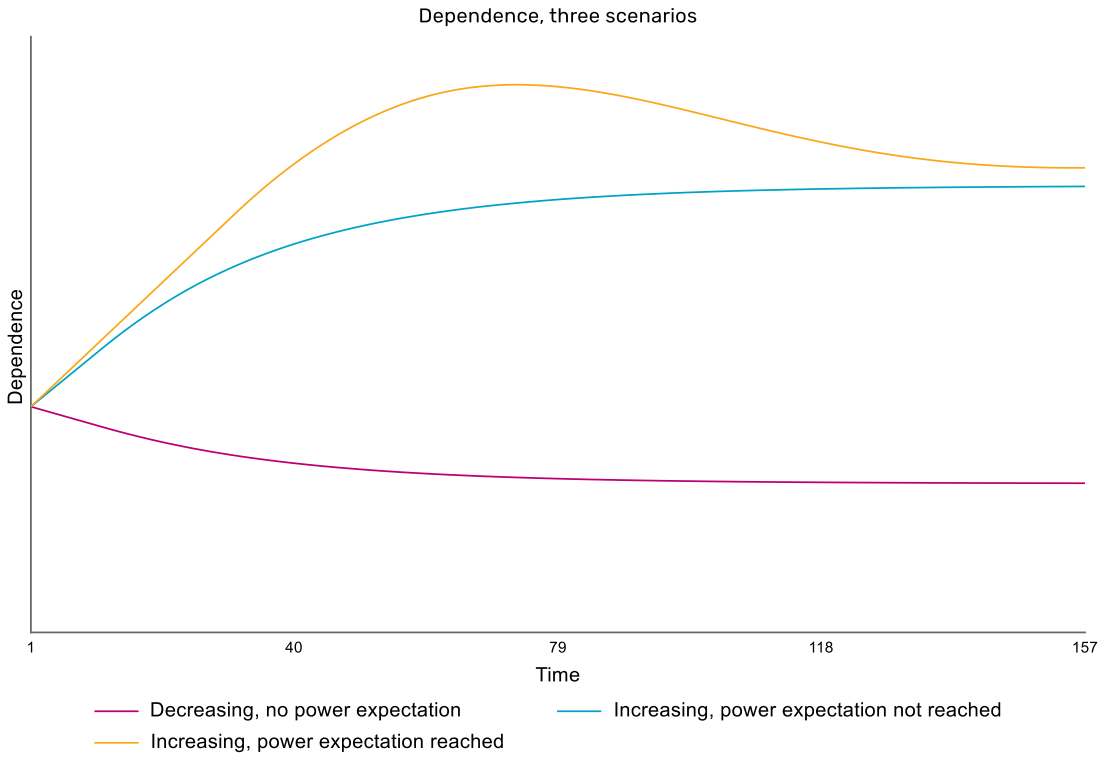


Figure 4: *The reference mode for dependence in three scenarios*

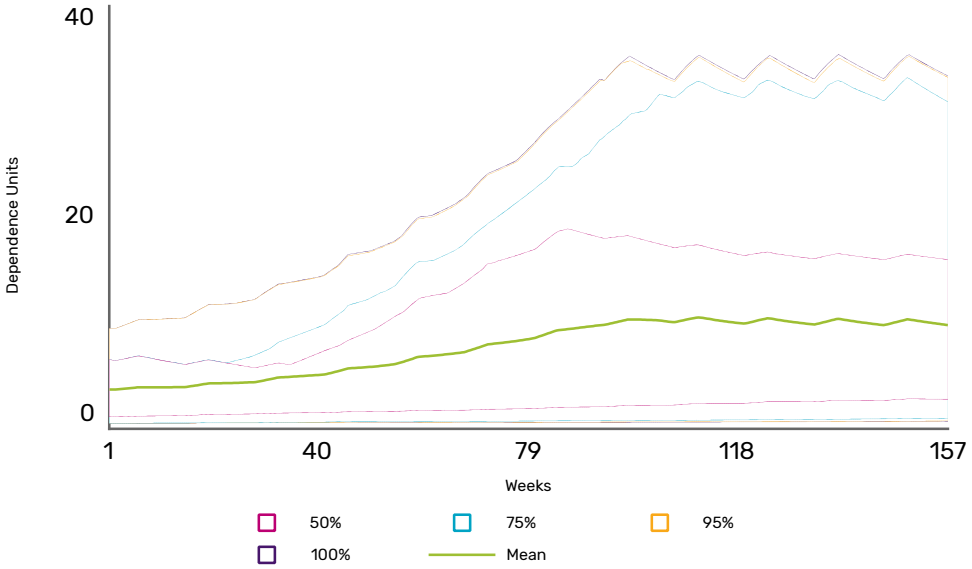
Time Horizon

The model focuses on romantic relationships in adolescents and thus runs for 156 weeks (3 years). This is consistent with the literature on the length of adolescent relationships, though not controlling ones specifically (Matson, Chung and Ellen, 2012).

Model testing

We conducted the following tests to build confidence in the model (Sterman, 2000)

- Dimensional consistency: The units are consistent and there are no errors in units and equations.
- Integration error test: We tested the numerical sensitivity to simulation time step by progressively reduced in half the integration time step until there were no significant difference in numerical results
- Boundary adequacy: The boundary of the model has been revised as part of the model development process, in an attempt to create a dynamic causal theory and model consistent with the existent literature.
- Extreme conditions: The model was tested under extreme conditions, with low and high initial parameters. The model displayed patterns of behaviour consistent with the logic of the underlying theory and the model formulation.
- Behaviour replication: The model can replicate the reference mode: dependence increases in the victim over time. The graph below covers results from 144 runs of perpetration and co-perpetration scenarios, based on varying levels of expected power among both partners and varying levels of initial self-esteem, social support and understanding of control for the victim.



ANALYSIS

There are three broad sets of scenarios:

- Neither partner has an expectation of power
- One partner has an expectation of power
- Both partners have an expectation of power

For each scenario, we conducted sensitivity analysis: varied the initial levels of self-esteem, social support and understanding of control for the partners. Based on this:

we can characterise relationships with no expectation of power (healthy relationships) as those with (1) increasing levels of attachment for both partners, with levels being high; (2) low levels of dependence which seems to approach a goal for both partners; (3) increasing levels of power for both partners, reaching the low to medium range (30 of a maximum of 100). Power

increases as a result of increasing attachment. According to the model, 25 of the maximum 100 units of power can be gained though attachment levels, and the other 75 through dependence levels. (4) lasting relationships – no partner leaves in the 4 years of the simulation time in any case. The graphs for both partners are the same indicating that the same initial conditions lead to the same levels of attachment, dependence and power in both partners when neither has an expectation of power.

We can characterise relationships with perpetration from one partner (one partner has an expectation of power) as those with (1) increasing levels of attachment for the perpetrator, with levels being high; goal seeking levels of attachment which stays moderate for the victim; (2) decreasing dependence for perpetrator, with levels being low; increasing levels of dependence for victim, with levels being moderate; dependence for both displays goal-seeking behaviour (3) increasing levels of power for perpetrators, approaching the goal of expected power; increasing levels of power for victim, staying in the low range 20 of a maximum of 100); (4) relationships that often end – in a majority of the cases, the victim leaves the relationship before the end of the simulation.

We can characterise relationships with co-perpetration as those with (1) increasing levels of attachment for both partners, with levels being low; (2) low levels of dependence which seems to approach a goal for both partners; (3) increasing levels of power for both partners, staying low, and displaying goal-seeking behaviour (4) relationships that end – in all cases, the relationship ends. The graphs for both partners are the same indicating that the same initial conditions lead to the same levels of attachment, dependence and power in both partners.

Next, we examine the second scenario of a single perpetrating partner in more detail, to understand the role of different factors:

Varying levels of expected power:

As expected power increases, the victim's attachment and dependence increase. Power is a function of partner's attachment and dependence levels, and thus this is intuitive.

As expected power increases, there is very little change in attachment levels for the perpetrator and no change in dependence levels.

In terms of power, the higher the expected power, the higher the actual power for the perpetrator; there is almost no difference in the power experienced by the victim – which is consistent with the attachment and dependence levels of the perpetrator being similar.

There is no much difference in the relationship ending based on the expected levels of power.

Varying levels of understanding of control: The main effect of understanding of control is on the likelihood of the victim leaving the relationship. When the understanding of control is zero, the relationship never lasts. When the understanding of control is perfect, the relationship ends in all cases. There is a positive correlation between the understanding of control and the likelihood of the relationship ending.

Varying levels of initial self-esteem: Higher the self-esteem, lower the attachment and dependence in the victim, resulting in lower power for the perpetrator. There is also an effect on the likelihood of the relationship ending. When the initial self-esteem is high, the relationship ends in most cases. Higher self-esteem means relationships end sooner. Where it doesn't, the understanding of control is zero. When the initial self-esteem is low to moderate, the relationship ends in cases where the understanding of control is perfect. There are few cases where the relationship ends when understanding is not perfect (although it is high at 6.66). In these cases, the expected power is high and the initial self-esteem is low.

Varying levels of initial social support: The initial level of social support impacts the initial dependence and the initial power experienced by the perpetrator. This means that the perpetrator feels more powerful when the initial levels of social support are low, perpetrating more/severe abuse to close the gap between the expected and actual power. Thus, the lower the initial social support, the higher the abuse. If the victim has any understanding of control, this will build their warning signs and drain their attachment levels. Thus, ending the relationship. The more the understanding of control, the faster the victim can leave the relationship. Thus, the behaviour is counterintuitive: the lower the initial social support, the higher the likelihood of the victim leaving the relationship. This is the case, when the victim has some understanding of control and a moderate self-esteem. If the victim has a low self-esteem, then the perpetrator is able to achieve their desired levels of power and dependency in all cases (varying levels of initial social-support).

Another counterintuitive thing is that: when dependence is very high at the start, it tends to reduce over time (compared to increasing in other cases).

DISCUSSION

Coercive control emerges when one or both partners have an expectation of power and the starting power, given by their partner's initial social support, self-esteem and attachment, is lower than their expected power.

Controlling partners carefully balance their tactics between positive and controlling to reach their expected level of power. The victim's attachment levels increase over time and due to the positive acts. Without an understanding of control as a pattern of positive and negative behaviour, the negative behaviours do not drain attachment sufficiently for them to want to leave the relationship. Thus, attachment levels are not low per se in abusive relationships and thus victims may not fully recognise the rationale to leave. In fact, for a very high level of power, it is essential for the perpetrator to build the victim's attachment to a high level.

Understanding of control also determines whether victims accumulate the resources required to leave the relationship. Once the partner decides to leave, the ability to leave is based on their accumulated resources as well as ability to build more resources, which is given by their dependence. If the victim does not have the resources required, they might be forced to stay in the relationship. In such a situation, the controlling behaviour is more severe as the perpetrator operates in 'crisis mode', given the victim wants to leave.

Key findings and implications for practice

Attachment or 'love' is not zero in abusive relationships or when relationships end. That attachment increased in most scenarios is partially consistent with the literature which finds that there is no difference in love between violent and non-violent relationships (Giordano, 2012). The model demonstrates this, which is an important contribution because it helps engage with young people in a way that accounts for their experience more comprehensively – it considers positive feelings, not just the negative aspects of the relationship.

Understanding of control as a pattern of behaviour (including both positive tactics and coercive behaviour) is the main factor influencing whether the victim can leave an abusive relationship. This validates the current focus of interventions: many of the state and third sector approaches to coercive control and, historically, domestic violence seek to improve understanding through public awareness campaigns and direct interventions.

The model also demonstrates that self-esteem is a vulnerability to controlling partners but not a deciding risk or protective factor. Victims with low initial low levels of self-esteem and social control can leave the relationship. Although, those with low initial levels are likely to experience more severe coercive control.

Moderate levels of initial self-esteem or social support are not sufficient, and many victims may not be able to leave the relationship. This is because moderate starting

dependence reduces the power of the perpetrator and thus the use of coercive control tactics is more gradual and less intense. Such patterns could be harder to spot especially when the understanding of control is low.

Interestingly, the model implies that co-perpetration may serve as a protective factor against becoming dependent on one's partner. There is not any literature on the dynamics of mutually controlling relationships and it is not well understood.

Limitations

Motivations for control

Presently, the model gives controlling partners' expectations of power as externally motivated. The literature suggests that it may be caused by several factors, such as expectations of traditional gender roles (McCarry, 2010), mental illness, substance misuse (Vagi *et al.*, 2014) and attitudes toward violence (Burman and Cartmel, 2005).

There some variables already coded in the model that are risk factors for perpetration of control, such as self-esteem (Vagi *et al.*, 2013). As well as a risk factor for perpetration self-esteem likely has continuous effect on the kind and the degree of controlling behaviour perpetrated against a partner (Borenstein, 2006) This kind of relationship may cause something such as the Crisis Mode currently deterministically coded in the model. As such, low self-esteem is unlikely to be a deciding factor in whether coercive control takes place, but it is likely affects the degree and even the form that it takes.

In addition to limiting the explanatory power of the model, not endogenizing controlling partner's behaviour implies that the responsibility for coercive control unduly rests with the subject of control. While the model does say that an expectation of power drives controlling patterns of behaviour, it also says that low self-esteem, low social support make a subject of control vulnerable to control. This could be taken to imply that it is something pathological about them at fault for them being subject to abuse (Chung, 2007).

Additional research is required to inform the model as to what motivates individuals to be controlling in their intimate relationships and to unpick the causal mechanisms indicated by epidemiological research.

Gender

As alluded to above, control, abuse and violence in intimate partner relationships is widely considered a gendered phenomenon. There are differences between boys and girls in attitudes toward violence (Burman and Cartmel, 2005); the justification given for the use of violence (Barter *et al.*, 2009); severity of abuse and violence perpetrated (Cutter-Wilson and Richmond, 2011); and impact of abusive behaviours (ibid).

Research has repeatedly found a high correlation between belief in traditional gender roles and perpetration of violence in intimate relationships (McCarry, 2010). This belief is more commonly and more strongly found in boys than in girls (ibid). This belief in traditional gender roles may work through the variable in the model for the expectation of power. If boys have a patriarchal view of intimate relationships, they will expect their partner to be compliant to them. There is also a belief among young people that violence is a normal part of boys behaviour, which make all genders more permissive of violent behaviours (ibid).

However, the exact relationship between gender and controlling, abusive and violent patterns of behaviour, or in responses to these behaviours, is not clear. It is likely that causal factors identified in the additional research laid out above would at least partially illuminate these relationships.

The environment

Currently in the model environmental factors can only be represented through exogenous variables. However, some of these may be in part endogenous to the model through feedback structures. One of these is the influence of peer groups. Young people often consult their peer about for whether their partner's behaviour is normal or acceptable (Fox *et al.* 2014) and acceptance of violence is a risk factor for victimisation (Reynolds and Shepherd, 2011).

This relationship is also likely present for parent-child relationships, where parents can either explicitly – though encouraging their child to stay in with a controlling partner – or implicitly – through modelling abusive relationships with their partners or their child (Wood, Barter and Berridge, 2011).

Building social support

According to the model, social support is built in two ways: the inflow depends on your existing level of social support, and there is a gradual increase in level that remains constant throughout the model. In reality, it might be that the second mechanism is influenced by the self-esteem or other factors. The higher the self-esteem the higher the inflow, building in a feedback mechanism.

A comprehensive view of learning theory

The picture of learning theory created by the model is incomplete. While alternating between positive reinforcement and negative reinforcement or other controlling behaviours are demonstrated to prove an effective strategy in maintaining a relationship while making one's partner dependent, the theory also posits that an element of "randomness" is important in subjugating one's partner. The theory builds on an element of behaviourism; random reinforcement is more effective than consistency because of the uncertainty it build in its subject. In controlling relationships, this uncertainty makes the subject of control tense, and

motivates them more strongly to anticipate and subjugate themselves to their partner (Stark, 2007).

Healthy Break Ups

Another element for the model that may need consideration is why healthy and how healthy relationships end. It may be that this is structurally distinct from unhealthy relationships, and as such not necessary to include in the model, but this would need additional research to consider whether it should inform the model.

Next steps

In order to validate the structure and findings of the model, consultations with young people, practitioners and subject experts will be undertaken, conditional to funding available for this work. These can be used to validate and refine the specification of existing relationships, improve the causal structure between the variables and add new structure, particularly around the limitations above.

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